Measuring progress towards sustainable food cities: Sustainability and food security indicators

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1. Introduction

This literature review is conducted in the context of the ESRC funded project "Enhancing the Impact of Sustainable Urban Food Strategies". The project aims to develop a set of indicators that helps city governments to measure their progress towards the design of a more sustainable and secure urban food system. This constitutes a crucial step to maximize the efficiency of resource investment at a time of austerity, improve urban food security, and provide informed advice to food policy makers at the local, national and international levels. This review of both academic and "grey" literature is instrumental to identify the approaches currently used to assess sustainable food systems and urban spaces as well as the range of indicators used to measure the environmental, social and economic sustainability of urban food strategies.

For that purpose, we first introduce the complexity of measuring the sustainability of the food system (Section 2), followed by a section where we discuss definitions for urban sustainability as well as associated indicators (Section 3). The fourth section presents three different conceptual frameworks that guide the design and selection of sustainability indicators: the Pressure State Response Framework, the material and energy flow framework, and theme-oriented frameworks. The subsequent section reviews eight initiatives focusing on the assessment of the sustainability of the food system implemented at different scales: urban/local, national and international. In section 6, we analyse key sustainability assessment initiatives that have taken place in the UK, in order to embed the work of the Sustainable Food Cities Network in its national context. Finally, we reflect on the strengths and weaknesses of developing indicators as well as point out key take away messages for the subsequent steps of the project.

This review has been instrumental to develop and design the workshops where practitioners from different cities will discuss what a successful sustainable food city looks like and the indicators that we might use to measure progress in that direction.

2. Measuring the sustainability of the food system

Food security and environmental, economic and social sustainability are at the forefront of current political agendas (FAO & Biodiversity International, 2012), which are increasingly stressing the need to strengthen the links between food, health, and environmental research (SCAR, 2011). In the food system, this raises the need for interdisciplinary and multi-stakeholder analyses of the nexus between diets, the environment and human health (Tilman & Clark, 2014).

Although research institutions, governmental and non-governmental bodies have produced a host of valuable efforts -both at the national and the international level- to identify tools for the assessment of the sustainability of food systems (Feenstra et al., 2005; DEFRA, 2009; FAO, 2013; UNSDSN, 2014), there is a lack of consensus about the metrics that should be employed to assess sustainable diets and food systems, which is key for providing decision-makers and policy-makers with evidence-based knowledge (Fanzo, 2014).

In the current context characterised by change, measures of food and nutrition security that only focus on outcomes - such as hunger and malnourishment- might be too narrow for a comprehensive understanding of the food system and its changing causal mechanisms. As several authors have pointed out, there is a need to identify a consistent range of evidence-based sustainability metrics and standards to conduct multidisciplinary analyses of the tangible linkages between food security, nutrition, diets, health, agricultural productivity, resource use, environmental impacts, costs and benefits (Beddington et al., 2012; Tilman & Clark, 2014). In other words, there is a call for multidisciplinary and more inclusive, integrated, and systemic approaches that focus on resources (financial, physical, natural, and social) to capture the dynamic processes between and within food system activities, nutrition and health, and environmental outcomes (Allen et al., 2014).

We outline in the Appendix 1 a list of recent and on-going research initiatives focusing on the measurement of the sustainability of the food system. Many of these studies aim to assess mainly the links between nutritional adequacy and environmental sustainability of diets. Others propose further multidisciplinary and holistic frameworks to explore the complexity of the sustainability problems of the food system. A second review will be dedicated to community initiatives that focus on the specific assessment of community, local, and urban food systems.

3. Urban food systems assessments

The sustainability of the food system can be explored at different scales. Urban communities, which are increasingly affected by the impacts of the global food system, would especially benefit from comprehensive food system assessments that examine the local connections between production, distribution, consumption, and waste disposal and measure their impacts on the environment, human health and livelihoods. An appropriate set of indicators could enhance our understanding of the trends and relationships between elements within the food system, detecting gaps

and problem areas that need to be addressed, monitoring progress in addressing those gaps and helping community stakeholders and policy-makers in identifying the areas of concern and investments.

The final report of the **Foodlinks project** "*Urban Food Strategies: The Rough Guide to Sustainable Food Systems*" (Moragues et al., 2013) describes how the global food context is interlinked with the local realities and identifies the potential that cities and local authorities can implement through community-level actions against these trends. The report points to the consequences of our unsustainable food system for our wellbeing (health issues, environmental impacts, economic performance, injustice and cultural erosion) and shows how Urban Food Strategies can take many forms and are conditioned by the local context. It also describes how stakeholders organize in different places, underlining the importance of guaranteeing participation from key actors and regularly interacting with the city as a whole.

The way we define "urban sustainability" strongly affects the way in which metrics and indicators are selected (Huang et al., 2015). For the purpose of this paper, we propose to adopt the following definition of urban sustainability, which emphasizes the importance of community-based efforts to improve public participation: ''*A sustainable city is one in which the community has agreed on a set of sustainability principles and has further agreed to pursue their attainment*'' (Munier, 2007).

The **selection of a set of sustainability indicators** is generally realized following the guidelines of a **conceptual framework** and a series of **criteria for checking the availability and quality of the data**. An indicator has been defined as "*a way to measure, indicate or point to with more or less exactness*", "*something used to show the condition of a system*" (Feenstra et al., 2005), an ''*operational representation of an attribute (quality, characteristic, property) of a system*'' (Gallopin, 1997). An index is a more complex aggregate variable that combines multiple indicators (Wu and Wu 2012). Huang et al. (2015) define a set of indicators as "*a group of non-aggregated indicators often organized following a certain indicator framework for a project*", and an indicator framework as "*a conceptual structure based on sustainability arguments in order to facilitate indicator selection, development, and interpretation*". The indicator data are the actual quantitative measurements or observations that address the underlying intent of the indicators (Feenstra et al., 2005)

Urban sustainability indicators "*provide information on the state, dynamics, and underlying drivers of urban systems, with specifications of time dimension, limits, or targets associated with them*" (Huang et al., 2015).

4. Organizing metrics for urban food systems

Building on Huang et al. (2015), the indicator sets for the assessment of the urban sustainability are generally based on three types of frameworks: the Pressure State Response Framework, the material and energy flow framework, and theme-oriented frameworks.

The **Pressure-State-Response framework** (PSR), as well as its more elaborated versions, i.e., the Driving force-State-Response framework (DSR) and the Driving force-Pressure-State-Impact-Response framework (DPSIR), is one of the earliest and most widely used indicator frameworks developed by the Organization for Economic Co-operation and Development (OECD 1993) and Eurostat (1999).

In this framework, the indicators are identified and clustered according to pressures or/and driving forces (mainly representing anthropogenic processes), system state or/and impacts (focusing on the current conditions and impacts of activities/events on the environment), and responses (relating to societal actions and reactions to changes in system state and driving forces). The PSR framework is applied especially for environment-centred indicator sets (Huang et al., 2015). The DPSIR framework is one of the several frameworks proposed to study social-ecological systems (Binder et al., 2013) such as the food system (Ericksen, 2008).

The **material and energy flow framework**, in the urban context, relates mainly to the inflows, outflows, and internal flows of material and energy in a city (urban metabolisms) (Huang et al., 2015). This framework (similarly to LCA) is very useful to keep track of the input, output, and internal dynamics of energy and materials within systems, and it provides information on the environmental and economic dynamics. However, it remains hard to adopt it for exploring societal, institutional and policy relevant issues.

The **theme-based framework** is a more flexible conceptual structure that clusters the indicators around four dimensions of sustainability (environment, economy, society, and institutions) and builds on central themes or issues of policy relevance such as equity, health, and education (social dimension), biodiversity and natural resources quality (environmental dimension), economic structure and consumption/production patterns (economic dimension), and institutional frameworks (institutional dimension) (Huang et al., 2015).

In this paper, we analyse urban food system assessment initiatives that adopted the DSPIR framework, the theme-based framework and the *goal-oriented framework*. Then we propose a classification of the indicators used in these initiatives, following the urban food system strategies (Moragues et al., 2013 - Foodlinks) and building on the six goals of the Sustainable Food Cities Community (Appendix 2):

1. Promoting healthy and sustainable food to the public.
2. Tackling food poverty, diet-related ill-health and access to affordable healthy food.
3. Building community food knowledge, skills, resources and projects.
4. Promoting a vibrant and diverse sustainable food economy.
5. Transforming catering and food procurement.
6. Reducing waste and the ecological footprint of the food system.

In order to cover the three pillars of Sustainable Development (Environment, Economy, and Society) and to reduce the arbitrariness in the indicator selection process, it is often recommended - for urban sustainability indicators - to apply the DPSIR or the theme-based frameworks. In particular, a considerable number of cities in developed and developing countries applied the theme-based framework to develop indicator sets for assessing the sustainability of individual cities and urban regions (Huang et al. 1998; Lee and Huang 2007; Tanguay et al. 2010; Huang et al., 2015).

For the breadth of the approach and of the factors considered within this analysis, a theme-based/goal-oriented framework can be here considered as the most appropriate to cover the variety of elements that constitute the urban food system. Although the DPSIR framework represents the overarching structure that is designed and actually suitable for practitioners, in our specific context this approach would not be flexible enough and some variables would risk to be excluded if they don't fall into the specific dynamics of the DPSIR framework. Furthermore, this work aims to build on and refine the SFC yearly Sustainable Cities Award Scheme, which constitutes a guide for 36 UK cities to calibrate their progress towards sustainability and social justice (see Appendix 2).

5 Exploring food system assessment initiatives at the local, national and international level

We propose here a review of eight initiatives focusing on the assessment of the sustainability of the food system implemented at different scales. Such initiatives have been selected based on two main criteria.

First, for the reasons mentioned above, we opted for including initiatives that applied theme-based, goal-oriented, and DPSIR frameworks. Second, only projects that developed indicators considered relevant to sustainability and to the food system were included in the review (that is, projects that develop indicators at different scales, but that can be applied also at the city level).

In particular, we selected a number of initiatives about indicators at the UK and at the international, urban and community level within the most recent, relevant, and specific ones that involved the active participation and consultation of local stakeholders. Also, we have included some initiatives on food system indicators at the global and regional level that propose large and detailed sets of indicators and that implied a strong participatory process. Building on the geographical scope of the selected initiatives, we have arranged them in three different groups: urban/local scale initiatives, national scale initiatives, and international initiatives.

5.1 URBAN/LOCAL SCALE INITIATIVES

5.1.1 The Vivid Picture project

In this initiative the indicators were clustered on the basis of a set of goals for measuring progress towards ecological, economic, social, and health outcomes. The selection process involved a large literature review and the implication of experts and stakeholders.

Further information available at:

- http://coloradofarmtoschool.org/wp-content/uploads/downloads/2013/02/Proposed-indicators-for-sustainable-food-systems.pdf

- http://www.rootsofchange.org/projects/vivid-picture-project/

OBJECTIVE

The Vivid Picture project represents an effort (at US state level, California) to develop indicators for food and agriculture using existing data. In its local context, the project

was a first attempt to quantify trends not previously measured. The project advanced current indicator theory by pioneering a set of indicators for not just one issue area but for a very multidimensional field: the health of the food system. The goal of the indicators developed by the Vivid Picture project was to come up with a set of measurable data that cover key trends whose change is a proxy for change in the broader system.

APPROACH

The project involved developing a system for measuring progress toward ecological, economic, social, and health outcomes, making the collection of indicators very diverse. Furthermore, it measures outcomes throughout the value chain, from input supply and production through to retail and consumption.

METHOD FOR SELECTING THE INDICATORS

The process started by gathering a team of experts who established a procedure for selecting indicators. The indicator process was guided by a review of many previous efforts. For the Vivid Picture indicators, a Pressure-State-Response model was selected and some aspects of the "Linkage Analysis" model were incorporated to ensure that the indicators were tied to the issues of greatest importance for the community in question.

An extensive process for identifying the indicators was employed. The first step was to identify and clarify a list of goals for a sustainable food system. Indicators were then selected to measure progress toward each of these goals. Stakeholder input and participation was a central part of the Vivid Picture process, especially for helping to identify, interpret and apply indicators. It is essential that stakeholders, the real users of the indicators, understand and support the set of indicators selected. Many participants brainstormed about possible indicators. Experts provided feedback on the data and content as well as possible data sources. An average of three experts were consulted per goal. A deep review of the indicator set was conducted to finalize the list and eliminate any remaining inappropriate indicators.

CRITERIA

The Vivid Picture project team developed a set of 11 criteria against which to assess the appropriateness of potential indicators. The criteria applied for the selection of indicators include the following. The indicators must be:

- Based on Vivid Picture goals: the indicator measures progress toward the given goal or goals.

- Opportunities-based: the indicator measures progress toward the goals (positive), rather than a regression away from the goals (negative).

- State-wide: The indicator data must be available for the state of California, rather than for the U.S. or a smaller region within California.

- Measurable: The indicator data must be quantifiable.

- Available: The data must be available to the public.

- Cost-effective: It must be possible to access the data with little monetary input.

- Stable, reliable, credible: The data must be retrieved from a reliable and credible source, collected in a rigorous and consistent way and replicable from one time period to the next.

- Understandable and usable: The indicator must be easily grasped by potential interpreters of the data to be applicable in their own communities.

- Sensitive to change: The indicator must respond to change over a reasonable length of time

- Measure the effectiveness of Vivid Picture scenarios: The indicator will ideally relate directly to the Vivid Picture scenarios and help to measure the outcomes of each scenario.

OUTCOMES

A list of 63 proposed indicators, for 18 of the 22 goals, was obtained. They were selected from a shortlist of more than 125 and a total of 81 data sets were used. Not all indicators selected for the main list perfectly conformed to all criteria.

LIST OF THE GOALS

Please see appendix "0".

LIMITATIONS

The authors observed that the process has highlighted the existence of significant data gaps that prevent a comprehensive understanding and measurement of the food system. Thus a "wish list" was proposed to address some important gaps. In fact many common-sense indicators initially appeared to be excellent candidates for the project goals, but many of them had to be rejected since there was no existing data to measure those indicators.

5.1.2 City Region Food Systems - FAO & RUAF Foundation

Further information available at:

http://www.fao.org/fileadmin/templates/agphome/documents/horticulture/crfs/UC_Booklet_Final_color_low.pdf

http://www.ruaf.org/sites/default/files/City%20Region%20Food%20Systems%20literature%20review.pdf

OBJECTIVE

The main goal of this on-going FAO and RUAF initiative is to map and assess the city-regions' food system and to plan specific interventions that address local key issues and needs in order to build sustainable and resilient city regions.

APPROACH

The "city region food system" (CRFS) approach represents a critical perspective of analysis and support based on existing transformation and implementation policies. The idea is to work at city region level in order to draw attention to the interconnectedness of the rural-urban dynamics, with food being the common denominator between both spatial dimensions. The aim is also to address broader issues such as human rights, climate change and resilience, within the framework of a multi-stakeholder participative and collaborative partnership.

METHOD FOR SELECTING THE INDICATORS

The global assessment of the specific city region food system will be based on specific and guiding research questions. Specific data gaps and key relevant issues are identified for the selected locations. Building on this analysis, the information on the policy objectives will be used to guide and plan the scenario development.

A suite of common indicators, selected depending on the data availability and the potential applicability, will be used for the data collection and to apply analysis tools.

OUTCOMES

The initiative is at an on-going stage. A considerable literature review is in progress to facilitate the definition of the objectives of the assessment process. However five

areas of intervention have already been identified to help achieve better economic, social and environmental conditions in both urban and nearby rural areas:

- Access to affordable and nutritious traded foods from local and regional producers to improve consumer food security and nutrition and enhance transparency in the food chain.

- Access to markets and support to alternative markets (i.e. farmers' markets, community supported agriculture) to improve livelihoods of both small-scale and larger scale producers.

- Support local and regional food hubs and shorter value chains, and more broadly, efficient and functioning agricultural supply chains that link hinterland producers to market systems, to contribute to sustainable diets, reduce food waste along the chain and stabilise livelihoods in distribution, processing and manufacture of food and fibre products.

- Protect and guarantee water, nutrients and energy resources, recover and reuse in agricultural production.

- Create the conditions for participatory governance structures to include stakeholders from multiple sectors from both urban and rural areas.

5.1.3 A Road Map for City Food Sector Innovation & Investment

In this initiative the indicators were clustered by capital/assets (Human, Financial, Physical, Social, and Natural).

Further information available at:

http://www.ngfn.org/resources/ngfn-database/knowledge/Roadmap%20for%20City%20Food%20Sector%20Innovation%20and%20Investment.pdf

OBJECTIVE

The Road Map for City Food Sector Innovation & Investment's project aimed at creating a balanced dashboard of indicators that draws from both currently available data (local, regional, and national) and, as appropriate, identifies new data that need to be collected at the local level to achieve the following goals:

- Provide selection criteria for city agencies to use when choosing among a variety of investment options (e.g., for grant funding projects/programs).

- Provide a means for assessing medium-to long-term impacts of individual projects or programs.

- Provide a means for cities to monitor performance of a group or cluster of food sector investments over time, and thus build knowledge about impacts.

- Provide a toolset for cities to use in communicating priorities to project proponents, developers, and other investors when writing grant proposals and/or other requests for city support of a project.

APPROACH

The focus of this initiative is on indicators that drive change in the short-term or that provide intermediate results, which at a later time will lead to the desired result, but can be reported and tracked. Also, a mix of quantitative and qualitative indicators is proposed for stronger monitoring and on-going reporting on performance for critical audiences, addressing the three main areas of sustainability: economic, social, and environmental.

METHOD FOR SELECTING THE INDICATORS

The process was articulated in three different phases.

Phase 1: Community Assessment: Establishing a Community Baseline; The community assessment phase helped paint a quantitative and qualitative picture of the resources available to foster innovation and how well situated stakeholders are to utilize them.

Phase 2: Innovation Investment Options: Assessing to Invest; it provided some concrete examples of indicators that cities can use when assessing where they can direct investment dollars for the greatest returns, be they financial, labour, or otherwise.

Phase 3: Post-Implementation Evaluation; In order to determine an innovation's impacts, the impacts a city investment has on the selected innovation(s), and identify course corrections, it is important to have in place monitoring and evaluation plans and indicators customized to the specific goals and objectives of the city and type of innovation.

5.1.4 Assessing the San Diego County Food System: Indicators for a More Food Secure Future

In this initiative, the indicators were grouped on the basis of a set of goals and sub-goals to measure the progress towards a sustainable food system, in order to better support human, environmental and economic health.

Further information available at:

http://asi.ucdavis.edu/programs/sarep/publications/food-and-society/sdcountyfoodshedassessment2010.pdf

OBJECTIVE

The goal of this initiative was to examine the overall viability of the food system in the San Diego County to identify key steps needed to strengthen the foundation for a thriving local food system and to deepen community understanding about the relationships and impacts of the current food system in San Diego County, with a view to better support human, environmental and economic health. Given this broad goal and the diverse range of stakeholders, the scope of the investigation is necessarily comprehensive, requiring analysis of a wide range of indicators throughout all phases of the food system.

APPROACH

This assessment was the result of a collaboration between governmental, public health, social service, environmental and agricultural experts from the San Diego County and was intended to serve as a catalyst for community based policy change. At the heart of the Working Group's objectives for a thriving local food system is collaboration amongst stakeholders. In this regard, the process of conceptualizing and executing an assessment and developing recommendations served as a strategic opportunity to demonstrate this collaboration.

METHOD FOR SELECTING THE INDICATORS

The first phase involved Working Group meetings to identify food system goals and the potential indicators to assess progress towards these goals. The perspective adopted by Working Group emphasized the following themes:

- Better Health and Well-being of San Diego County Residents

- Agricultural Stewardship of San Diego County's Environmental Resource Base

- Thriving Communities and Sustainable Economic Growth

Based on these themes, the group identified a series of 14 sub-goals (*see appendix "0").* In order to measure progress towards these goals, the Working Group selected a set of indicators. Indicator data were then collected and analysed by a group of technical experts.

OUTCOMES

A set of 45 indicators where then developed for each goal and sub-goal identified. Finally, recommendations by the stakeholders were gathered to identify areas of concern and design appropriate socioeconomic and environmental reforms.

5.2 NATIONAL SCALE INITIATIVES

5.2.1 Sustainable food system indicators for the UK (UK Department for Environment, Food & Rural Affairs, DEFRA)

In this initiative the indicators were categorised according to the themes of the Food 2030 Strategy[5].

Further information available at:

http://webarchive.nationalarchives.gov.uk/20130131093910/http://www.defra.gov.uk/statistics/files/defra-stats-foodsystemindicators.pdf

http://webarchive.nationalarchives.gov.uk/20130131093910/http://www.defra.gov.uk/statistics/files/defra-stats-foodsystemindicators-factsheet.pdf

OBJECTIVE

This initiative developed a set of indicators for sustainable food in order to measure progress in delivering the UK Food 2030 strategy. In particular, it aimed at assessing the economic, social and environment sustainability of the UK food system.

APPROACH

DEFRA proposed to assess the indicators using a simple "traffic lights system" to highlight whether the system is moving in the right or wrong direction, in order to stimulate a debate on food policy.

METHOD FOR SELECTING THE INDICATORS

The selection and definition of the indicators was obtained through a stakeholder consultation exercise. A consultation document was sent to participants setting out proposals for high-level indicators to measure the economic, social and environmental sustainability of the UK system[6].

DEFRA initially proposed seven themes for grouping the indicators:

[5] The Food 2030 Strategy: http://nourisheu.com/wp-content/uploads/2015/02/food2030strategy.pdf

- Economic performance and resilience;

- Skills and innovation;

- Eco-efficiency;

- Essential resources (water usage, soil and air quality);

- A healthy and well-managed ecosystem (sourcing of fish being a particular concern);

- Healthy and informed consumers;

- A safe food supply (animal health and welfare, foodborne disease incidence, traceability of food, consumer confidence in food safety and availability).

OUTCOMES

Following the stakeholder consultation process, 53 indicators (see Appendix 0) could be clustered around six (and not the seven initial ones) main dimensions: 1) Encouraging and enabling people to eat a healthy, sustainable diet; 2) Having a resilient and economically sustainable food system; 3) Increasing food production sustainably; 4) Reducing the food system's greenhouse gas emissions; 5) Reducing, reusing and reprocessing waste; 6) Having the appropriate research, skills, knowledge and technology.

5.2.2 Charting Growth to Good Food: Developing Indicators and Measures of Good Food

In this initiative the indicators were grouped on the basis of the four attributes of "good food" such as healthiness, fairness, greenness, and affordability, and a further group was created for indicators of promising innovations towards "good food". The selection process implied the involvement and consultation of experts and stakeholders.

Further information available at:

https://static.squarespace.com/static/520ed291e4b066a62d157faa/5232585be4b003f010fec77d/5232585be4b003f010fec803/1376619804797/Charting%20Growth%20Report.pdf

OBJECTIVE

The Charting Growth Project began at the Wallace Centre (US) in late 2006, building on the Food and Society Initiative's vision of "a future food system that provides all segments of society a safe and nutritious food supply grown in a manner that protects

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http://www.freshfields.com/uploadedFiles/SiteWide/Knowledge/Food%20safety%20update%2002.0

health and the environment and adds economic and social value to rural and urban communities".

The goal of the Charting Growth Project was to develop indicators of "good food", thus selecting credible, legitimate indicators to estimate the amount of "good food" available at any given time, with the end goal of drawing meaningful inferences that might guide action. In particular, the objectives of the project include: to define healthy, green, fair and affordable as attributes of the system; to develop a broadly credible set of national indicators of good food, and readily comprehensible ways to display them; to use the indicators to assess the current availability of good food in the United States.

APPROACH

In this initiative the term "indicator" was used to mean a positive change; in this specific case, a change toward greater health, fairness, "greenness" (environmental quality), or affordability of the US food supply. The choice of selecting positive/success indicators was based on the assumption that those should help people to envision a healthy, fair, green and affordable food supply ("*You Get What You Measure*"). For each attribute of interest there are several possible indicators.

A common way to conceptualize indicators systemically was considered (similarly to the Vivid Picture project) and consists of selecting the indicators from important drivers, pressures, states, impacts and responses (DPSIR) within the system of interest. This is an extension of the Pressure-State-Response (PSR) model originally developed by the Organization for Economic Cooperation and Development (OECD), and has been adopted by the European Environment Agency and several United Nations agencies.

To select possible indicators the project team conducted an expert-driven approach in order to focus the work on a national level set of indicators and measures that are considered credible in conventional forums. 48 people were interviewed and a draft was prepared and submitted to 54 people for comment. Finally 24 experts amended this draft, which was posted on the Wallace Centre website.

METHOD FOR SELECTING THE INDICATORS

A small project team reviewed the related literature and interviewed numerous experts on food systems to develop definitions, indicators and measures. Many of the interviewed people and other stakeholders provided useful feedback on an early draft. These suggestions were incorporated into another draft that was then posted

on the Wallace Centre website for public consultation. Subsequently, a questionnaire was posted on the Wallace Centre website and an invitation was distributed to review the draft indicators to Food and Society Initiative's Project Directors, the Food and Society Initiative's Policy Fellows listserv, additional Wallace Centre contacts, and on the Community Food Security Coalition's listserv.

CRITERIA

For selecting the best indicators the project team referred to a set of standard criteria to guarantee that the indicators should:

- *Be measurable*

- *Be relevant to the attributes of interest*

- *Address the most important trends and impacts related to these attributes*

- *Be sensitive/responsive to changes over time in physical conditions*

- *Be hierarchical (providing a clear overview, but amenable to expansion into detail or at finer scales)*

- *Promote learning and effective feedback to decision making*

Furthermore, the measures of the indicators (i.e. the data supporting the indicators) should be:

- *Valid and reliable (high quality)*

- *Timely (indicating problems or progress while there is still time to act to prevent negative consequences)*

- *Collected and reported regularly and consistently over a broad geographical range of the US*

- *Publicly available*

- *Transparent and understandable*

In selecting measures for the indicators, priority was given to data that are valid, reliable and transparent, in order to have broad credibility and legitimacy.

For the purpose of the project the indicators were considered at the national-scale, but some attention was given also to community-level metrics.

OUTCOMES

For each indicator in the list, a specific food system activity (represented by the indicator) is shown: food production, processing, distribution, sales and purchasing, and consumption. Two types of indicators were selected.

The first type, National Indicators, pointed to aspects of the food system that are most critically in need of immediate action by policy makers in order to achieve the attributes of a “good food” supply.

The second type pointed to possible solutions, often pilot programs that could be replicated more widely and that can contribute to improve more than one attribute of good food.

Furthermore, a set of “Hot Spots” was identified -- as places or situations in which impacts of the lack of healthy, fair, green and affordable food create especially difficult conditions that need attention.

LIMITATIONS

The indicators proposed by this initiative only deal with conditions in the US and do not capture the impacts of international production and processing of food that enters the US food supply.

5.3 INTERNATIONAL SCALE INITIATIVES

5.3.1 Sustainable Consumption and Production Indicators for the Future Sustainable Development Goals

In this initiative the indicators were clustered on the basis of the Sustainable Development Goals. The goals were also grouped in a number of domains, or themes, for sorting the most relevant indicators by: sustainable agriculture, water, energy, climate change, marine resources, ecosystems and biodiversity, cities and tourism.

Further information available at:

https://www.iisd.org/sites/default/files/publications/sustainable-consumption-production-indicators-future-sdgs_0.pdf

OBJECTIVE

Within the framework of the Post-2015 development agenda, reaching the Sustainable Development Goals requires translating the goals into concrete and measurable objectives. Thus, a set of indicators has been developed for monitoring the interface between the economy, environment and society, and the resource use and waste flows of the consumption and production activities. The main objective of this initiative is to select indicators that will allow identifying whether and at what pace progress is being made towards sustainable consumption and production (SCP) patterns.

APPROACH

Sustainable Consumption and Production (SCP) connects environmental and social concerns with economic processes, and markets on both the supply (production) and demand (consumption) side, using a holistic approach.

METHOD FOR SELECTING THE INDICATORS

Step 1: Identifying the targets[7] that contribute to making the shift to Sustainable Consumption and Production patterns.

Step 2: Identifying the indicators that build synergies and complementarities between the selected Sustainable Consumption and Production related targets, and have transformative potential for sustainable development

Step 3: Assessing data availability and identifying additional data and/or new indicators required by decision makers to guide the design of necessary response measures and to assess progress

[7] In July 2014 the OWG put forward a proposal for SDGs comprising 17 goals and 169 targets (UN 2014). The range of indicators are offered to help policy makers and other stakeholders guide progress towards a sub-set of the relevant Sustainable Consumption and Production (SCP) targets in the currently proposed Sustainable Development Goals. [UN. (2014) Open Working Group Proposal for Sustainable Development Goals. New York: United Nations. Available at: https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=1579&menu=1300]

CRITERIA

This process of identification of indicators implies a set of properties and a set of criteria that the indicators need to fulfil.

The properties consist of: Resource and critical thresholds/ carrying capacity; Resource Decoupling; Impacts Decoupling; Social Benefits; Universality; Linkages to other targets.

A set of questions are related to the above mentioned properties:

- Can the indicator provide information about the overall increase in resource use (e.g. water, soil, biodiversity, minerals) to identify the critical thresholds beyond which Earth System processes may be dangerously or irreversibly disrupted?

- Does the indicator measure reduction in resource use per unit of production/consumption?

- Does the indicator measure changes in environmental impacts as the outcome of production and consumption processes (per unit or in aggregate terms)?

- Does the indicator cover revenue and/or social benefits (health, education, well---being...) for poor and vulnerable people and groups from the shift to SCP?

- Is the indicator relevant for both developed and developing countries – i.e. helping to achieve SCP in both?

- What potential indicators are relevant for the identified target and at the same time support other targets, and vice versa?

The criteria proposed in these initiatives imply that the indicators should:

- be developed within an agreed conceptual framework (reference to SCP properties identified);

- be clearly defined, easy to understand and interpret, and able to show trends over time;

- be scientifically credible;

- be based on existing high-quality, independently verifiable data or data that can be generated at reasonable cost;

- be policy relevant;

- be relevant to users, politically acceptable and a basis for action;

- be responsive to changes in the environment and related human activities;

- provide a basis for international comparison;

- be subject to aggregation (from household to community, from community to nation).

OUTCOMES

Approximately 200 indicators for the considered targets were identified. Given its size and complexity, this target/indicator system had to be filtered through the introduction of a number of domains, or themes, for sorting the most relevant indicators by: sustainable agriculture, water, energy, climate change, marine resources, ecosystems and biodiversity, cities and tourism.

5.3.2 Metrics of Sustainable Diets and Food Systems

In this initiative the indicators were grouped under eight dynamic interactions between the drivers of change that influence the food system and the food system outcomes directly concerned by those drivers, and then clustered within the three dimensions of exposure, sensitivity and resilience.

Further information available at:

http://www.bioversityinternational.org/uploads/tx_news/Metrics_of_sustainable_diets_and_food_systems_1882.pdf

OBJECTIVE

This initiative (implemented by Bioversity International and the CIHEAM-IAMM) aimed at exploring the different approaches to the assessment of sustainability of diets and food systems, establishing a multidisciplinary taskforce of experts and identifying a shortlist of indicators for sustainable diets and food systems to inform policy-makers.

APPROACH

The research approach builds on the assumptions that a sustainability assessment aims at capturing the ability of a system to maintain and enhance its essential functions over time, and that sustainability addresses threats to preserving life support systems, including their capacity to withstand and adjust. The scientific approach was based on theories of vulnerability and resilience within the socio-ecological system and aimed to analyse the sustainability of critical food and nutrition security issues at the sub regional level. This theoretical modelling exercise allowed the identification of a first suite of indicators.

METHOD FOR SELECTING THE INDICATORS

Following the protocol of the Delphi Survey[8], approximately 50 experts from more than 40 academic and policy institutions in the world were asked to discuss and complement the framework and the underlying assumptions, and to test the framework by selecting proxy indicators. Subsequent rounds have been designed to bring the group to focus or consensus. An upgraded framework and a restricted set of indicators were agreed through this consultation process.

OUTCOMES

A reduced pool of metrics was then obtained, from an initial list of 136 indicators, through an expert-based elicitation process (Delphi Survey), moving beyond subjective evaluations to reach consensus.

6. Sustainability assessment initiatives at the UK level

The High Level Panel of Experts on Food and Nutrition Security provided the Committee on Food Security with a succinct definition of Sustainable Food System by interconnecting the previously coined concepts of Food Security (UN, 1996) and Sustainable Development (1987): "A sustainable food system (SFS) is a food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised" (HLPE, 2014). Under this definition, the specification of the generational-temporal factor emphasizes the link between food systems and their ability to maintain or enhance their functions over time (Conway, 1985; Hansen, 1996; Prosperi et al., 2014).

Another similar definition of sustainable food system (Sage, 2012) draws the attention to some particular environmental, economic and social elements that are likely to constitute the outcomes of the food systems, as well as the potential spatial and functional interconnections existing within different stakeholders (including consumers) of the food value-chain: "Combining a concern with the present and future generations, a sustainable food system is one that provides sufficient healthy food to meet current needs while ensuring the integrity of agro-ecosystems and the

[8] The Delphi method is a popular social research technique for forecasting and an aid in decision-making, and its aim is to obtain a reliable common opinion from a group of individual experts who can each provide anonymous valuable contributions in order to resolve a complex problem on the basis of free opinions and knowledge, avoiding influences from personality and authority (Landeta, 2006; Linstone & Turoff, 1975).

wider environment to meet the food needs of generations to come. It fosters greater local production and distribution in order to ensure that nutritious food is available, accessible and affordable to all. A sustainable food system is built on human practices, building equitable and just trading partnerships with distant producers, protecting farmers, workers and consumers" (Sage, 2012).

Several initiatives in the UK have been developed to assess urban sustainability and might represent guiding examples in terms of methods used and adoption of participative and policy-oriented approaches.

The sustainability of the Britain's 20 largest cities - between 2007 and 2010 - was measured through the Sustainable Cities Index according to social, economic and environmental performance[9]. The assessment - supported by the Forum for the Future - was based on three main themes (or criteria): the environmental impact (i.e. the city's impact in terms of resource use and pollution), the quality of life (i.e. what the city is like for people to live in), and future-proofing (i.e. how well the city is preparing for a sustainable future). These themes originated 13 indicators (Appendix 0) to be applied using available data "to determine who's sustainable and who's not" year after year.

The criteria and indicators proposed for the Sustainable Cities Index are useful for the analysis of the sustainability of urban food systems (see Appendix 2). In particular, indicators such as "river water quality", "ecological footprint" and "waste collected per head" constitute some fundamental elements to assess the environmental impact of the structural and behavioural aspects of the urban food systems. Also, with regards to the quality of life, the "Healthy life expectancy", the "residence satisfaction with green space", the "Unemployment" rate and the population "Education" level are factors strictly entwined with the quality of food consumption and food habits in cities and with the socioeconomic status of the urban population. Moreover, the "Biodiversity" level, the "Recycling" rate and the "Green business per capita" can help understand the role that food related consumption/production behaviours and urban agriculture could play to achieve sustainability goals.

[9] Further information available at:
www.forumforthefuture.org/project/sustainable-cities-index/overview
www.forumforthefuture.org/sites/default/files/images/Forum/Projects/Sustainable_Cities_Index/sustainablecities07.pdf

Another interesting initiative to promote sustainability within communities is the One Planet Living. This is based on a clear set of ten sustainability principles put together by the organisations BioRegional and the Worldwide Fund for Nature, which set out how we can live and work using a fair share of our planet's resources[10] (see Appendix 0). The 10 principles form a holistic framework that can help meet sustainability challenges through the development of suitable solutions, through networking, and by enhancing communication between key stakeholders. Unlike other similar initiatives, the One Planet Living does not propose specific indicators, but is rather an overarching framework - defined by previous users as "accessible", "easily adaptable", "flexible" and "comprehensive" (retrieved from: http://www.ukgbc.org/sites/default/files/Pinpointing_OPL.pdf) - that organisations, communities, project teams and companies can apply to their specific sustainability targets. these: " *can range from "simple" such as annual energy targets to those that need creativity e.g. setting sustainable food targets for an office*" (retrieved from: http://www.ukgbc.org/sites/default/files/Pinpointing_OPL.pdf).

In addition to the 10 principles, a number of recommendations are provided to facilitate implementation and to improve the effectiveness of the framework in different contexts by ensuring transparency, quality and endorsement. Furthermore, the use of the One Planet Living Framework allows the use of a "*common language to express the collective intentions*" of a specific sector of application, aligning the project partners and the stakeholders around the same goals with the same language. Thus, the One Planet Living Framework is considered an appropriate stakeholder engagement tool that can be extended to all stakeholders, contributing to comprehensive but flexible planning for sustainability at the community level.

The case of the city of Brighton and Hove shows that it is possible to integrate the One Planet Living Framework with local framework directive and city plan. Also, with reference to the Sustainable Cities Index, Brighton and Hove was ranked - between 2007 and 2010 - within the first three most sustainable cities in the UK. Food sustainability has been supported through the establishment, in 2003, of the Brighton & Hove Food Partnership[11], a volunteer based, not-for-profit, independent and politically neutral organisation that represents "*a place to go to find information and inspiration and provides a way of connecting up all of the bits of work going on across the city*". This "hub" is a grass-root initiative that works towards a healthy, sustainable and fair food system at different level within the city. In particular, actions are implemented for creating shared knowledge within the community about the

[10] Further information available at:
www.bioregional.com/oneplanetliving/
www.bioregional.com/wp-content/uploads/2014/10/BioRegional-One-Planet-Living-The-case-for-Sustainable-Consumption-and-Production-in-the-Post-2015-Development-Agenda1.pdf
[11] www.bhfood.org.uk

relationship between food, health, environmental sustainability and socioeconomic features typical of urban centres, such as increasing population, high household food waste, low recycling and composting rate, high housing costs, small households and high average age, strong presence of restaurants and cafés per capita, water quality at risk, low availability of land.

These principles are divulgated practically and transversally through actions in several community contexts. University menus provide information about the dietary importance of vegetables and fish and the pitfalls of excessive meat consumption. Cookery classes are organized to inform vulnerable eaters about problems related to overweight and the role of local producers to enhance the quality of the food and the economic performance at the local level. Important initiatives are conducted to fight food poverty through advising and the establishment of food banks and to promote recycling, composting and urban agriculture.

Another interesting case at the UK level is the Bristol Food Policy Council, the first in the UK,[12] which is composed of volunteer members from different sectors of the food system, with the city council providing administrative support. The objective of Bristol's "*Plan for Good Food*" is to enact change through the definition of feasible targets, interventions and proposals and the involvement of all relevant stakeholders in the food value chain. This initiative focuses on enhancing understanding of the way in which the city of Bristol and its regional food supply system function, of their strengths and vulnerabilities and of the opportunities available to address sustainability problems (see Moragues-Faus and Morgan, 2015).

For instance, the city of Bristol has identified a number of problems related to the food systems, such as the lack of local greengrocers, a high level of obesity within children and young people, a considerable concentration of the big food supply companies and a high rate of abandonment of agricultural land in the region. A holistic analysis of these problems led to the identification of a set of eight objectives of the Bristol's Good Food Plan in order to achieve "*a healthy, viable and equitable food system that is as resilient as possible to any future shocks and challenges*":

- To encourage people to cook from scratch, grow their own, and eat fresher, seasonal, local, organically grown food.

- To champion the use of local, independent food shops and traders to help keep our high streets vibrant and diverse.

- To promote the use of good quality land in and around Bristol for food production.

[12] www.bristolfoodpolicycouncil.org

- To grow and distribute Bristol grown fruit and vegetables to restaurants, cafes, markets, households.

- To minimise food waste by encouraging composting and the redistribution of good food that would otherwise be wasted.

- To retain and strengthen city links with local wholesale markets, and nearby abattoirs, dairies and farms.

- To increase procurement of regional products, and establish more markets for local producers.

- To promote community-led food trade such as co-operatives, buying groups, Community Supported Agriculture and pop-up shops.

To achieve these objectives, the Bristol Food Policy Council has been supporting the organization of events, it has commissioned reports, has engaged in partnerships with local stakeholders and producers, has publicised good food as key for health and sustainability in the community, has supported financially good-food related grassroots initiatives, has engaged with public services such as hospitals and universities for encouraging local and regional food procurement, has worked to facilitate learning exchange at the European level and to enhance the relationship between business, practitioners, supply stakeholders and policy-makers. Furthermore, they are developing a set of indicators to measure progress in the implementation of their *Plan for good food* (see here.

The Bristol Food Policy Council's initiative allowed achieving good results by enhancing the rate of the food waste collected, introducing nutrition scheme in schools to avoid children to eat sweets and crisps on a daily basis and providing instead fruit and vegetables, serving free hot meals from food that would have otherwise been wasted, etc.

7. Strengths and weaknesses of an indicator approach

Assessing issues related to sustainability problems, with the goal of informing the decision-making process, has a number of critical implications. There is, in fact, a growing debate about the importance of the role, utility, adoption, focus and final goals of the sustainability indicators.

On the one hand scholars and policy-makers call for the development of metrics of food security and sustainability to inform decision- making (Barrett, 2010; Dicks et al., 2013). Since indicators guide action (Barrett, 2010), they are essential to establish communication between science and policymakers. The indicator approach is valuable for monitoring trends and for exploring and operationalizing conceptual frameworks. A sound theoretical framework is the starting point in constructing metrics (OECD, 2008). In fact, indicators create knowledge, and sustainability metrics capture important conditions, complex data and trends for policy makers (Bell & Morse, 2010; 2011). There is, therefore, a need for integrated sets of metrics. Once that a framework is in place to define the phenomenon that needs to be measured, the selection of individual indicators should be based on what is desirable to measure and not on which indicators are available. However, the exercise of developing indicators should take into account limitations such as budget constraints that can lead to identify a very refined set of indicators but that are very difficult to measure and replicate those measurements in time. Furthermore, the transparency of the whole exercise is essential in constructing credible indicators (OECD, 2008).

On the other hand, the identification of indicators for policy-making and the pathway leading to the choice of indicators (often through group dynamics) need to be traceable and evidence-based to guarantee transparency in decision-making and effectiveness of evidence-based policy (Bell & Morse, 2013). However, several scholars demonstrate that the assumption about the existence of direct and transparent links between the formulation of evidence-based indicators and the use made by policy-makers is questionable and rather dogmatic (Innes, 1998; Ayres, 2000; Gudmundsson, 2003; Lehtonen, 2004; Hezri & Dovers, 2006; Rosenström, 2006; Boulanger, 2007; Rydin, 2007; Turnhout et al., 2007; Bell and Morse, 2008; Bell & Morse, 2011; Bauler, 2012; Sébastien & Bauler, 2013). In fact policy decisions are based not just on the quality of the information provided but also on other factors linked to the power of individuals or groups who shape policies and to their interests, intentions and the surrounding institutional and social contexts.

Often we measure what we want to measure. Indicators provide information only about the issues that they have been designed to measure (Bell & Morse, 2013). Moreover, there are several different ways to interpret indicators and select data. It is therefore important to know how the information provided by the indicators is going to be transferred to policy-makers, and which are the actual aims of using the indicators (Chess et al., 2005). For instance, indicators might be used to justify decisions that would have been made anyway, or, in other cases, the lack of indicators could be used to justify inertia in policy-making (Gudmundsson, 2003; Hinkel, 2011). The role of press, as intermediary on the communication of information through indicators, is crucial here (Morse, 2011).

Aggregation of data can strongly alter the messages for policy-makers (Chess et al., 2005), and several studies demonstrate that often the indicators that have been prepared in appropriate technical manner are not actually applied nor they have a real impact on policy-making (Bell & Morse, 2013). A study by Sébastien & Bauler (2013) tries to answer questions about the necessity to increase the understanding of the motivations that lead policymakers, stakeholders, civil society and citizens to adopt indicators and composite metrics, and how those measures actually impact policies in complex society dynamics. Referring to EU institutions, Sébastien & Bauler (2013) used these findings to prove the need for a greater involvement of the actors in the political and institutional contexts where indicators have to be identified and applied. These elements are confirmed also by similar results produced by other studies that show that research on the use and effects of sustainability indicators should not just be a technical exercise; rather, it needs to take into account the geographical, socioeconomic and cultural context within which such tools are implemented (Cassar et al., 2013).

In conclusion, a strong and active involvement of the local/community stakeholders is key to design a set of metrics that will be useful to measure real progress and gaps towards the sustainability of the urban food systems. This constitutes the subsequent step of this action-research project.

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ONLINE DOCUMENTS AND WEBSITES

A ROADMAP FOR CITY FOOD SECTOR INNOVATION & INVESTMENT

www.ngfn.org/resources/ngfn-database/knowledge/Roadmap%20for%20City%20Food%20Sector%20Innovation%20and%20Investment.pdf

ASSESSING THE SAN DIEGO COUNTY FOOD SYSTEM: INDICATORS FOR A MORE FOOD SECURE FUTURE

http://asi.ucdavis.edu/programs/sarep/publications/food-and-society/sdcountyfoodshedassessment2010.pdf

BIOVERSITY INTERNATIONAL & CIHEAM/IAMM

www.bioversityinternational.org/uploads/tx_news/Metrics_of_sustainable_diets_and_food_systems_1882.pdf

BRIGHTON & HOVE GOOD PARTNERSHIP

www.bhfood.org.uk

CHARTING GROWTH TO GOOD FOOD DEVELOPING INDICATORS AND MEASURES OF GOOD FOOD

https://static.squarespace.com/static/520ed291e4b066a62d157faa/5232585be4b003f010fec77d/5232585be4b003f010fec803/1376619804797/Charting%20Growth%20Report.pdf

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ONE PLANET LIVING

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www.fao.org/fileadmin/templates/agphome/documents/horticulture/crfs/UC_Booklet_Final_color_low.pdf

www.ruaf.org/sites/default/files/City%20Region%20Food%20Systems%20literature%20review.pdf

SUSTAINABLE CITIES INDEX

www.forumforthefuture.org/project/sustainable-cities-index/overview

www.forumforthefuture.org/sites/default/files/images/Forum/Projects/Sustainable_Cities_Index/sustainablecities07.pdf

UNEP. SUSTAINABLE CONSUMPTION AND PRODUCTION INDICATORS FOR THE FUTURE

www.iisd.org/sites/default/files/publications/sustainable-consumption-production-indicators-future-sdgs_0.pdf

VIVIDPICTURE:

http://coloradofarmtoschool.org/wp-content/uploads/downloads/2013/02/Proposed-indicators-for-sustainable-food-systems.pdf

http://www.rootsofchange.org/projects/vivid-picture-project/

APPENDIX 0 FRAMEWORKS AND INDICATORS

The Vivid Picture project

LIST OF THE GOALS

Goal 1: Promotes food choices that lead to healthy eating

Goal 2: Provides easy access to healthy food from retail outlets for all eaters in California

Goal 3: Provides affordable food for all eaters in California

Goal 4: Provides for meaningful livelihoods and opportunities for all food and farming workers.

Goal 5: Facilitates continuous entry for beginning farmers, fishers, foresters, processors, retailers, restaurateurs and ranchers

Goal 6: Provides eaters with foods produced and processed as close to home as possible

Goal 7: Encourages eaters to know where, how, and by whom their food is produced

Goal 8: Supports deepening regional identities through food.

Goal 9. Honors and draws on the diversity and richness of different food cultures.

Goal 10: Supports and increases biodiversity in plant and animal products (including marine species).

Goal 11: Conducts farming, ranching, and fishing activities so that water, air, forests, and soil resources are enhanced and biodiversity and wildlife habitat are increased so that food production continues into perpetuity.

Goal 12: Preserves farmland, forests, and oceans.

Goal 13: Provides incentives for waste recycling, reduction of petroleum and other non-renewable inputs

Goal 14: Employs humane practices in animal care

Goal 15: Provides opportunities for revenue from on-farm energy production, tourism, education, and other value added services (in addition to food production).

Goal 16: Rewards farmers, fishers, and ranchers for conservation services

Goal 17: Provides opportunities for food, fishing, and farming operations to be profitable.

Goal 18: Is characterized by many locally owned and operated food and farming businesses.

Goal 19. Encourages capitalization and business structures that provide investment and ownership opportunities to workers and community members.

Goal 20. Facilitates graceful exits for farmers, fishers, foresters, ranchers, processors, retailers, and restaurateurs.

Goal 21. Promotes efficient markets that share information and proceeds equitably among all players in the food chain.

Goal 22. Allows businesses of all sizes to participate in the system as long as they are abiding by sustainable practices and principles.

Assessing the San Diego County Food System: Indicators for a More Food Secure Future

Food system goals for selecting the indicators

Goal 1: San Diego County Residents Know Where Their Food Comes From, How It Is Grown and Who Grows It

Goal 2: San Diego County Residents, From Infants to Seniors, Consume More Healthful Foods

Goal 3: All San Diego County Residents Have Access to Affordable, Healthful, Culturally Desirable Foods at all Times

Goal 4: Initiation and Duration of Breastfeeding, the Healthiest First Food, Increases in San Diego County

Goal 5: San Diego County Has Local, Accessible, Adequate Food Supplies for Emergency Preparedness

Goal 6: San Diego County Increases its Working Lands for Urban and Rural Food Production

Goal 7: San Diego County Improves its Waterways as Healthful, Sustainable Food Sources for San Diego County Residents

Goal 8: San Diego County Food Producers and Processors Employ Practices that Support Animal Welfare

Goal 9 San Diego County Prioritizes Food Production in its Allocation of Available Water Resources

Goal 10: San Diego County Recycles its Organic Wastes Locally and Makes Compost Available for Local Food Production

Goal 11: San Diego County Reduces Food System-related Greenhouse Gas Emissions Through its Food System

Goal 12: Local and Regional Procurement and Sale of Food Grown in San Diego County Increases

Goal 13: Fishing, Farming, and Ranching Increases for Diverse Groups in San Diego County

Goal 14: The San Diego County Food System (Production, Distribution, Processing, Disposal) Provides Safe, Fair, Meaningful Work

The Sustainable Cities Index

Ranking the largest 20 British cities

A. Environmental Impact

This basket of indicators reflects the wider environmental impact of the city.

1. Air quality - the annual average for particulates.

2. River water quality – the percentage of rivers where biological and chemical qualities were deemed to be good or fair.

3. Ecological footprint - the impact of services, housing, travel and housing on the environment.

4. Waste collected per head - a partial proxy for the resources used per capita.

B. Quality of Life

This basket of indicators reflects what the city is like to live in and how it is performing in broader sustainability terms.

5. Healthy life expectancy at 65 - the number of years a person can expect to live in "good" or "fairly good" self-perceived general health.

6. Resident satisfaction with green space.

7. Resident satisfaction with local bus service.

8. Unemployment - the number of claimants as a percentage of working age population.

9. Education - percentage of the working age population with NVQ2 or equivalent.

C. Future Proofing

This set of indicators reflects, in more dynamic terms, the progress the city is making towards sustainability.

10. Local authority commitments on climate change - local authorities were rated against three criteria on how they are tackling climate change.

11. Green business per capita - the number of environmental businesses listed on yell.com.

12. Biodiversity – percentage of land deemed to favour biodiversity.

13. Recycling – improvement in recycling between 2000/01 and 2005/06, and the overall level of recycling.

One Planet Living Framework

The Ten One Planet Principles

Zero Carbon (Saving Energy):

Making buildings more energy efficient and delivering energy with renewable technologies.

Zero Waste (Reducing waste):

Reducing waste, reusing where possible and ultimately sending zero waste to landfill.

Sustainable Transport:

Encouraging low carbon modes of transport to reduce emissions; reducing the need to travel.

Sustainable Materials:

Choosing construction and consumer goods with low embodied energy – the amount of energy it takes to manufacture and distribute a product - sourced locally wherever possible.

Local and Sustainable Food:

Supporting sustainable and humane farming, promoting access to healthy, low impact, local, seasonal and organic diets and reducing food waste. Choosing local, seasonal food for a healthy, low impact diet higher in vegetable than animal protein.

Sustainable Water:

Using water more efficiently in buildings and in the products we buy; tackling water course pollution; adapting and preparing for severe weather events including flooding and drought.

Land Use and Wildlife:

Protecting and restoring biodiversity and creating new natural habitats through good land use and integration into the built environment.

OBJ

Culture and community:

Respecting and reviving local identity, wisdom and culture; encouraging the involvement of people in shaping their community and creating a new culture of sustainability.

Equity and local economy:

Creating bioregional economies that support equity and diverse local employment and international fair trade.

Health and Happiness:

Encouraging active, sociable, meaningful lives to promote good health and wellbeing.

Sustainable food system indicators for the UK

UK Department for Environment, Food & Rural Affairs, DEFRA

Enabling and Encouraging People to Eat a Healthy Sustainable Diet:

- Index of fruit and vegetable prices relative to all food

- Low income households' share of spending on food (as a % of total spending)

- Food price in real terms

- Household access to food stores

- Purchasing behaviour in at risk groups (under development)

- Engaged and informed consumers (under development)

- Public sector leading by example (under development)

- Obesity levels

- Dietary health

- Fruit and vegetable consumption

- Public confidence in food safety measures

- Consumer confidence in food availability (under development)

Ensuring a Resilient, Profitable and Competitive Food System

- GVA per person UK compared with EU

- Agricultural resilience

- Total factor productivity of the food chain beyond the farm gate

- UK food chain resilience

- Water usage post farm gate (Under development)

- Water use in the food and drink industry

- UK urban food transport (proxy for urban road congestion) + HGV transport of food for UK consumption (proxy for infrastructure costs)

- Amount of food covered by assurance schemes

- Trends in cases of illness due to food-borne pathogens

- Level of cattle trade restrictions against the UK on animal health grounds

- Number and percentage of cattle tested for TB that are slaughtered

- On farm animal welfare

Increasing food production sustainably

- Water abstraction for agriculture

- River water quality: Nitrate and Phosphate Levels In Rivers

- Pesticides in water

- Soil Quality: soil organic matter

- Soil erosion (under development)

- Status of farmland biodiversity action plan priority species and habitats in England

- Biodiversity – water environment (under consideration)

- Farmland Birds (The population of farmland birds in England from 1970)

- Changes in plant diversity in fields and hedges on agricultural land in England

- Change in effective population size for native breeds of sheep and cattle at greatest risk of loss of genetic diversity

- Agricultures contribution to ammonia emissions from agriculture + Sources of ammonia emissions from agriculture

- Percentage of UK fish stocks harvested sustainably and at full reproductive capacity, 1990 to 2007

- Proportion of large fish by weight in the northern North Sea

- Fish imports (under development)

- Sustainable fish consumption (under development)

- Global fish stocks

- Global food availability

- Food production: cereals, fruit and vegetables, meat, milk and final output at market prices

Reducing the food system's greenhouse gas emissions

- Primary energy use in the UK food chain

- Energy use in domestic food sectors: food transport; food, drink and tobacco manufacturing; agriculture

- Greenhouse gas emissions from the UK food chain + Greenhouse gas emissions from agriculture + Carbon Dioxide emissions from food and drink manufacturing

- Food related greenhouse gas emissions from UK households

Reducing, reusing and processing waste

- Consumer attitudes to household waste

- Waste produced by the food and drink manufacturing industry

- Estimated tonnage arising of food waste in municipal waste in England, 2007/07

Increasing the impact of skills, knowledge, research and technology

- Investment in training (Under development)

- Training of farm managers and qualification levels in the food and drink manufacturing and processing industry

Further indicators for an international perspective:

- Origins of UK food imports based on traded values

- Trends in the expenditure of imported fair-trade products

- Millennium Development Goal 1 (Reduce hunger and poverty)

APPENDIX 1: RESEARCH INITIATIVES ASSESSING THE SUSTAINABILITY OF THE FOOD SYSTEMS

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
Assessment of the impact of global drivers of change on food security, Resilience and Vulnerability, Agrofood system	TRANSMANGO EU Project: KU Leuven, FIRAB, University of Oxford-ECI, Cardiff University, Wageningen University, IIASA, University of Jyväskylä, University of Dar es Salaam, UCD Dublin, KHL Leuven, Polytechnic University of Valencia, University of Pisa.	Challenges to scenario-guided adaptive action on food security under climate change. *Global Environmental Change*. (2014) http://www.sciencedirect.com/science/article/pii/S0959378014000387	This project aims to obtain a comprehensive picture of the effects of the global drivers of change on European and global food demand and on raw material production. The research focuses on the vulnerability and resilience of European food systems in a context of socio-economic, behavioral, technological, institutional and agro-ecological change and aims to enhance understanding of the new challenges and opportunities that the food sector will face in the future.	2014-2018	EU
Metrics, Sustainable Food and Nutrition Security	SUSFANS Project: - Wageningen University and Research Centre - Institute for Food and Resource Economics, Universität Bonn - INRA, Institut National de la Recherche Agronomique - CEPS, Centre for European Policy Studies University of Oxford - IIASA, Internationales Institute für Angewandte System Analyse - Státní zdravotní ústav (Czech National Institute of Public Health) - ANSES, Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail - CRA, Consiglio per la Ricerca e la Sperimentazione in Agricoltura - DTU, Danmarks Tekniske Universitet Fødevareinstituttet - ILSI-Europe (International Life Sciences Institute) - SP, Sveriges tekniska forskningsinstitut - JRC, European Commission Joint Research - National Taiwan University - Luke, Luonnonvarakeskus (Natural Resources Institute Finland) - DSM Nutritional Products Dutch Dairy Association (NZO) Unilever R&D	SUSFANS Project "Metrics, Models and Foresight for European Sustainable Food And Nutrition Security A H2020 Research project to explore sustainable diets in the EU." http://www.ilsi.org/Europe/Documents/SUSFANS%20Factsheet%201.pdf	Strengthening EU food and nutrition security requires more sustainable food consumption and production. Project organization: Pillar 1: Assessing sustainable FNS. Pillar 2: Innovative micro- and macro- modelling of the nutrition chain from primary production to consumer intake. Pillar 3: Case studies on producer and consumer innovations to test the framework and options for policy reform to support sustainable FNS in the EU - Engaging with stakeholders for impact.	2015-2019	EU
Resilience, Measurement for Food Insecurity	Cornell University - USA, IFPRI, Tango International, WFP, FAO-ESA	"Principles of Resilience Measurement for Food Insecurity: Metrics, Mechanisms, and Implementation Issues". *Food Security and Nutrition Network*. (2015) http://www.fsincop.net/fileadmin/user_upload/fsin/docs/resources/FSIN_29jan_WEB_medium%20res.pdf http://www.ifpri.org/sites/default/files/publications/2020resilienceconfpaper08.pdf	While a number of strategies may be used to help refine the resilience agenda for food security, measurement directs attention to the empirical qualities of the resilience concept. One could argue that the immediate value and the long term utility of resilience for food security can only be determined if we have reliable and valid measures that will allow us to generate empirical evidence need to judge the effectiveness of resilience interventions.	2015	Global
Environmental impact of diets, Carbon footprint, GHG, Nutrient density, Energy density	- Center for Public Health Nutrition, University of Washington, Seattle - Institute of Cardiometabolism and Nutrition (ICAN), Nutrition Department, Paris - Institut National de la Santé et de la Recherche Medicale (INSERM), Nutriomics team, Paris - Nutrition Department, Danone Research, Palaiseau, France - AgroParisTech and Institut National de la Recherche Agronomique (INRA), Nutrition Physiology and Ingestive Behavior, Paris - Groupe Casino, Saint-Etienne, France	Energy and nutrient density of foods in relation to their carbon footprint. *The American Journal of Clinical Nutrition*. (2014). http://ajcn.nutrition.org/content/early/2014/11/05/ajcn.114.092486	Considerations of the environmental impact of foods need to be linked to concerns about nutrient density and health. The point at which the higher carbon footprint of some nutrient-dense foods is offset by their higher nutritional value is a priority area for additional research.	2015	France
Environmental impacts of diets, Nutrition transition	- Institute of Biological & Environmental Sciences, Aberdeen, UK - Rowett Institute for Nutrition and Health, University of Aberdeen, UK	The environmental impact of nutrition transition in three case study countries. *Food Security*. (2015). http://link.springer.com/article/10.1007%2Fs12571-015-0453-x	The findings, in terms of consumption of food groups and environmental impact, highlight differential environmental impacts of the nutrition transition in different countries and emphasise the need to measure environmental impacts beyond those on GHGs.	2015	China – Brazil – India
Dietary and food consumption data,	Tufts University Friedman School of Nutrition Science and Policy, Medford, USA - et al.	International Dietary Data Expansion (INDDEX) project	Aims of the project: - Improve the collection and use of dietary and food consumption data for food and	2015-2019	Global

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
food and nutrition policy-making			nutrition policy-making - Standardize and streamline the collection and analysis of individual dietary data - Improve the design of household consumption and expenditure surveys; - Increase the use of food and nutrient data to guide nutrition and agriculture policy - Stimulate global cooperation and country capacity for improved acquisition and use of dietary data		
Sustainable Nutrition Security, Developing data and models	ILSI - Center for Integrated Modeling of Sustainable Agriculture and Nutrition Security (CIMSANS)	Assessing Sustainable Nutrition Security: The Role of Food Systems. *Working Paper.* (2014) [T. Acharya, J. Fanzo, D. Gustafson, J. Ingram, B. Schneeman] http://www.ilsi.org/ResearchFoundation/CIMSANS/Documents/CIMSANS-Sustainable-Nutrition-Security-FINAL%2029July2014.pdf	Aims of the project: - Define the landscape for integrated sustainable nutrition assessments - Develop the data and models needed to create a credible, comprehensive, global assessment of sustainable nutrition security that includes all of the world's most important non-staple and staple foods.	2014-2016	Global/ Regional
Sustainable Diets, Sustainability, Vulnerability, Resilience of Food Systems	Biodiversity International, CIHEAM-IAMM Montpellier, CGIAR- A4NH; University of Catania-Di3A ; Montpellier SupAgro-MOISA	- Sustainability and Food & Nutrition Security: A Vulnerability Assessment Framework for the Mediterranean Region. *SAGE Open*. (2014). http://sgo.sagepub.com/content/4/2/2158244014539169 - Identifying appropriate Metrics of Sustainable Diets and Food Systems: A Delphi expert consultation. *Technical Brief 1.0-2014 Bioversity International-CIHEAM/IAMM.* (2014) . http://www.bioversityinternational.org/fileadmin/user_upload/research/research_portfolio/Diet_diversity/Montpellier/Technical_Brief__Mar_14_.pdf	The understanding of the food systems as SES proved helpful in answering questions on the sustainability problems of the food system. Theories of vulnerability and resilience are often adopted in research to understand the complex dynamics involving socioeconomic and biophysical aspects, and to implement sustainable development strategies. A conceptual framework was identified for modeling the relationships between food and nutrition security and sustainability, and developing potential indicators of sustainable diets and food systems. Consensus on a reduced pool of indicators was obtained in the 75% of cases (18 indicators). It allowed validating a conceptual and dynamic framework for the food system, and identifying main metrics of reference for sustainable diets and food systems, moving beyond subjective evaluation.	2013-2014	Regional/Subregional; Mediterranean Region, Latin Arc (France, Spain, Italy).
Metrics, Agriculture, Nutrition	- Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH), UK - London School of Hygiene & Tropical Medicine, UK - Gerald J. and Dorothy R. Friedman School of Nutrition Science and Policy at Tufts University, USA - SOAS, University of London, UK	Innovative Metrics and Methods for Agriculture and Nutrition Actions (IMMANA) http://www.lcirah.ac.uk/immana	- Develop scientific evidence to inform effective policies and investments in agriculture for improved nutrition and health - Engage with the research community to stimulate development of innovative methodological approaches and novel metrics - Strengthen international interdisciplinary research collaborations for evidence-based policy making and programme design	2014-	Global
Nutritional quality of diets, Greenhouse Gas Emissions	- UMR "Nutrition, Obesity and Risk of Thrombosis" Aix- Marseille Université, Marseille - AgroParisTech, Nutrition Physiology and Ingestive Behavior, Paris, - Danone Research, Global Nutrition Department, Palaiseau, France - UR "Aliss," Ivry sur Seine, France	Reducing energy intake and energy density for a sustainable diet: a study based on self-selected diets in French adults. Am J Clin Nutr . (2014). http://www.ncbi.nlm.nih.gov/pubmed/24695893	Reducing diet-related GHGe and increasing nutritional adequacy are possible through frugality and wiser dietary choices such as a lower intake of meats and alcoholic drinks, higher intake of plant-based foods, and moderate food intake.	2014	France
Scenario analysis, Diet, Nutrition, Climate, Land use Meat	- Department of Technology and Society, Environmental and Energy Systems Studies, Lund University, Sweden - Department of Energy and Technology, Swedish University of Agricultural Sciences, Uppsala, Sweden	Sustainable meat consumption: A quantitative analysis of nutritional intake, greenhouse gas emissions and land use from a Swedish perspective. *Food Policy*. (2014) http://www.sciencedirect.com/science/article/pii/S0306919214000670	This quantitative analysis suggests that beneficial synergies, in terms of public health, GHG emissions and land use pressure, can be provided by reducing current Swedish meat consumption.	2014	Sweden
Sustainable Food Security, Sustainable Diets	- Cardiff School of Planning and Geography, UK - Joint Research Centre Science Advice to Policy, European Commission, Brussels, Belgium - Public d'amenagement de Senart New Town, Savigny-le-Temple, France - Department of Geography and Environmental Studies, Wilfrid Laurier, Waterloo, Canada	Sustainable Food Security: An Emerging Research and Policy Agenda. *International Journal of Sociology, Agriculture and Food*. (2014) http://orca-mwe.cf.ac.uk/58308/1/sonnino.pdf	This study highlights a series of cross-cutting issues and areas of disconnection between food production and consumption that call for a renovated focus on the different nodal points of the food system. It is suggested that a sustainable food security framework should move away from the conventional focus on individual components of the food system (e.g., supply and demand) and address more holistically the complex relationships between its different stages and actors. - Sharing community-derived good practices can support and reinforce global networks of sustainable community food systems, foster knowledge co-creation and ultimately cement collective action to global pressures. In turn these networks could enhance the sustainability and resilience of community food systems and facilitate wide scale food system transformation.	2012-2014	Community

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
Food and Diets, Food-system, Scenario, Assessment, Policy-making	European Commission, Joint Research Centre, Foresight and Behavioural Insights Unit, Brussels	*Tomorrow's Healthy Society Research Priorities for Foods and Diets. JRC Foresight Study*. (2014) https://ec.europa.eu/jrc/sites/default/files/jrc-study-tomorrow-healthly-society.pdf	The research priorities developed in this study, and based on scenarios with a long-term perspective, fall into four thematic areas: 1) healthier eating: integrated policy-making; 2) Food, nutrients and health: cross-interactions and emerging risks; 3) Making individualised diets a reality; 4) Shaping and coping with the 2050 food system. This Study shows that we still need to know more about foods, diets and health, and that we need to have effective, integrated and acceptable policies in order to move towards a sustainable food chain providing consumers with healthy diets. Changes in consumer behaviour must go hand in hand with changes in the food supply. The scenarios developed in this study are intended to contribute to a societal dialogue on how to shape the future food system, while research will provide the evidence necessary for informed decision-making.	2012-2014	EU
Sustainable Diets	Food Forum; Food and Nutrition Board; Roundtable on Environmental Health Sciences, Research, and Medicine; Board on Population Health and Public Health Practice; Institute of Medicine.	IOM (Institute of Medicine). 2014. Sustainable diets: Food for healthy people and a healthy planet: Workshop summary. Washington, DC: The National Academies Press. (2014). http://www.ncbi.nlm.nih.gov/books/NBK189809/	- One of the many benefits of the U.S. food system is a safe, nutritious, and consistent food supply. However, the same system also places significant strain on land, water, air, and other natural resources. A better understanding of the food-environment synergies and trade-offs associated with the U.S. food system would help to reduce this strain. Many experts would like to use that knowledge to develop dietary recommendations on the basis of environmental as well as nutritional considerations. But identifying and quantifying those synergies and trade-offs, let alone acting on them, is a challenge in and of itself. The difficulty stems in part from the reality that experts in the fields of nutrition, agricultural science, and natural resource use often do not regularly collaborate with each other, with the exception of some international efforts. - Experts explored the relationship between human health and the environment, including the identification and quantification of the synergies and trade-offs of their impact. This report explores the role of the food price environment and how environmental sustainability can be incorporated into dietary guidance and considers research priorities, policy implications, and drivers of consumer behaviors that will enable sustainable food choices.	2013-2014	USA
Sustainable Diets, Production and Consumption Patterns	Departments of Nutrition (JS) and Environmental Health and Geoinformatic Sciences (SS), School of Public Health, Loma Linda University, Loma Linda, USA	Sustainability of plant-based diets: back to the future. *The American Journal of Clinical Nutrition.* (2014). http://ajcn.nutrition.org/content/100/Supplement_1/476S.short	Plant-based diets in comparison to meat-based diets are more sustainable because they use substantially less natural resources and are less taxing on the environment. The world's demographic explosion and the increase in the appetite for animal foods render the food system unsustainable. Food security and food sustainability are on a collision course. Changing course (to avoid the collision) will require extreme downward shifts in meat and dairy consumption by large segments of the world population. Although other approaches should be pursued, they are insufficient to make the global food system sustainable, and therefore the dietary shift is an inevitable strategy.	2014	Global
Sustainable Diets, Health, Food security, Environmental sustainability	- Office of the UN Special Envoy for Financing of the Health Millennium Development Goals and Malaria, MDG Health Alliance, New York - Columbia University, Institute for Human Nutrition, New York - Bioversity International, Rome, Italy	Understanding Sustainable Diets: A Descriptive Analysis of the Determinants and Processes That Influence Diets and Their Impact on Health, Food Security, and Environmental Sustainability. *Advances in Nutrition.* (2014) http://advances.nutrition.org/content/5/4/418.short	The complex web of determinants of sustainable diets makes it challenging for policymakers to understand the benefits and considerations for promoting, processing, and consuming such diets. To advance this work, better measurements and indicators must be developed to assess the impact of the various determinants on the sustainability of a diet and the tradeoffs associated with any recommendations aimed at increasing the sustainability of our food system.	2014	Global
Dietary recommendations, Nutrition quality, food consumption patterns	Ministry of Health (Brazil)	Brazilian Food Based Dietary Guidelines http://www.foodpolitics.com/wp-content/uploads/Brazilian-Dietary-Guidelines-2014.pdf	- Prepare meals from staple and fresh foods - Use oils, fats, sugar and s in moderation. - Limit consumption of read to-consume food and drink products - Eat regular meals, paying attention, and in appropriate environments - Eat in company whenever possible.	2014	Brazil

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
			- Buy food at places that off varieties of fresh foods. - Develop, practice, share and enjoy your skills in food preparation and cooking. - Plan your time to give meals and eating proper time and space. - When you eat out, choose restaurants that serve freshly made dishes and meals. Avoid fast food chains. - Be critical of the commercial advertisement o food products.		
Sustainable food value chain	FAO	Developing sustainable food value chains: Guiding principles. http://www.fao.org/3/a-i3953e.pdf	- Sustainable value chains have significant impacts on food systems through enhancing economic sustainability by creating added value (higher incomes), social sustainability by facilitating more equitable distribution of added value among stakeholders, and environmental sustainability by reducing ecological footprints throughout the value chain. - Aimed at policy-makers, project designers and field practitioners, this publication provides the conceptual foundation for a new set of FAO handbooks on sustainable value chain development. It defines the concept of a sustainable food value chain, presents a development paradigm that integrates the multidimensional concepts of sustainability and added value,	2014	Global
Metrics and Concepts, Food Security	- University of Michigan, Department of Environmental Health Sciences, USA - Cornell University, Division of Nutritional Sciences, Ithaca USA	"What Are We Assessing When We Measure Food Security? A Compendium and Review of Current Metrics". *Advances in Nutrition: An International Review Journal* (2013). http://advances.nutrition.org/content/4/5/481.full	This study identifies six considerable challenges that remain to measuring food security, including: 1) adequately measuring dietary adequacy and distinguishing the constructs it represents; 2) differentiating the various components of food access; 3) applying cutoff points for defining food insecurity; 4) mitigating potential response bias from experience-based measures; 5) acknowledging trade-offs; 6) validating measures amid great diversity in approaches to measurement and conceptualization of food security.	2013	Global
Cardiovascular disease, Sustainable diets, UK, Cancer, Meat consumption, Dairy products	- Nuffield Department of Population Health, University of Oxford - British Heart Foundation, Health Promotion Research Group, Department of Public Health, University of Oxford - - Health, Deakin University, Geelong, Victoria, Australia	- Defining sustainable diets by comparing greenhouse gas emissions from different food groups: a systematic review. *The Lancet*. (2013). http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(13)62529-5/fulltext - Modelling the health impact of environmentally sustainable dietary scenarios in the UK. *European Journal of Clinical Nutrition*. (2012). http://www.ncbi.nlm.nih.gov/pubmed/22491494	- Organic foods and locally produced foods do not always produce fewer GHGEs. Future LCA food studies should make efforts to follow a uniform approach, to include common definition of stages in the lifecycle and inclusion of similar activities always under each category of food. - Modelled results suggest that public health and climate change dietary goals are in broad alignment with the largest results in both domains occurring when consumption of all meat and dairy products are reduced.	2013-2012	UK
Environmental impacts, traditional diets, dietary recommendations, theoretical diets	- Institute of Food and Resource Economics, Faculty of Science, Copenhagen University - Department of Human Nutrition, Faculty of Science, Copenhagen University - Department of Agroecology, Aarhus University, Denmark	"The global warming potential of two healthy Nordic diets compared with the average Danish diet". *Climate Change* (2012). http://link.springer.com/article/10.1007%2Fs10584-012-0495-4	A well-designed diet could lead to lower climate impact and improved health. A change to Nordic diets (less animal foods, more fruits and vegetables) could support climate change mitigation, but must be cautious with diet recommendations. Reducing alcoholic drinks, hot drinks, and sweets by 50% would reduce GHGe the same as reducing meat intake by 30%.	2013	Denmark
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	- Centre for Nutrition and Health, National Institute for Public Health and the Environment, Bilthoven, The Netherlands - Wageningen University and Research - Centre for Energy & Environmental Studies, University of Groningen - Blonk Consultants, Gouda, The Netherlands	Replacement of meat and dairy by plant-derived foods: estimated effects on land use, iron and SFA intakes in young Dutch adult females. *Public Health and Nutrition*. (2013) http://www.ncbi.nlm.nih.gov/pubmed/23425363	- Replacing meat and dairy foods with plant-based foods could reduce land use and lower saturated fat in young Dutch women and not compromise total iron intake. Sugar intake would probably increase. - GHGE of daily diets in the Netherlands is between 3 and 5 kg CO_2e, with considerable differences between individuals. Meat, dairy and drinks contribute most to GHGE. The insights of the study may be used in developing (age- and gender-specific) food-based dietary guidelines that take into account both health and sustainability aspects.	2013	The Netherlands
Environmental impacts of habitual	- Ribble Consultants - Infonomics	A balance of healthy and sustainable food choices for France, Spain and Sweden. World Wildlife Fund. (2013).	All diets show a reduction in the total amount of meat consumed. This is inevitable since these are the foods with the highest GHGe. On the other hand, this study shows that for a	2013	France, Spain, Sweden

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
diets, recommended diets, and/or theoretical diets	- University of Aix-Marseille - Murphy-Bokern Konzepte	http://livewellforlife.eu/wp-content/uploads/2013/02/A-balance-of-healthy-and-sustainable-food-choices.pdf	25% reduction it is still possible to have enough meat and/or fish in the diet to comply with nutritional recommendations and maintain some traditional dishes and meal patterns. All diets show an increase in the consumption of legumes as sources of protein. This again is inevitable owing to the lower GHGe of legumes relative to most other sources of protein, even if they are imported long distances. As legumes are not costly, this may help to keep the food budget constant or even to decrease it. All diets show an increase in cereals and starchy foods, typically represented by increases in bread, pasta and potatoes. Healthy, sustainable food choices are possible in a variety of countries. Further research and analysis should be done to improve precision and assist in guidance to stakeholders.		
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	- Department of Public Health, University of Otago, Wellington, New Zealand - National Institute for Health Innovation, University of Auckland, New Zealand	Foods and dietary patterns that are healthy, low-cost, and environmentally sustainable: a case study of optimization modeling for New Zealand. *PlosONE*. (2013). http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0059648	Low-cost, low-GHGe modeled diets are complementary but with trade-offs of higher daily food costs. This is partly because of reduction in higher GHGe foods, such as eggs and milk, pushes food choices to more costly alternative foods containing nutrients such as calcium. Milk is a relatively efficient beverage for nutrient provision (i.e., nutrients per GHGe generated).	2013	New Zealand
Environmental impact, GHGe, Nutritional quality of different self-selected diets	- UMR Nutrition, Obesity and Risk of Thrombosis, Institut National de la Recherche Agronomique, Institut National de la Santé et de la Recherche Medicale, INSERM, Aix- Marseille Université, France - Institut National de Recherche Agronomique, Ivry sur Seine, France	High nutritional quality is not associated with low greenhouse gas emissions in self-selected diets of French adults. Am J Clin Nutr . (2013). http://ajcn.nutrition.org/content/early/2013/01/30/ajcn.112.035105.abstract	Healthy diets are supposed to be more environmentally friendly because they rely mainly on plant-based foods, which have lower greenhouse gas emissions (GHGEs) per unit weight than do animal-based foods. Despite containing large amounts of plant-based foods, self-selected diets of the highest nutritional quality are currently not those with the lowest diet-related GHGEs. This study seems to contradict the widely accepted view that diets that are good for health are also good for the planet.	2013	France
Sustainable Diets, Nutrition, Health	British Nutrition Foundation	Sustainable diets: Harnessing the nutrition agenda. *Food Chemistry*. (2013). http://www.sciencedirect.com/science/article/pii/S0308814613001180	A sustainable food supply is key to ensure food security for future generations. Food demand is rising in line with growth of the global population. Obesity and malnutrition often co-exist in a country, challenging public health. Nutrition has to be an integral part of sustainability discussions. Reducing food waste at all stages in the food chain is considered to be a quick win.	2013	Global/UK
Dietary and environmental recommendations, Nutrition quality, food consumption patterns	German Council for Sustainable Development	Sustainable Shopping Basket (2014) http://www.nachhaltigkeitsrat.de/uploads/media/Broschure_Sustainable_Shopping_Basket_01.pdf	- Follow the food pyramid - Eat less meat and fish but savour them - Follow 5-a-day on fruit and vegetables - Eat seasonally and regionally as your first choice - Eat organic products - Choose fair trade products - Choose drinks in recyclable packaging - Use designated certification schemes	2009-2013	Germany
Dietary and environmental recommendations, Nutrition quality, food consumption patterns	UK Government working party	UK Green Food Project, 8 principles (Defra, 2012) https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229537/pb14010-green-food-project-sustainable-consumption.pdf	- Eat a varied balanced diet to maintain a healthy body weight. - Eat more plant based foods, including at least five portions of fruit and vegetables/day. - Value your food. Ask about where it comes from and how it is produced. Don't waste it. - Moderate your meat consumption, and enjoy more peas, beans, nuts, and other sources of protein. - Choose fish sourced from sustainable stocks. Seasonality and capture methods are important here too. - Include milk and dairy products in your diet or seek out plant based alternatives, including those that are fortified with additional vitamins and minerals - Drink tap water - Eat fewer foods high in fat, sugar and salt	2012	UK

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
Metrics, Sustainable diets	Bioversity International	Metrics of Sustainable Diets and Food Systems. Technical Brief. Bioversity International. (2012). http://www.bioversityinternational.org/e-library/publications/detail/metrics-of-sustainable-diets-and-food-systems/	The identification of a research agenda will need to: 1) Address gaps in our understanding of what constitutes a sustainable diet; 2) Build on the example of the Mediterranean Diet; 3) Understand the need to value biodiversity and nutrition plus other dimensions; 4) Propose new research on describing, measuring and promoting sustainable diets; 5) Identify a process for developing indicators and guidelines aimed at measuring the sustainability of diets worldwide	2012	Global/Mediterranean
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	Small World Consulting, Lancaster Environment Centre, Lancaster University, UK	"The relative greenhouse gas impacts of realistic dietary choices". *Energy Policy* (2012). http://www.sciencedirect.com/science/article/pii/S0301421511010603	If UK population changed to vegetarian or vegan diets, GHGe and food costs would be lower. Informed dietary choices can make a difference to GHGe, potentially reducing food-related emissions by ~25%, with potential health benefits.	2012	UK
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	Department of Public Health and Primary Care, University of Cambridge, UK	"Impact of a reduced red and processed meat dietary pattern on disease risks and greenhouse gas emissions in the UK: a modelling study" *BMJ Open - Public Health* (2012). http://bmjopen.bmj.com/content/2/5/e001072.full	Reduced consumption of red and processed meat could bring multiple benefits to health and environment.	2012	UK
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	- UMR Nutriments Lipidiques et Prévention des Maladies Métaboliques, Univ Aix-Marseille, France - Institut National de Recherche Agronomique, Ivry sur Seine, France	" Greenhouse gas emissions of self-selected individual diets in France: changing the diet structure or consuming less?". *Ecological Economics.* (2012). http://www.sciencedirect.com/science/article/pii/S0921800912000043	GHGe linked to amount of food and kcal eaten. Substituting fruits and vegetables for meat (especially deli meat) may be desirable for health but is not necessarily the best approach to decreasing diet-associated GHGe.	2012	France
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	Energy Institute, Johannes Kepler University, Austria	Impact of changes in diet on the availability of land, energy demand, and greenhouse gas emissions of agriculture. *Energy, Sustainability and Society.* (2011). http://link.springer.com/article/10.1186%2F2192-0567-1-6	It is feasible to mitigate GHGe, reduce use of fossil energy and help meet energy demand through renewable energy crops. Agricultural land will always be needed for food and feed production, even with large changes in diets.	2012	Austria
Food systems, climate change and greenhouse gases, recommendations	First Steps Nutrition Trust	*Healthy and sustainable diets in the early years Implications of current thinking on healthy, sustainable diets for the food and nutrient intakes of children under the age of 5 in the UK.* (2012). http://www.firststepsnutrition.org/pdfs/sustainability.pdf	This report examines the progress that has been made towards defining what a healthy, sustainable diet might look like for developed countries, and in particular examines the implications of this for children under the age of 5 years in the UK. This study shows that the current diets of some children fail to achieve minimum nutrient requirements and therefore, if dietary recommendations change, the impact on those with marginal intakes needs to be considered. Current dietary reference values in the UK have been developed based on current UK intakes of foods and nutrients and therefore there may need to be some review of the adequacy of these if dietary composition is suggested to change substantially.	2012	UK
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	The Rowett Institute of Nutrition and Health, The Division of Applied Health Sciences, Biomathematics and Statistics, University of Aberdeen, Aberdeen, UK	Sustainable diets for the future: can we contribute to reducing greenhouse gas emissions by eating a healthy diet? *American Journal of Clinical Nutrition* ;. (2012) http://www.ncbi.nlm.nih.gov/pubmed/22854399 Livewell: a balance of healthy and sustainable food choices. World Wildlife Fund; (2011). http://assets.wwf.org.uk/downloads/livewell_report_ja	A diet that meets dietary requirements with lower GHGe is possible without eliminating meat or dairy or increasing the cost to the consumer.	2011-2012	UK

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
		n11.pdf			
- Quantifying the environmental impact of food consumption	Blonk Milieu Advies, The Netherlands	*Methods for quantifying the environmental and health impacts of food consumption patterns.* (2011) Blonk Milieu Advies BV http://blonkconsultants.nl/en/upload/pdf/duurzaam_gezond_menu.pdf	This report presents the results of a literature review of about fifty publications on the environmental and/or health impacts of food consumption patterns. The main findings of the literature review were: 1) The relation between greenhouse gas emissions and (healthy) food consumption patterns is the most frequently studied topic. 2) Life cycle assessment was the most frequently used method to quantify environmental impact. 3) Several attempts have been made to derive an overall indicator to quantify or qualify the nutrient value of diets (food consumption patterns), but these were not successful. 4) Present consumption patterns and diets were defined and quantified in different ways, depending on the data available and the scale of the analysis (global, national, regional or plate level).	2011	Global/Europe
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	- Friedman School of Nutrition Science and Policy, Tufts University, Boston, USA - Dyson School of Applied Economics and Management, Cornell University, Ithaca, USA. - Geography and Geosciences, Salisbury University, USA. Division of Nutritional Sciences, Cornell University, Ithaca, USA - Crop and Soil Sciences, Cornell University, Ithaca, USA	Mapping potential foodsheds in New York State by food group: an approach for prioritizing which foods to grow locally. *Renewable Agriculture and Food Systems*. (2011). http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=8547574&fileId=S1742170511000196	Local and regional food systems in NY could specialize on high-value crops and livestock. This approach is more realistic than a simple food miles–based approach.	2011	New York State
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	- European Commission, Joint Research Centre, Seville, Spain - Netherlands Organisation for Applied Scientific Research, Delft, The Netherlands - Institute of Environmental Sciences, Leiden University, The Netherlands - Norwegian University of Science and Technology, Trondheim, Norway	- Do healthy diets in Europe matter to the environment? A quantitative analysis. Do healthy diets in Europe matter to the environment? A quantitative analysis. *Journal of Policy Modeling*. (2011) http://www.sciencedirect.com/science/article/pii/S0161893810001031 - Environmental impacts of changes to healthier diets in Europe. *Ecological Economics* . (2011). http://www.sciencedirect.com/science/article/pii/S0921800091100190X	2011 Promotion of less-meat-rich diets in the EU27 could lead to limited but positive environmental and health effects. Moderate diet changes are not enough to reduce impacts from food consumption drastically.	2011	EU27 Spain, The Netherlands, Norway
Dietary and environmental recommendations, Nutrition quality, food consumption patterns	Health Council of the Netherlands	Guidelines for a healthy diet: the ecological perspective (Netherlands) http://www.gr.nl/sites/default/files/201108E.pdf	- Move to a less animal- based, more plant- based diet - Lower energy intake, and eat fewer snacks - Eat two portions of fish a week but from sustainable sources - Reduce food waste	2011	The Netherlands
Environmental impacts of diets in developing regions of the world	Division of Environmental Sciences, Indian Agricultural Research Institute, New Delhi, India	Carbon footprints of Indian food items. Agric Ecosyst Environ . (2010). http://www.sciencedirect.com/science/article/pii/S0167880910001738	A change in food habits could offer a possibility for GHGe mitigation. Some potential options to reduce GHGe from food may be consumption of locally produced foods; less mutton; substitute meat and milk with vegetable protein.	2010	India
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	Potsdam Institute for Climate Impact Research (PIK), Potsdam, Germany	"Food consumption, diet shifts and associated non-CO2 greenhouse gases from agricultural production." *Global Environmental Change* (2010). http://www.sciencedirect.com/science/article/pii/S0959378010000075	The highest reduction potential for non-CO2 emissions would be from the combination of technological mitigations in the agricultural sector and changes in food consumption patterns. Important to recognize livestock-based food products are important sources of nutrition, especially for poor and undernourished people in developing regions at risk of protein and nutrient deficiencies.	2010	Global economic regions: sub-Saharan Africa, central Asia, Europe including Turkey,

Main topic	Institutions involved	Key publications / Project	Key outcomes	Years	Geographical scope
					Independent states of former Soviet Union, Latin America, Middle East/North Africa, North America, Pacific region, South Asia including India.
Environmental impacts of habitual diets, recommended diets, and/or theoretical diets	MTT Agrifood Research, Jokioinen, Finland	Dietary choices and greenhouse gas emissions - assessment of impact of vegetarian and organic options at national scale. *Progress in Industrial Ecology – An International Journal* (2009) http://www.inderscience.com/info/inarticle.php?artid=32323	Giving up animal husbandry could have maximum re- duction of 7% GHGe; how- ever, large-scale changes in the diet of the whole pop- ulation would be needed. Environmental impacts for food should not be restricted to GHGe. Attention is needed on overall sustainability of food supply.	2009	Finland
Dietary and environmental recommendations, Nutrition quality, food consumption patterns	National Food Administration and Sweden's Environmental Protection Agency	Environmentally effective food choices (Sweden)	Eat less meat. Replace it with vegetarian meals; choose local meats or organic if available - Eat fish 2-3 times a week from sustainable sources - Eat Fruit, vegetables, berries: a good rule of thumb is to choose seasonal, local and preferably organic products - Choose locally grown potatoes and cereals rather than rice - Choose pesticide-free or organic when possible - Choose rapeseed oil rather than palm oil fats - Eat fish 2-3 times a week from sustainable sources - Eat Fruit, vegetables, berries: a good rule of thumb is to choose seasonal, local and preferably organic products - Choose locally grown potatoes and cereals rather than rice	2009	Sweden

APPENDIX 2: COMMUNITY AND ACTION-RESEARCH INITIATIVES FOR THE ASSESSMENT OF SUSTAINABLE FOOD SYSTEMS

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
SUSTAINABLE CONSUMPTION AND PRODUCTION INDICATORS FOR THE FUTURE SDGS (UNEP, 2015; International Institute for Sustainable Development - Commonwealth Scientific and Industrial Research Organisation)	Sustainable Development Goals	TRANSFORMING CATERING AND FOOD PROCUREMENT	***Market share of goods and services certified by independently verified sustainability labelling schemes***	Goods and services certified by independently verified sustainability labelling schemes, market share in value, compared to total goods and services available in the market.	%			Global / National
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Amount of R&D spending on environmentally sound technologies***	2) Amount of spending on R&D in developing countries on environmentally sound technologies. ($US or Euro). Poor; reported on an annual basis, but there is a paucity of data for developing countries. R&D for environmentally sound technologies need to be selected from R&D spending for the environment.	(% of goods and services)		Poor; lack of data from retailers and consumer goods manufacturers, especially on a per country basis.	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Number of organizations actively engaged in regional cooperation supporting the implementation of Sustainable Consumption and Production activities at the regional, sub-regional and national levels***	3) Measuring increased cooperation and networking among countries and all stakeholders on SCP.	(# of organizations)		Good, Data not available currently – quantitative data will be provided by mid 2015 as a result of the first Global Survey on SCP.	
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Per capita food losses and waste (kg/year), as measured using the Food Loss and Waste Protocol***	Global standard for quantifying loss and waste of food.	Tonnes		Currently poor, baseline needs to be established in order to track percentage reduction. The Food Loss Index will be integrated into the Protocol, and it includes good data on food loss.	
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Contaminants in air, water and soil from industrial sources, agriculture, transport and wastewater and waste treatment plants***	Annual average levels of selected contaminants in air, water and soil from industrial sources, agriculture, transport and wastewater and waste treatment plants. Pollutant releases to air, water and land as well as off-site transfers of waste and of pollutants in wastewater include: heavy metals, pesticides, greenhouse gases and dioxins.	Kg of contaminant		Poor, data from pollutant release and transfer registers (PRTRs) only covers releases from industrial facilities, and mainly developed countries. Environmental data on wastewater and treatment of wastewater are available.	

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***National recycling rate and recycling rate for specific materials and sectors***	Share of DPO reintroduced as resource input replacing Domestic Extraction (DE) or Imports AND Share of sector DPO reintroduced as resource input.	% of waste flow recycled AND % of waste flow recycled for each sector specified (including household sector)		- Poor; Waste and recycling statistics are not well standardized; waste amount often underestimated - Poor; not covered in national statistical system; no measure for sector material use.	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Number of companies publishing sustainability reporting***	7) Increase in percentage of the world's largest companies disclosing sustainability information; as well as: - Percentage of such reporting which is addressing essentially the entire supply chain - Percentage of the reporting companies with information in their sustainability reporting aligned with relevant indicators in the SDGs.	% of Fortune Global 500 companies reporting against a framework they select (GRI, IIRC, UNGC or SASB) provided they have been able to meet due quality requirements.)		Very Good; GRI, IIRC, UNGC or SASB all have data on company reporting and reporting content (though this would need to be pulled together and mapped against the companies listed in the Fortune Global 500).	
		(BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS)	***Sustainable Consumption and Production mainstreamed into formal education***	Inclusion of SCP in school curricula (formal education).	(Percentage of countries reporting inclusion in formal education curricula)		Poor; currently unavailable.	
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Proportion of land under climate smart and sustainable technologies and practices***	Total area of land under climate smart and sustainable technologies and practices as a proportion of total area of productive land	(% of growth compared to baseline p.a.)		Good, data available from Alliance for Climate Smart Agriculture, FAOSTAT,CGIAR.	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Teachers training and teachers' skills to deliver Education for Sustainable Development (ESD)***	Teachers and In-service teachers receiving training in ESD and sustainability teaching including both basic ESD curriculum contents and also the pedagogies and learning approaches for sustainability teaching.	Percentage of teacher trainers and percent age of In-service teachers who have received training in ESD and sustainability teaching, including both basic ESD curriculum contents and also the pedagogies and learning approaches for sustainability teaching.		Poor; currently unavailable	
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Share of renewable energy, i.e. Renewable Energy Target (RET)***	11) TPES by primary energy sources; definition of renewable may include hydro, solar, wind, geothermal, etc.	% share of renewable energy of Total Primary Energy Supply (TPES)		Very good; International Energy Agency (IEA) energy statistics and balances, national energy accounts	

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Growing investment in green and renewable energy***	Capital investment into renewable generation capacity as part of capital investment accounts	Share of investment into renewable energy generation capacity of total investment into energy generation capacity.		Very good; System of National Accounts, SEEA framework, additional definitions may be needed	
Urban Agriculture & Sustainable Food Systems SUSTAINABLE COMMUNITIES LEADERSHIP ACADEMY A Resource Guide for Local Leaders (Institute for Sustainable Communities, 2013)		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Amount of healthy foods being consumed***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD)	***Obesity and chronic disease rates***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD)	***Access to stores that provide healthy foods and/or that accept government food assistances programs***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Measures of food security***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***School lunch eligibility among children***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of farms in the region & average age of farmers***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Wages of jobs in the agricultural sector***					
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Soil quality***					
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Land use and zoning policies***					
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Access to community gardens***					
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Number of miles traveled by the average food item***					
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number of food manufacturers***					

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Incidences of foodborne disease***					
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Participants in composting programs***					
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Amount of food waste diverted to charitable purposes***					
Proposed Indicators for Sustainable Food Systems, The Vivid Picture Project (2005)		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Daily per capita servings of fruits and vegetables***	Daily servings of fruits and vegetables is a very good proxy for healthy eating. It is a direct and straightforward measure of the extent to which Californians are fulfilling an important piece of the food pyramid, and obtaining key vitamins and minerals. It is also the area where diets most commonly fall short of the standard.	This indicator gauges the number of daily servings of fruits and vegetables consumed by the average Californian resident each year.		Data were drawn from the California Dietary Practices Survey conducted by the Cancer Prevention and Nutrition Section of the California Department of Health Services. Obtained through personal communication with CPNS staff. Data are collected through telephone surveys.	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Obesity rate in adults***	Of all the public health problems caused by diet-related factors, the obesity epidemic is the most widely recognized. In addition, trends in obesity are well understood by the nutritional community.	%		WHO	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Distance (and distance distribution) from eaters to nearest full-service food store (urban and rural, those with/without cars)***	An indication of how far people must travel to obtain food is an important aspect of access. Generally speaking, the further people, particularly those without personal transportation, live from food outlets, the poorer their access is.	Km		Ecotrust Geographic Information System (GIS)	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of farmers markets that accept FMNP coupons (WIC), senior FM coupons, food stamps***	This indicator portrays an important subset of government food assistance programs. It is a valuable mechanism for showing how low-income segments of the population who do not have access to food can gain access and assistance at public markets.	Nb			
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Percentage of households that are food insecure/food secure***	Food security is an excellent indicator of food affordability. It directly specifies the extent to which the population is achieving adequate food intake, which has a significant correlation to affordability.				
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Percentage of population that is in poverty.***	Poverty is a leading driver of food affordability—if people are living in poverty, they will clearly have a more difficult time being able to afford food.				
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Average wage paid to grocery workers (compared to other industries)***	The average wage paid to grocery workers is important to monitor as an indication of adequate wages, and is particularly relevant at this point in time.				
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Average wage paid to food service and processing workers (compared to other industries)***	The average wage paid to grocery workers is important to monitor as an indication of adequate wages, and is particularly relevant at this point in time.				
		PROMOTING HEALTHY AND	***Total direct agricultural sales to***	This indicator is a straightforward and easily understandable method				

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		SUSTAINABLE FOOD TO THE PUBLIC	***public***	to measure one of the main mechanisms through which people purchase local food.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Percentage of consumers now buying California agricultural products more often than 6 months ago.***	This is a clear and direct indicator of the degree to which Californians are purchasing food produced close to home. It is a highly sensitive measure of change, as it is a direct and responsive measure of change in consumer behavior.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of school districts with farm-to-school programs.***	The more districts that have farm to school programs, the more broadly the youth population has access to healthy, fresh food produced close to home.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Total direct sales per capita, as % of total agricultural sales***	When eaters purchase directly from producers, it is a good proxy for knowledge about where their food comes from.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number certified farmers markets***	The presence of farmers' markets, assuming they are patronized, is a very straightforward and common-sense measure of peoples' ability to know where their food is coming from and by whom it was grown. Markets further provide an opportunity to create new relationships between producers and consumers. The number of active farmers' markets from year to year lends insight into the extent to which the direct marketing channel is growing in popularity.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Sales from certified farmers markets***	Total sales is a good indicator of peoples' knowledge of where there food comes from because it reflects that eaters are willing to spend more for their food through direct marketing channels.				
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of school garden***	This is a very important indicator of knowledge about where our food comes from—it directly points to literacy about the agricultural cycle and targets the youth population.				
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of farm-to-school programs***	It is another way to represent youth learning about the agricultural cycle and has the added dimension of education about working commercial farms. Farm-to-school programs tend to focus on cafeterias, whereas school gardens have more of a focus on agriculture and gardening.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of counties and producers participating in "Buy Fresh, Buy Local" campaigns***	Buy Local campaigns are an excellent way to increase regional food identity. Measuring their increase is a direct reflection that a stronger identity is being built in a given region.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of restaurants participating in the Chef's Collaborative***	The Chefs Collaborative is the leading organization of chefs dedicated to providing fresh, local food to customers, making direct marketing connections with producers and undertaking education by making regionally identified and seasonal food part of the dining experience at their restaurants. An increasing number of participating restaurants reflects growing popularity of these qualities.				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A	***Number of Slow Food Convivia and number of members in the organization.***	Slow Food chapters are created in commitment to "stewardship of the land and ecologically sound food production; to the revival of the kitchen and the table as centers of pleasure, culture, and community;				

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY		to the invigoration and proliferation of regional, seasonal culinary traditions; and to living a slower and more harmonious rhythm of life."				
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of acres of urban area***	…….				
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Number of composters accepting food and agricultural waste (current) in relation to total number of composters/processors of organic materials (mostly urban)***	Composters that accept food and agriculture wastes directly divert significant quantities of material from the waste stream. An increasing proportion of such facilities means better access for agriculture- and food-related businesses and an increased statewide capacity to recycle food and agriculture waste.				
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Total tons of food and agricultural waste disposed; pounds per capita***	The total volume of food and agricultural waste disposed of doesn't tell us how much waste is generated but quantifies how much is going into the state's landfills. Waste diversion and recycling programs are not directly taken into account and are thus not reflected in the data. This is an important and responsive indicator because incentives for waste recycling will lead directly to less food waste in landfill.				
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Number of Operating Food Diversion Programs***	The proportion of jurisdictions with composting programs is a good indication of the extent to which incentives for waste recycling are provided.				
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of workers in various food sectors***	This indicator gives a sense of the significance of various food sectors as employers in the economy.				
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of retail food businesses by size classes (number of employees)***	Clearly, the number of firms and number of employees does not equate to profitability, so this indicator must be used with care. From the firms' perspective, a larger firm that has more technology may be more profitable; from the community perspective, a greater number of smaller firms may lead to greater community profitability as more local business owners will tend to funnel greater profits into the local community.				
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of food manufacturers by size classes (number of employees)***	"Food manufacturers" are also known as "food processors".				
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Aggregate income earned by workers in various food sectors.***	This indicator is particularly interesting when the balance of income among various sectors is considered. This indicator compares total personal income in each sector rather than per capita income. For example, food service workers are the lowest paid, but represent the highest total due to growth among restaurants. This indicator reports on the impact on the economy, not on individuals.				
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Per capita weekly expenditures (by demographic per product categories)***					
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Variety in the average diet***					
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and REDUCING WASTE	***Food miles***					

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM						
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***# of people that know a farmer***					
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***# acres in production with products that will be consumed locally***					
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***# of retailers that have country of origin labeling***					
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***# of acres in urban agriculture***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Overweight children***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of food banks***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD and PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Money granted to Senior Nutrition Program and WIC Program in CA***					
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Percentage of consumers inclined to buy CA product***					
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Percentage Californian grown food purchased***					
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Number of unique regionally based branding efforts, or place-based marketing programs***					
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Total compost sold to agricultural sector (cubic yards)***					
Metrics of Sustainable Diets and Food Systems (Bioversity and CIHEAM/IAMM, 2013-2015)		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD	***Water Footprint of nutrient-dense foods***	Volume of freshwater appropriated to produce a product, taking into account the volumes of water consumed and polluted at the different steps of the supply chain. This indicator refers to a specific application of the Water Footprint to nutrient-dense food items. The selection of the relevant nutrient-dense foods is left open for now. The Nutrient	m3/kg		(Bioversity International and CIHEAM/IAMM)	

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		SYSTEM		density score (SAIN) is suggested to identify them (Darmon and Darmon, 2008).				
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Energy share of water-demanding nutrient- dense foods***	Share of nutrient-dense foods that are particularly water-demanding in total energy. The Nutrient density score (SAIN) and the Water Footprint are suggested to identify the nutrient-dense and water demanding foods respectively (Darmon and Darmon, 2008; Water Footprint Network).	&			
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Food-borne disease incidence***	Cases of illness due to food-borne pathogens such as salmonella, listeria, e-coli and campylobacter.	&			
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Nutrient density score of water-demanding foods***	The Nutrient density score (SAIN Score d'adéquation aux recommandations nutritionnelles, in French) is a nutrient density that evaluate the capacity of a food product - or food group - to cover the nutritional needs (Darmon and Darmon, 2008). It is calculated as the arithmetic mean of the percentage adequacy (to DVs) for positive nutrients over total energy intakes. The selection of the relevant nutrients and of the water-demanding foods is left open for now. The Water Footprint is suggested to identify the water-demanding foods (Water Footprint Network).	unit/100 kcal			
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Existence of national dietary guidelines***	Binary indicator that measures whether the government has published guidelines for a balanced and nutritious diet.	0 or 1			
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Indicator on Food Composition (INFOODS)***	Count of the number of foods with a sufficiently detailed description to identify genus, species, subspecies and variety/cultivar/breed, and with at least one value for a nutrient or other bioactive component.	Unit			
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Waste output assessment***	Self-assessment tool that measures if waste prevention policy efforts have been made. It balances between the diversity of instruments applied locally, adapted to the needs of each context, and the need to reach common EU prevention policy goals.	score			
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Nutritional inequality concentration index***	Developed by analogy with the Lorenz curve and the Gini coefficient, the Concentration Curve and the related Concentration Index (CI) have been widely used in Health Economics to measure socioeconomic inequality of health. The concentration curve represents the cumulative percentage of the population against the cumulative amount of health. The Concentration Index is then def ined as twice the area between the concentration curve and the diagonals. Similarly, the "Nutritional Inequality" Concentration Ind ex (Allen, 2010) measures the socioeconomic inequality of nutritio n adequacy scores by taking into account, for selected measures of nutritional adequacy (MAR, MER, MAR/DE), every individual's l evel of and every individual's rank in the socioeconomic domain. The resulting concentration index measures income distribution related nutritional adequacy performance.	score [-1 : +1]	Allen, 2010		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Healthy Food Basket index***	Following the Illawarra Healthy Food Basket index (Williams et al., 2009), the index would monitor the affordability of a nutritionally adequate diet. It consists of a basket of food items selected to meet the nutritional requirements at the lowest cost, and repeat the costing of the basket over time to assess trends in affordability.	index	Allen & Prosperi, 2014 (adapted from Williams et al., 2009)		
		PROMOTING HEALTHY AND	***Ratio seasonal/non-seasonal***	Ratio between seasonal and non-seasonal fruits and vegetables in the	%	Heller and		

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		SUSTAINABLE FOOD TO THE PUBLIC and REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***fruits & vegetables***	diet.		Keoleian, 2000		
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Time available for food preparation***	Average time available for food preparation in a day.	hours/day			
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Price elasticities of nutritional adequacy of diet***	The price elasticities of the Mean Adequacy Ratio (MAR) measures the effects on the overall nutritional adequacy of diets to changes in food prices. It combines the price elasticities of demand with nutrient adequacy ratios (NARs) for each food item/group in the consumer basket. As many price elasticities of MAR can be computed as item considered in the demand system. In the case at end, only the price elasticity for a food group comprising the 10 food items with the highest Nutrient density score (SAIN) would be considered.	unit			
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***HDDS - Household Dietary Diversity Score***	Measure of the number of unique foods or food groups consumed by household members over a given period. At household level, it is meant to proxy the average economic ability of a household to access a variety of foods.	score			
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Nb of farmers markets***	Number of farmers markets.	unit			
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Community garden access***	Proportion of households that are within 1/4 mile of a community garden.	%			
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Food Miles***	Distance food travels from the location where it is grown to the location where it is consumed.	Km	Paxton, 1994; Lang et al., 2001		
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Caloric share of ready-to-consume products***	Share of ready-to-consume products in total energy. Purchased food items are divided according to the extent and purpose of their industrial processing (minimally processed, ready-to-consume, processed and ultra-processed food and drink products). The quantity of each group was converted into energy.	%			
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Nutrient density score of fast and street foods***	The Nutrient density score (SAIN - Score d'adéquation aux recommandations nutritionnelles in French) is a nutrient density that evaluate the capacity of a food product --- or food group - to cover the nutritional needs (Darmon and Darmon, 2008). It is calculated as the arithmetic mean of the percentage adequacy (to DVs) for positive nutrients over total energy intakes. The selection of the relevant nutrients and of fast and street food products is left open for	unit/100 kcal			

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
				now.				
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***IDDS - Individual Dietary Diversity Score***	Measure of the number of unique foods or food groups consumed by an individual over a given period. At individual level, it is meant to provide a proxy of individual nutrient adequacy.	score			
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Retail Food Environment Index***	Ratio describing the relative abundance of different types of retail food outlets in a given area. The RFEI is constructed by dividing the total number of fast-food restaurants and convenience stores by the total number of supermarkets and produce vendors (produce stores and farmers markets) in a given area. This methodology was developed by the California Center for Public Health Advocacy (2009).	score	USDA (USA)		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Nb of food deserts***	Number of food deserts in a given geographical area. Food deserts are defined as urban neighbourhoods and rural towns without ready access to fresh, healthy, and affordable food. In the USA, USDA, Treasury and HHS have defined a food desert as a census tract with a substantial share of residents who live in low-income areas that have low levels of access to a grocery store or healthy, affordable food retail outlet.	unit	USDA (USA)		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***% of Internet users***	Internet users (per 100 people). Internet users are people with access to the worldwide network.	%	The World Bank		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***% of public expenditure on food subsidies***	Level of public expenditure on food subsidies.	%	FAO		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Nb of farm-to-school programs***	Number of schools implementing farm-to-school programs. A school is considered as implementing a farm-to-school program when it is carrying out any combination of the following activities: 1. Buying products from local producers 2. Gardening and waste management programs 3. Nutrition, health and environment education 4. Learning opportunities such as farm/market tours or chef/farmer visits to the classroom.	unit	Feenstra et al., 2005		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Nb of foods bearing authorized nutrition claims***	Number of food products bearing a permitted nutrition claim. The EU Regulation on Nutrition and Health Claims [Regulation (EC) No 1924/2006] includes, in its annex, a list of the authorized nutrition claims. Since January 19, 2010, these have been the only permitted nutrition claims in the EU market.	unit	Allen & Prosperi, 2014 (adapted from Williams et al., 2003)		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Water Footprint (for an average diet)***	Total volume of freshwater that is used to produce the goods consumed in a specific diet. It is the sum of direct and indirect water use of domestic and foreign water resources through domestic consumption.	m3/year	Water Footprint Network; Vanham et al., 2013		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF	***Price index for 10 most water-demanding foods***	Measure of the monthly change in prices of a basket of water-demanding food commodities. The Water Footprint is suggested to	index	Allen & Prosperi, 2014		

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		THE FOOD SYSTEM		identify the 10 most water- demanding foods.		(adapted from FAO)		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Ratio external Water Footprint over total Water Footprint to produce food***	Ratio between the volume of freshwater used outside the country to produce food that is consumed by the inhabitants of a nation, and the total volume of freshwater used inside and outside the country to produce food consumed in the nation.	%	Allen & Prosperi, 2014 (adapted from Water Footprint Network)		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***% of food importations from water-rich countries***	Percentage of food importations from water-rich countries over total food consumption. Water-rich countries have more than 1700 m3 /inhabitant/year. Water-scarce country is below 1000 m3/inhab/year.	%	Allen & Prosperi, 2014 (Adapted from Water Footprint Network and UN-Water)		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***% of food household expenditure***	Monetary value of acquired food, purchased and non purchased (including non-alcoholic and alcoholic beverages as well as food expenses on away from home consumption in bars, restaurants, foodcourts, work canteens, street vendors, etc.) over total household consumption expenditure (monetary value of acquired goods for consumption, food and non-food items, consumed by members of household).	%	FAO		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Food and drink manufacturing waste***	[under development] Percentage of waste produced by the food and drink manufacturing industry disposed of or recovered at regional level.	%	Defra (UK)		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Nb of people reached with food assistance***	Number of people who are reached with food assistance.	unit	Allen & Prosperi, 2014 (adapted from DFID (UK))		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***% of diets locally produced***	[under development] Share of diets that is locally produced	unit	CIHEAM/FAO, 2012		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Presence of food safety net programs***	A measure of public initiatives to protect the poor from food-related shocks. This indicator considers food safety net programmes, including in-kind food transfers, conditional cash transfers (i.e. food vouchers), and the existence of school feeding programmes by the government, NGOs or the multilateral sector.	score [0-4]	Economist Intelligence Unit, 2013		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***At-risk-of-poverty rate***	Share of people with an equivalised disposable income (after social transfer) below the at-risk-of-poverty threshold, which is set at 60 % of the national median equivalised disposable income after social transfers.	%	Eurostat		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH	***Energy density of fast and street foods***	Average amount of kcal per 100 g for a selection of fast and street food products.	kcal/100g	Allen & rosperi, 2014 (adapted		

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
		AND ACCESS TO AFFORDABLE HEALTHY FOOD				from Gewa et al., 2007; Buscemi et al., 2011)		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Milk fat/protein ratio in infant formula***	Ratio of percent milk fat over milk protein in infant formula. An early adiposity rebound (AR) - a low BMI followed by increased BMI level after the rebound - is associated with an increased risk of overweight and associated metabolic diseases. Early AR suggests that an energy deficit had occurred at an early stage of growth, and can be attributable to the high-protein, low-fat diet fed to infants at a time of high energy needs (Rolland-Cachera et al., 2006; Koletzko et al., 2009).	%	Allen & Prosperi, 2014 (adapted from Rolland-Cachera et al., 2006; Koletzko et al., 2009)		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***% of high school students wat ching TV ≥3 hours/day***	Percentage of high school students who watched television ≥3 ho urs per day.	%	HHS (USA)		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Nb of food TV advertisements to children***	Number of food and beverage advertising in programs with a significantly high child (14 years and under) audience.	unit	ANPH (Australia)		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***DES - Dietary Energy Supply***	Percentage of population with a body mass index (BMI) of 25 kg/m2 or higher.	%	WHO		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Diet-related death rate***	Age-standardised death rate calculated for selected diet-related mortality causes, including cardiovascular diseases (such as coronary/ischaemic heart diseases and stroke/cerebrovascular diseases), diabetes mellitus and malignant neoplasms such malignant neoplasms (of the colon, stomach and breast).	[per 100,000]	WHO; Rodrigues et al., 2007		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Average portion sizes for key foods***	Amount of food consumed at a given eating occasion (EO) for a selection of key foods. Food models can be used to assist respondents in identifying portion sizes (cf.: USDA/NHANES surveys).	g or kcal	Piernas and Popkin, 2011		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***% of adults practicing physical activity***	Percentage of adults reaching the minimum WHO recommendation on physical activity for health (150 minutes of moderate-intensity aerobic physical activity throughout the week, or at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week, or an equivalent combination of moderate- and vigorous-intensity activity).	%	European Commission, 2013		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***DALYs due to overweight and obesity***	Disability Adjusted Life Years due to overweight and obesity: sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability attributed to high BMI (overweight and obesity) and related risk factors, such as diabetes and high blood pressure.	years	WHO		
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Literacy rate of adults***	Percentage of adults (years 15+) who can, with understanding, read and write a short, simple statement on their everyday life. Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations. This indicator is calculated by dividing the number of literates aged 15 years and over by the corresponding age group population.	%	The World Bank		

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		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Compliance with food and beverage TV advertising standards***	Percentage of advertisements aimed at children compliant with self-regulatory TV advertising standards to protect children from exposure to unhealthy food advertising. Classification into 3 categories: "compliance", "non---compliance" and "uncertain compliance".	%	Romero-Fernandez et al., 2009		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Funding allocated specifically to physical activity***	Yearly funding (in Euros) allocated specifically to health-enhancing physical activity (HEPA) promotion. Financial resources allocated specifically to HEPA promotion is a strong indicator of the importance a country attaches to this topic within its policy agenda.	EUR million	European Commission, 2013		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Funding allocated specifically to nutrition education***	Yearly funding (in Euros) allocated specifically to nutrition education programs. Nutrition education spending was found to have the intended effect on BMI, obese and overweight in aggregate on US data (Geary, 2013).	EUR million	Allen & Prosperi, 2014 (adapted from Geary, 2013)		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Existence of a policy plan for overweight/obesity***	Indicates whether or not the country has an operational policy, strategy or action plan for unhealthy diet and/or overweight/obesity.	0 or 1	WHO		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***Carbon Footprint of imported foods***	Total amount of GHG emissions that are directly and indirectly caused by an activity or are accumulated over the life stages of a product. This indicator refers to a specific application of the Carbon Footprint to imported food commodities.	kg (CO_2 eq)/kg	Defra (UK), 2005; WRAP/WWF (UK), 2011		
		REDUCING WASTE AND THE ECOLOGICAL FOOTPRINT OF THE FOOD SYSTEM	***HTL - Human Trophic Level***	Average of the trophic levels of the food items in the human diet, weighted by quantity consumed. Trophic levels describe the position of species in a food web from primary producers to apex predators. HTL depicts energy pathways from plant-based diets toward diets higher in meat and dairy consumption.	score [1-5]	Bonhommeau et al., 2013		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***MAI-Mediterranean Adequacy Index***	Ratio obtained by dividing the energy provided by typical Mediterranean food items by the energy provided by non-traditional Mediterranean foods.	score	Alberti-Fidanza et al., 1999; Bach-Faig et al., 2010		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***% of eco-friendly & organic food consumption***	Share of organic and eco-friendly food in the diet (Authors' note: either in kcal or expenditure).	%	CIHEAM/FAO, 2012		
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Consumer interest in ethical imports***	Imported fair-trade products relative to total expenditure for a selection of products (coffee, tea, bananas and chocolate/cocoa) to demonstrate the level of commitment that consumers give to ethically sourced products.	%	Defra (UK)		
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Nb of consumer organizations***	Number of consumer organizations that are active and present at a national level.	unit	CIHEAM/FAO, 2012		
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Nb of CDO, PDO, PGI***	Number of products with geographical indication or designation of origin.	unit	CIHEAM/FAO, 2012		
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Eco-Label awards***	Number of eco-label products. Eco–label is a voluntary certification scheme that is awarded to products and services with reduced environmental impacts.	unit	Eurostat		
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Integration of biodiversity considerations in business activity***	[under development] Two measures are proposed: a) Measuring the number of businesses with an Environmental or Sustainable Management System (EMS), and b) Measuring how widely the	unit	Defra (UK)		

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
				environment is considered in the supply chain of businesses and whether there is a formal process carried out to consider the environment.				
NORTH AMERICAN FOOD SECTOR - A ROADMAP FOR CITY FOOD SECTOR INNOVATION & INVESTMENT, Innovation Fund of the Urban Sustainability Directors Network (Changing Tastes, Wallace Center at Winrock International, 2013)		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number and/or percentage of each employed/unemployed within a given area/radius/commute distance from a food innovation (Living wage labor Semi-skilled labor Skilled labor SBA food technical assistance resources)***				Local city or county data SBA agencies US Census, BLS data	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number and/or percentage of each within job categories in each supply chain segment within a given area***	(Living wage labor Semi-skilled labor Skilled labor SBA food technical assistance resources)			Local city or county data SBA agencies US Census, BLS data	
		TRANSFORMING CATERING AND FOOD PROCUREMENT	***Wage profile: average daily/hourly wages by job category***				Local city or county data SBA agencies US Census, BLS data	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number (and possibly quality) of technical assistance providers***				Local city or county data SBA agencies US Census, BLS data	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number who would benefit from SBA technical assistance***				Local city or county data SBA agencies US Census, BLS data	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Community-based food organizations***				USDA Food Atlas and/or Food Desert database	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Neighbourhood food networks***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of Food access programs***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE	***Number of Food safety regulations***				Local city or county data and regulations	

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		PUBLIC and TRANSFORMING CATERING AND FOOD PROCUREMENT					Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number of Procurement protocols***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number of Distribution networks***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TRANSFORMING CATERING AND FOOD PROCUREMENT	***Number of Land use/zoning code***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Food policy councils***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Workforce development programs***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Number and/or percentage of population with access to healthy foods***				Local city or county data and regulations Local or regional non-profit directories or inventories USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Venture capital available during a given period***				Local city or county data USDA directories of food-related grants Directories of venture	

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							capitalists and foundations	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Property tax exemptions available during a given period***				Local city or county data USDA directories of food-related grants Directories of venture capitalists and foundations	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Property tax revenues available during a given period***				Local city or county data USDA directories of food-related grants Directories of venture capitalists and foundations	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Grants available during a given period***				Local city or county data USDA directories of food-related grants Directories of venture capitalists and foundations	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Amount of funding needed***				Local city or county data USDA directories of food-related grants Directories of venture capitalists and foundations	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Amount of revenues generated***				Local city or county data USDA directories of food-related grants Directories of venture capitalists and foundations	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Amount/proportion of local dollars generated/multiplier effects***				Local city or county data USDA directories of food-related grants Directories of venture capitalists and foundations	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of Community kitchens within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of Urban farms within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of Bake ovens within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH	***Number of Food banks within a given locale/community***				Local city or county data USDA Food Atlas and/or	

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		AND ACCESS TO AFFORDABLE HEALTHY FOOD					Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Farmers markets within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Processing facilities within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Supermarkets within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Small food stores within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Restaurants within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Number of Schools within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Colleges and universities within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Vacant facilities within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Transportation infrastructure within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Number of Mobile markets within a given locale/community***				Local city or county data USDA Food Atlas and/or Food Desert database	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Retail Environment Food Index***	(#fast food + #convenience stores)/(#supermarkets + # produce stores + #farmers markets) (compare communities with and without good access)			Local city or county data USDA Food Atlas and/or Food Desert database	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD	***Amount of and/or access to healthy natural assets***	(Such as: Vacant unimproved land, Soil health and tilth, Water for irrigation, Pollinators and their habitat, Preserved agricultural land)			Local city or county data Local or regional inventories of habitat, soil	

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		POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD					tilth, and wildlife (through non-profits including universities)	
CHARTING GROWTH TO GOOD FOOD DEVELOPING INDICATORS AND MEASURES OF GOOD FOOD - FINAL PROJECT REPORT APRIL 2009		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***US Death Rates: Diet-related Causes***	Death rates of diet-related diseases that are among the top causes of US mortality (heart disease, cancers, stroke, diabetes). While the top causes of mortality used to be infectious diseases and accidents, chronic diseases associated with diet have moved to the top of the list. In part, this is because people are living longer; but poor diets clearly play a role as well. A larger proportion of the population eating healthier foods should be reflected in lower death rates (deaths per 100,000 people) of diet-related disease.			National Vital Statistics Reports, Centers for Disease Control, National Center for Health Statistics for leading causes of death	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Prevalence of Overweight and Obesity: US Adults***	Rapidincreasesintheprevalenceofoverweightandobesityhaveledtoserio usconcernsinallindustrializedcountries,and increasingly in developing countries as well. Overweight and obesity are highly correlated with several diseases, and the individual and social costs of coping with and treating these diseases are large.			Centers for Disease Control, National Center for Health Statistics, National Health & Nutrition Examination Survey (NHANES; overweight and obesity incidence reported in 2-year periods, latest posted data 2003-4)	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Prevalence of Overweight: US Children and Adolescents***	Prevalence of children and adolescents aged 2-19 with sex-and age-specific BMI ≥ 95th percentile based on the CDC growth charts. The increase in childhood overweight is a serious public health concern because children who are overweight have a high likeli- hood of becoming obese or overweight adults, and having diet-related diseases. We separate childhood overweight from adult overweight because they are measured differently and have different consequences.			Centers for Disease Control, Center for Health Statistics, National Health and Nutrition Examination Survey	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***US Daily Consumption of Fruits and Vegetables***	Average fruit and vegetable consumption per day for people age 2 and older. Fruits and vegetables are the food category that is most under-consumed in the typical US diet. Fruits and vegetables provide essential nutrients, and their consumption is correlated with reduced risk of developing many diseases. Diets including a large proportion of fresh fruits and vegetables usually have lower overall caloric intake due to their higher water and fiber content, which appeases hunger.			Dietary guidelines for fruits and vegetables from USDHHS/USDA (2005)	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Incidence of Major Food-Borne Diseases***	Food-borne illnesses are a serious health problem, associated with many food categories (recent outbreaks have been traced to contaminated meat, spinach and peppers). New and more virulent pathogens are appearing, in part due to globalization. While other sources of food contamination, such as pesticide and hormone residues on food, are also of grave concern, microbial contamination has greater impacts in terms of loss of life, sickness and cost to society (the criteria we used to assess health impacts).			Source: Centers for Disease Control, FoodNet (Foodborne Diseases Active Surveillance Network), re- ported as preliminary data for 10 states in 2007 in Morbidity and Mortality Weekly Report (2008); cost to society of food contamination. Source: USDA, Economic Research Service, Foodborne Illness Cost Calculator	

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		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Incidence of Nonfatal Injuries and Illnesses for Food System Workers***	Reported workplace injuries and illnesses for farmworkers and for food-processing workers. Food system workers (e.g., people who work in food-processing plants, packing plants, fast-food restaurants and food retail) generally have higher hourly wages than fieldworkers, although annualized wages still tend to be below the poverty threshold (see Anderson, 2008). Viola- tions of workplace safety regulations are common in food production and processing, and means of recourse often do not exist or are inadequate.			Department of Labor, National Agricultural Workers Survey (see #1 above); Bureau of Labor Statistics	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Fatal Occupational Injuries: Farm and Food Processing Workers***	Reported workplace injuries and illnesses for farmworkers and for food-processing workers. Food system workers (e.g., people who work in food-processing plants, packing plants, fast-food restaurants and food retail) generally have higher hourly wages than fieldworkers, although annualized wages still tend to be below the poverty threshold (see Anderson, 2008). Viola- tions of workplace safety regulations are common in food production and processing, and means of recourse often do not exist or are inadequate.			Department of Labor, National Agricultural Workers Survey (see #1 above); Bureau of Labor Statistics	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Food Security Prevalence Rates***	Percentage of population that is food secure. If food were affordable we would expect to find little food insecurity because food in the US generally is available (although with some exceptions, such as in rural or urban areas without retail markets) and accessible (although with some exceptions, such as when transportation options are limited).			Current Population Survey, reported by Economic Research Service of USDA	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Childhood Food Security Prevalence Rates***	Percentage of children ages 0-17 that is food secure. Child food security tends to be higher than overall household food security because adults will forego meals to make sure that children eat (Nord 2003). We highlight child food insecurity in addition to household food insecurity because its impacts and solutions are different. It is especially insidious because it leads to poor school performance and perpetuation of the conditions later in life that created food insecurity for the child.			Current Population Survey, reported by Economic Research Service of USDA	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Enacted Child Obesity Policies***					
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC and TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Government Fresh Food Assistance Program Recipients***					
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Percentage change in the food section of the Consumer Price Index***	Percentage change in the food section of the Consumer Price Index relative to percentage change in average wages over the past 12 months. Households that are not in poverty can become food insecure easily if food costs rise too rapidly to allow them to budget for food expenditures, or if the cost of other necessities precludes being able to buy food. The Employment Cost Index allows tracking the percentage increase in the total value of wages, salaries and benefits.			increase in price of food from Bureau of Labor Statistics, Consumer Price Index Detailed Report Tables (CPI-U). Increase in average wages and salaries from Bureau of Labor Statistics, Employment Cost Index from the National Compensation Survey. Historical data (1999 and earlier) from	

Project	Sector	Themes/Link to sustainable urban food system strategies	*Key indicators*	Definition	Unit	Source	Data availability quality	Geographical scale and scope
							Employment Cost Indexes, 1975-99	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Number of farm-to-school programs.***	Farm-to-school programs help provide needed income to farmers and supplement school meals with fresh, local produce. In addition, farm-to-school programs often have opportunities for children to learn about farms, food production and the food system.			National Farm to School Program, Center for Food and Justice, Occidental College, and Community Food Security Coalition.	
		PROMOTING HEALTHY AND SUSTAINABLE FOOD TO THE PUBLIC	***Number of successful state initiatives to improve quality of foods available to children in schools.***	Public policy initiatives promoted by citizen action are encouraging indicators that the US public is concerned about diet-related health problems and willing to take action. There is strong interest in creating regulations at the state and local level to improve the likelihood that children, in particular, will make healthy food choices.			National Conference of State Legislatures "State Legislation on Childhood Obesity Options 2007". Also see the Centers for Disease Control Steps Program for examples of local and community initiatives.	
FARM TO PLATE STRATEGIC PLAN - A 10-YEAR STRATEGIC PLAN FOR VERMONT'S FOOD SYSTEM- Goals for Strengthening Vermont's Food System		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD and PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Estimates of Local Food Expenditures in Vermont***	Consumption of Vermont-produced food by Vermonters and regional consumers			Amount of money spent on food in Vermont (Economic Census) Value of food shipments into Vermont (Commodity Flow Survey) Food expenditures for households by quintile of income (Consumer Expenditure Survey) Direct sales (Census of Agriculture, NOFA Vermont) Annual food system marketing budgets for state agencies (multiple sources)	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Institutional Purchases (Minimum Estimates)***	Consumers in institutional settings (e.g., K-12 schools, colleges, state agency cafeterias, hospitals, prisons)			Number of Farm to School programs by area (Vermont farm to school network) Local food expenditures and total food expenditures at all educational institutions (multiple sources) Local food expenditures and total food expenditures at hospitals (multiple sources) Local food expenditures and total food expenditures at state institutions (multiple sources)	

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		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Overweight and Obese Adult Vermonters***				Adult obesity (# and %; Centers for Disease Control and Prevention) Childhood obesity (# and %; Centers for Disease Control and Prevention) Vermonters with diabetes (# and % of total; Vermont Department of Health) Farmers' markets accepting EBT cards (# of markets, % of all markets; NOFA Vermont) Fruit and vegetable consumption (# and %, Centers for Disease Control and Prevention)	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Public Gardens in Vermont***	The long-term goal of a truly secure food system in Vermont is to maximize the ability of all of residents to purchase or cultivate food for themselves whenever possible. Community food security programs seek to build capacity and infrastructure to enable individuals and communities to grow, access, and prepare fresh, nutritious foods for themselves in a long-term, sustainable manner.			Number of Farm to School programs (Vermont Farm to School Network; VAAFM) Number of community gardens (Vermont Community Garden Network) Healthy Retailers (# of retailers by location; Vermont Department of Health)	
			Vermont Manufacturing Establishments + Employment, 1997- 2012	Measuring the infrastructure and capacity of value-added food processing and manufacturing facilities.			Number and types of multi-purpose processing and manufacturing facilities (multiple sources) Number of employees at processing and manufacturing facilities (Department of Labor) Annual investment in processing and manufacturing facilities (Financing Crosscutting Team) Annual sales by type of processing and manufacturing facility (Economic Census)	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Estimates of Local Food Expenditures in Vermont***	Measuring the amount of locally produced and processed food available in local and regional retail outlets.			Local food expenditures as percentage of total food expenditures (multiple sources) Per capita direct sales (Census of Agriculture) Number of retail outlets carrying Vermont food products (multiple sources)	

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							Annual marketing budget for Vermont food products (multiple sources) Annual number of matchmaking events (VAAFM) Number of food producers and processors selling food in grocery stores (multiple sources)	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Percentage of Food Insecure Vermont Households***	Measuring the number of food insecure Vermonters and the access to healthy, affordable food for all Vermonters.			Food insecurity by region (# and %; USDA) Vermonters enrolled in supplemental assistance programs (e.g., federal Supplemental Nutrition Assistance Program [SNAP], formerly called Food Stamps) (Department for Children and Families) Number of Vermonters using emergency food system (DCF) Number of farmers' markets accepting EBT cards or Farm to Family coupons (NOFA Vermont, DCF) Gleaning and farm programs (# and acres of farms, type and weight of production, # of recipients, Vermont Foodbank) Number of community gardens (Vermont Community Garden Network) Number of participants in cooking or nutrition education classes (multiple sources) Number of Transition Towns that have food skills development classes or workshops (Transition Vermont)	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Learning Opportunities Available***	Measuring the educational resources for strengthening Vermont's food system.			Number of higher education courses and degree offerings focused on the food system (multiple sources) Number of graduates from food system–related higher	

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							education programs (multiple sources) Number of Farm to School programs (Vermont Farm to School Network) Number of food system research projects annually (UVM Food Spire, other educational institutions) Course offerings for food system–related occupations at Career and Technical Education Centers Number of short-term certificate and/or noncredit programs for adults to fill skill gaps in areas of food- related business management, direct marketing, and so on (multiple sources)	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Food System Employment***	Measuring the number of food system establishments and employees.			Food system employment (# and annual % change; multiple sources) Food system establishments (# and annual % change; multiple sources) Number of graduates from farm incubation programs who own their own farms (multiple sources) Number of graduates from Food Venture Center and similar programs who own their own businesses (VFVC)	
		TACKLING FOOD POVERTY, DIET-RELATED ILL HEALTH AND ACCESS TO AFFORDABLE HEALTHY FOOD	***Food System Wages***	Measuring the number of livable wage jobs in the food system and to increase workplace safety.			Median wage by food system enterprise compared to a Vermont livable wage (Vermont Joint Fiscal Office) Number of participants in Rural and Agricultural VocRehab (RAVR) and Farm Safety programs (UVM) Number of food system workplace injuries (Bureau of Labor Statistics, Department of Health) Worker's compensation rates by industry/category (insurance companies)	

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		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Types of Data Collected by Technical Assistance Providers***	Measuring the number of food system businesses using business planning and technical assistance services.			Annual referrals by type of business and stage of business development (Technical Assistance WG) Annual number of farms/businesses working with service providers (Technical Assistance WG) Outcomes by type of technical assistance provided (Technical Assistance WG) Annual funding of technical assistance organizations (survey) Revenue generated by fee for service (survey)	
		PROMOTING A VIBRANT AND DIVERSE SUSTAINABLE FOOD ECONOMY	***Food System Funding by Source of Capital***	Measuring the level of the investments in food system enterprises.			Annual food system funding by source of capital (multiple sources) Number of funding opportunities workshops and number of participants (Financing Cross-cutting Team) Annual allocation of Working Lands Enterprise Fund grants and loans and leveraged $ (WLEF, VAAFM) Number of first time borrowers from VEDA, Yankee Farm Credit, and the Farm Service Agency (multiple sources) Annual grants distributed to food system projects and organizations by Vermont Food Funders Network (Vermont Community Foundation)	
		BUILDING COMMUNITY FOOD KNOWLEDGE, SKILLS, RESOURCES AND PROJECTS	***Number of Farm to Plate Goals, Objectives, and Strategies Accomplished***	Measuring the coordination and communication among food system organizations.				