Future Earth KAN SSCP Working Group:

**Sustainable Consumption and Production in Cities**

SCOPING paper
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1. Introduction

1.1 About the scoping paper

Future Earth is a major international research platform providing the knowledge and support to accelerate transformations to a sustainable world. Future Earth has initiated a set of Knowledge-Action Networks (KANs) as part of a prime mechanism for delivering a research strategy.

This scoping paper of the Knowledge Action Network (KAN) on Systems of Sustainable Consumption and Production (SSCP) Working Group on “Sustainable Consumption and Production in Cities” presents a Research and Action agenda on “Sustainable Consumption and Production for Sustainable Cities”. It is one of currently five issue-focused Working Groups currently contributing to the KAN-SSCP.

This document intends to have the following functions:

1. (For the Working Group itself): to identify who we are; what our collective objectives are in terms of research and engagement; which projects we want to undertake in the near future; and how we see long-term objectives and developments.

2. To submit it to the Development Team of the Knowledge Action Network (KAN) on Systems of Sustainable Consumption and Production (SSCP) as our strategy and Working Plan, and to contribute to the KAN’s Research and Engagement Plan.

3. (For outsiders) to present this working group to potential new members, to potential collaborating institutions; and to the outside world.

4. To serve as a basis for a summary to be posted on the KAN SSCP website.

5. To serve as the basis for a working paper, to be published as part of a series of KAN SSCP working papers.

1.2 Problem statement

Our world is currently facing serious challenges. Human use of natural resources and associated environmental impacts affects basic ecosystem services as provisioning of food and water, nutrient cycling supported by biodiversity and climate change in a negative way, with unknown long-term consequences. Large amounts of resources will be needed for creating a decent life for a growing population in developing economies. Future pathways towards sustainable development on a global level involve many conflicting goals. As stated by the Brundtland Commission we have to take care of people today as well as of future generations1. This challenge cannot be solved by more intelligent solutions for use of resources alone, solutions that will have less environmental impacts, fair distribution

among people globally, and also save resources for future generations. In addition we also need changes in lifestyles and values, as pioneered by social innovation².

When discussing resources in this paper we mainly refer to land, energy, materials, food, and water. Of these, energy is the central resource which makes it possible to utilize the other resources for human needs like building infrastructures, supplying food and water. Available and affordable energy is prerequisite for combatting poverty in developing economies. The world economy today uses around 30% fewer resources to produce one Euro of GDP than 30 years ago³; however, overall resource use is still increasing mainly because of higher rates of consumption. The growing need for resources especially in emerging economies creates conflicts over resources which can be seen already today, for example land grabbing for urban development and displacement of farmer; and conflicts about scarce metals.

There are three important trends driving the future development of impacts and global needs for resources:

1. Growing population on the global scale
2. High urbanization rates
3. Higher affluence stimulating consumption of goods and services

These trends all point towards increasing needs for and impacts of resources on the global scale. To address these challenges now two important international agreements have been created. One is the Paris agreement⁴ with focus on emissions of GHGs, and the other one is the UN 2030 Agenda including the Sustainable Development Goals⁵ that include goals on Sustainable Cities and Communities (Goal 11) and on Responsible Production and Consumption (goal 12). However, to be successful these agreements should be implemented through more detailed goals on national and local levels in order to face the challenges and the conflicting goals. A global transition to SCP will require huge social and economic changes at different levels, most importantly in cities, as in these will be most of the population and affluence growth. The main local entity will be the city, so initiatives on the local level will be of central importance to change the current development towards increasing use of resources.

1.3 The importance of cities

Cities are increasingly emerging as focal points for transitions towards sustainability. More than half of the global population lives in cities and their numbers are increasing both relatively and absolutely. Cities are, and have always been, centres for technological, institutional and social innovations; cities are hubs for science, technology, arts, business, governments, experimentation and learning. They have been stressed by waves of migration and, especially in the global south, by the challenge to create jobs and livelihoods. Cities promise modern lifestyles and a better tomorrow which attracts young people from the countryside.

Most consumers live in cities; and urban consumption patterns and lifestyles are driven by technological and social innovations, fashions and styles. Already consumption is moving from products to services; most of these are provided locally within cities. It may be paradoxical that although urban lifestyles are often associated with high footprints, many (but not all) sustainable solutions and lifestyles

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³ http://www.resourcepanel.org/reports/assessing-global-resource-use
⁴ https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf; see p2: “….Also recognizing that sustainable lifestyles and sustainable patterns of consumption and production, with developed country Parties taking the lead, play an important role in addressing climate change, ....”
⁵ https://sustainabledevelopment.un.org/sdgs
are also pioneered in cities. Production and supply chains of consumer goods are also getting more complex and span the entire world, far beyond city boundaries.

There are important differences between cities in the global North and South. In the global North, especially in Japan and Europe, the population of many inner cities is shrinking because of gentrification, ageing of the population and changing demographics. Another reason for shrinking cities is the decline of the traditional manufacturing base, especially in the USA. In contrast, nearly all cities in the global South are growing fast because of migration from rural to urban areas, industrialization and jobs creation, and rationalization of agriculture with a steep decline of jobs outside cities. High population density, the poor state of the infrastructures, lack of affordable housing, emergence of slums, traffic congestion and air pollution are serious urban problems.

1.4 Drivers of increasing consumption

The increasing impacts concerning the environment and the use of resources have been traditionally and in a general form expressed in the I=PAT equation. This equation states that the environmental impacts (I) are proportional to population (P), Affluence (A), and Technology development (T). Population increase is taking place mainly in emerging economies. It has a huge effect on consumption and impacts. Under current conditions in the United States, for example, each child adds about 9441 metric tons of carbon dioxide to the carbon legacy of an average female, which is 5.7 times her lifetime emissions. However, affecting the birth rates involves serious moral and ethical aspects, but research shows that growing welfare and gender equity will slow down this increase.

At the same time, however, growing material welfare will result in higher Affluence. It appears that addressing the factor T alone (through technological innovation) is not sufficient to reduce the “I” sufficiently because of growing population and affluence as well as because of rebound effects and other unintended consequences of technological innovations; and thus we also need to problematize the growth of the factor Affluence. However, the existing urban sustainability literature tends to focus more on eco-efficient production of goods, the built environment, urban form and infrastructure to find solutions for reducing energy, emissions and materials demand, which is in line with the thinking of ecological modernization. For reasons sketched above this approach is problematic.

This leads to a conclusion that, from the systems perspective of sustainable consumption and production, equally important are consumption patterns and lifestyle choices of the people who live in

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This map is quite revealing, in Europe it’s the city centers which are shrinking, people are moving out into suburbs and surrounding areas because of gentrification. European cities are becoming more like US cities.


http://environment.yale.edu/gillingham/GillinghamRapsonWagner_Rebound.pdf


the city. Sizes of houses and apartments, motor vehicle ownership and mobility choices are partially influenced by urban form, but they are also influenced by cultural and socio-economic characteristics and social practices. Similarly, urban food choices and diets are influenced by the physical availability of food offered in supermarkets and restaurants, but even more so by culinary trends, social practices and cultural norms.

People are generally striving for a higher degree of well-being, one of the main motivations of moving to cities, but it appears that urban consumption and modern lifestyles are only partially fulfilling this desire. However, wellbeing is definitely not only determined by levels of wealth and affluence, there is growing evidence that social relations, mental and physical health, belonging to a community and living a good life with sufficient time off are also key to wellbeing.

Urban lifestyles are therefore increasingly important for the sustainability of current and future consumption and production systems. In the near and medium-term future, lifestyles in many cities are likely to be affected by ongoing secular stagnation\(^\text{13}\), the expanding labour-market informalization, increasing social vulnerability and inequalities, and further societal disembedding. We are likely to see during this timeframe the deepening of tendencies toward centralization and power asymmetries, the intensifying of complexity and speed, the accelerating accumulation of risks, and the expanding scope of ecological and social threats.

In particular cities in developing countries face multiple major challenges, including a rapid increase in urban populations with limited access to social services, burgeoning municipal waste generation, inefficient infrastructures and air pollution. Cities in developed countries also face huge challenges related to reducing resource and energy requirements and climate change, as well as social challenges related to deprived groups, shrinking populations, decreasing labour conditions, and withdrawal of the welfare state. Nevertheless, whereas citizens in developing countries are more concerned about getting a livelihood, in the developed countries the emphasis should be more on moderation of lifestyles and reducing resource and energy intensity of lifestyles.

At the same time, we can anticipate the emergence of opportunities brought about by more efficient provisioning and better access to goods and services and by “smart” consumption. Smart Cities\(^\text{14}\) has been a concept used in many different ways. Most commonly it is used for controlling of energy consumption by using smart products and different economic instruments, but it is increasingly used for solving societal socio-economic issues as well as new approaches to innovation and the sharing economy building on developments in ICT (though side-effects and negative impacts of this seem to be neglected). For instance, social media are more and more used as part of a sharing economy and can contribute to sustainable ways of sharing, but we need to realize that the most successful examples of the sharing economy are AirBnB and Uber, which are not sustainable at all.

Interestingly, there are some signs that new urban consumers in the Global South are “lifestyle leapfrogging”\(^\text{15}\), bypassing the high-impact urban lifestyles of consumers in Europe and the US, while also alternative more environmentally aware lifestyles, prosumer initiatives and local citizen initiatives are growing in size and numbers in cities in developed countries. We also see increasing opportunities

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\(^{13}\) Secular stagnation refers to “a condition of negligible or no economic growth in a market-based economy” (Wikipedia). In this context, the term secular is used in contrast to cyclical or short-term, and suggests a change of fundamental dynamics which would play out only in its own time.

\(^{14}\) [https://www.researchgate.net/publication/267038770_Smart_Cities_Definitions_Dimensions_Performance_and_Initiatives](https://www.researchgate.net/publication/267038770_Smart_Cities_Definitions_Dimensions_Performance_and_Initiatives)

for community building and organization and the emergence of strategically placed metropolises as innovation hubs.

2. Scope of Research and Main Research Question

2.1 Focus and Scope
The WG will focus on three interlinked issues relating to Systems of Sustainable Consumption and Production (SSCP) in the context of urbanization and cities—urban provisioning systems such as housing, transportation, food, and leisure; social inequality, and well-being. The WG will aim to build on existing research on urban sustainability, for instance recent reports such as the German WBGU report\textsuperscript{16} and the UNEP report on city-level decoupling\textsuperscript{17}, as well as on the United Nations Habitat resolution\textsuperscript{18} to provide new perspectives and possible solutions to reduce direct and indirect footprints of cities.

This scoping paper reflects our understanding of the multiple framings and dimensions that are currently used to understand current problems and issues in cities, especially in relation to sustainability, production and consumption; and of the dynamics of change government by multiple driving forces, experiments, and policies and strategies by a multitude of actors. It is still under development and reflects the WG’s unfolding understanding of the multiple issues that could be addressed through research and policy. It is organized along the three lines of research as proposed below.

2.2 Aims and objectives
The aim of this Working Group on SCP in Cities is to provide a SCP perspective on the challenges related to urban provisioning, equity, and wellbeing in cities; to expose the trade-offs between mutually desirable yet competing objectives related to the pursuit of sustainable urban provisioning, equity and wellbeing; to develop reflexive strategies to address these challenges; and to support actors, actions and development of policies aiming to achieve those systemic changes.

The objectives for fulfilling this aim are:

1. To identify and close knowledge gaps, formulate research questions and develop transformative and transdisciplinary research projects which contribute to improved understanding of urban sustainability transformations.

2. To engage in and support activities and experiments by stakeholders (business, civil society, academia, local governments) and citizens to address unsustainable consumption, production, and lifestyles, by analysing methods, activities, experiments, projects and their intended and unintended outcomes. This implies the important step of going from awareness to action. It thus includes action research and being involved in co-creation processes with users and other stakeholders; and to disseminate the results and policy relevance of engagement and evaluation activities.

2.3 Main research question
The main research question this WG aims to address is:

\textsuperscript{16} \url{http://www.wbgu.de/en/flagship-reports/fr-2016-urbanization/}
\textsuperscript{17} \url{http://www.resourcepanel.org/reports/city-level-decoupling}
\textsuperscript{18} \url{http://habitat3.org/wp-content/uploads/N1639668-English.pdf}
How can a transformation of SCP systems be conceptualized and achieved in cities through policies and citizens’ initiatives; and how can sustainable provisioning, greater equality and people’s well-being in urban areas be simultaneously pursued while minimising the trade-offs between these desirable objectives?

The WG will engage in overarching and systemic studies, addressing the present state and challenges, as well as required future transformations, through qualitative and quantitative research and collecting data, and also through a case-study approach to develop city case studies highlighting variety and commonalities among cities.

In particular, the WG aims to address the following aspects of unsustainable urbanization and associated SCP patterns and the opportunities for bringing about SCP in an urban context:

1. **Consumer culture and lifestyles**: In cities, higher income levels and a culture of consumerism lead to more material consumption and more waste. This includes the “nutrition transition” toward higher caloric and more processed food. These lifestyles are spreading worldwide, especially in urban centres and suburbs, and are major drivers for increasing material consumption levels and urban footprints.

2. **Increasing waste generation** and emissions to air and water are pressing concerns of many cities, especially in developing countries; deteriorating quality of urban environments has negative effects on health and well-being. Waste and pollution are often the result of inefficient management systems, uncoordinated industrial activity, and automobile-based mobility systems. These situations call for alternative models of provisioning with lower environmental impacts while enhancing local economic development, innovation and job creation. The overall challenge is to lower aggregate resource-consumption levels and waste generation of urban environments.

3. **Growing inequality within cities**, especially in relation to consumption and production patterns and unequal distribution of benefits and burdens through urban provisioning systems (including unequal access to services like healthcare and education) is a growing concern. This includes quantitative relationships between income levels, education levels, and age distribution and the ecological footprints in cities; as well as qualitative relationships and case studies.

We have identified the following possible solution directions to address these issues:

1. **Strengthening the relationships between well-being, bottom-up citizen-led community initiatives, sustainable lifestyles, sharing, and social innovations** to establish localized SSCP in urban contexts with the goal to decouple urban footprints from urban quality of life and to promote sufficiency. In this context social innovations like sharing and exchanges question the role and narratives of middle-class lifestyles. Sharing connects and cuts across consumption, waste management, cultures of ownership and property, and importantly production. Sharing is a socially constructive production-enabling practice as in the examples of tool libraries, makerspaces, co-working spaces, co-housing, shared equipment, pooled buying of supplies by enterprises, and all types of knowledge sharing through Open Access information and online resources, that always go along with these phenomena as well as manifesting independently. Other approaches and potential solutions include sustainable urban consumption practices, urban living labs, urban transition experiments, urban visions and how they relate to developments in urban provisioning and more sustainable consumption, social innovation in cities for sustainable lifestyles.
2. **Circular economy (CE) innovations** in urban contexts: Pollution from industrial manufacturing and municipal solid waste can be addressed through CE innovations in urban areas. CE innovations have the potential to create sustainable supply networks and provisioning systems and generate new employment opportunities. Repair businesses (or "repair cafes") and CE innovations for food waste are important elements of the CE in cities, which are linked to social innovation and community initiatives. In cities of the global South the role of the informal sector in urban provisioning systems, in particular regarding waste management and recycling, is significant. Acknowledging the role of the informal sector and livelihoods of marginalized groups such as waste pickers is important to develop alternative narratives regarding the circular economy, with the goal of creating inclusive circular economy practices in cities.

3. **Urban policies, governance mechanisms, and multi-stakeholder collaborations** that can address the tensions among conflicting issues and create synergies across solutions to address multiple problems are needed. This includes coordinating top-down policy and urban planning processes while enabling innovative citizen-led initiatives that steer sustainability transformations.

4. Increasing the role and contribution of big data, social media, the Internet of Things (IoT), and Artificial Intelligence (AI) in facilitating change towards SSCP. While big data and IoT can provide accurate data about resource flows to make provisioning systems more efficient or measure environmental data to provide users with information about potential health impacts, it is important to ensure that smart cities are not only smart, but also inclusive. Big data can enable fact-based decision making, but equally privacy concerns need to be considered. The challenge for utilizing big datasets are uneven quality and uncertainties in the data, and also lack of insight in causal relationships. The role of social media in enabling collaboration for community-based action and social innovation has been emphasized, and can also play an important role in communicating successful transition experiments.

5. Making explicit underlying and potentially conflicting normativities and values: the systemic approach to SSCP is an important framework that allows being adapted to various contexts and be made applicable in different cities and urban lifestyles.

6. Identifying patterns, mechanisms, benefits and implications of emerging good/better practices of SCP in cities: for this sectoral or domain-oriented approaches to local systems of provision and consumption can be used, and distinctions can be made between different lifestyles and consumption domains/sectors such as housing, food, energy, mobility, use of manufactured products, leisure and clothing.

### 2.4 Three lines of Research

Three major lines(streams) of research can be distinguished for the WG:

1. The current state, challenges, and foundations of SCP in an urban context, which includes what SCP in cities entails and how it relates to the transition to a circular economy and circular cities. Where are SCP in cities and circular cities aligned, and what are possible tensions and conflicts?

2. What are current best practices and how can these more widely diffused and promoted. This should include what can be learned from comparing best practices in developing countries and developed countries as well as how these best practices may benefit from each other and how this can be transferred between countries

3. Transformations to SCP in cities. This stream focuses on bringing about transitions to SCP in cities and how visions, scenarios and pathways can be developed and support the transformation process.
2.5 Sectoral approaches and systems of provision

Specific research questions and projects will be developed based on these cross-cutting topics linked to one or more of the three provisioning systems (or demand areas) of food, mobility, and housing:

1. **Housing** accounts for a major share of urban energy consumption\(^\text{19}\). Urban energy transitions will be to a large degree determined by their success in dramatically improving the energy efficiency of the building stock. High-performance buildings (PassivHaus for instance) are a socio-technical solution to this problem. What are the possibilities of applying PassivHaus design for cities where new construction is happening (e.g., enabling leapfrogging in building stock)? In terms of materials, housing is a growing factor in the accumulation of building material stock which need to be taken into account in the design of urban CE systems\(^\text{20}\). This issue is not only linked to reducing the energy demand of cities, but is closely linked to strategies aimed at making sustainable lifestyles easier through appropriate infrastructure and urban forms that enable well-being (e.g., community and family friendly urban forms).

   Another important issue is the size and occupancy of individual housing units. Sizes of houses and apartments have been increasing enormously in the last half-century, which offsets increases in efficiency. The solution lies in both a cultural change toward reduced symbolism of a large house as an expression of wealth and success and the availability of more sustainable housing stock. Changes in behavioural aspects, occupant behaviour and reduction in per capita floor space are important non-technical elements which determine the energy consumption of buildings. Design of neighbourhoods that foster well-being and strong communities are equally important.

2. **Food-provisioning systems**: Alternative systems are proliferating around the world and some of them provide innovative approaches to provisioning urban areas. Food systems expose key conflicts between local and bottom-up provisioning and large, integrated solutions. In particular, there are fundamental conflicts between dominant regimes of food production that have been historically focused on food security and food safety and small-scale efforts to produce, distribute, and share food resources while addressing issues of inequality and other alternative sustainability goals. There are also tensions emerging as alternative approaches and resources are being co-opted and commodified in the effort to “scale up” alternative models.

   Research in this area will investigate cases of both large-scale and alternative food provisioning to see how these tensions are playing out in practice. We will investigate different (and potentially conflicting?) sustainability implications, the utilization of new technologies (in particular nano-, bio-, and AI technology) within different movements, the question what “alternative” food practices mean in different contexts, and how dominant food regimes are accommodating (or not) alternative food provisioning and management practices. We will also look at which aspects of food provisioning and food waste seem to be the most promising from a sustainability perspective and most “ripe” for alternative approaches. Relatedly, what policies and other triggers are required to promote urban (food) solutions? Moreover, urban agriculture could possibly contribute to food security by addressing health problems, counter trends to processed foods, reduce transportation of food by emphasizing conservation, biodiversity, recreation, local identification, and social cohesion. There is also likely a role for urban

\(^{19}\) [http://metabolismofcities.org](http://metabolismofcities.org) ; [http://www.urbanmetabolism.org/](http://www.urbanmetabolism.org/)

gardening and other forms of intercultural and collective gardens. In addition, certain specific food-consumption practices such as meat consumption could be addressed.

It is surprising that the consumption of (red) meat, which is one of the most environmentally damaging foodstuffs, has not become the focus of worldwide change initiatives. Why is this so; and under what condition could that change?

3. **Transportation/urban mobility** involving walkable cities, inclusive transport infrastructure, car-sharing systems, and autonomous (electric) vehicles. In recent years, a lot of progress has been made to address mobility in urban areas. The main issue is to reduce the use of private automobiles in cities and beyond, without compromising access to mobility. Urban planning, transit-oriented development, increasing density, access to public transit, and bike infrastructure are getting more attention from many city planners and municipalities. Still, car mobility is hardly decreasing mainly due to low fuel prices and entrenched habits and the “automobile culture.” There is scope for an integrated approach which includes car companies (who should become sustainable mobility providers), fuel prices which should include a carbon tax to internalise the cost of greenhouse-gas emissions, but also communications and advertisements that aim at a cultural change toward shaming unnecessary automobile use and excessive size of vehicles. Furthermore, policies for sustainable urban mobility include congestion charges, low emission zones, limiting vehicle parking options and restrictions on access for private vehicles in city centres.

2.6 **Links and boundaries to other SSCP WGs and other FE KANs**
There are obvious overlaps between the SCP in Cities working group and the other SSCP KAN working groups. For instance, communicating for sustainable consumption and production is clearly a subject that is relevant for SCP in cities. Other WGs such as Social Change; and Macro-Economics and Political economy also have clear overlaps. The Working Group on Global Value Chains is complementary to the SCP in Cities working group because this WG focuses more on global supply chains that feed into cities.

The SSCP-KAN has clear connections to other Knowledge-Action Networks. The most obvious connection is with the Urban KAN, which has developed a systems approach to sustainable cities.

Other connections are with:
- Water-Energy-Food Nexus
- Transformations
- Sustainable Development Goals
- Health

When scoping papers from the other KANs have been developed it will be possible to investigate interactions, overlaps, and gaps between the KANs.

3. **Current state of problem areas and indicators for change**
In order to deepen the research question it is important to describe the problem areas and challenges in more detail. This is developed below.

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21 [http://futureearth.org/future-earth-urban](http://futureearth.org/future-earth-urban)
3.1 Urban metabolism, material flows and the food-water-energy nexus

Urban metabolism has emerged as a leading methodology for quantifying energy consumption and use patterns in urban environments\textsuperscript{23}. It can show the nature of energy generated, transmitted into, and consumed in cities, including the amount of renewables; the amount of greenhouse gas emissions generated; and the categories of energy end use. Traditional urban metabolism approaches can be expanded to incorporate socioeconomic analysis, policy analysis, and additional quantitative methodologies such as life cycle analysis.\textsuperscript{24} Such an integrated approach is required to assess the role of sustainable consumption and production practices. Material flow analysis (MFA) and Input/Output (I/O) accounting are examples of useful tools for understanding the energy and material metabolism of a city and its per capita distribution across its resident population. More studies that link that urban metabolism to the associated consumer demands on nature’s services using ecological footprint analysis are needed\textsuperscript{25}.

Urban metabolism is an example of a complex process that cannot be expressed in linear and deterministic terms, but more in system-dynamic ways. An alternative idea of handling the problem is to use large sets of data using black-box modelling (Big Data). However, the problem with this approach is low data quality and a lack of understanding of causal relationships.

The relationship between the energy-water-food-pollutant nexuses is close and complicated. The production and consumption of energy, water and food leads to huge amounts of pollution. It is necessary and important to figure out this nexus at the city level and find the feasible path which can maximize the conservation of energy-water-food while minimize pollution. The main research points are as follows:

1. Accounting of energy-water-food nexus\textsuperscript{26} on the city level. Accounting model selection; determine the relationship among energy subsystems, water subsystems and food subsystems from the urban level.
2. Accounting of pollution emissions related with the energy-water-food system. Determine the pollution emission pathway and emission amount of energy, water and food subsystems.
3. Constraining factors affecting the energy-water-food system in different cities; this dimension encompasses the materials flowing into and out of the city; and the processes of transformation into consumer goods and infrastructure; recycling, and generation and processing of waste.

The provisioning systems of food and drinks, transport and housing are consistently, across countries and cities, the most important impact areas – across different studies and different impact categories compared (global warming, acidification, photochemical ozone formation, and eutrophication). In the EU together they account for 70 to 80 per cent of the entire life cycle impact of products.\textsuperscript{27}

\textsuperscript{23} https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5055480/
\textsuperscript{24} http://www.sciencedirect.com/science/article/pii/S0169204612001922
\textsuperscript{25} http://www.sciencedirect.com/science/article/pii/S0921800906005933
\textsuperscript{26} https://dspace.stir.ac.uk/bitstream/1893/7616/1/Turner%20et%20al%20Ecological%20Economics%202007_Turner%20final%20version.pdf
3.2 Sustainability indicators to track trends and changes

Currently, around half of the world’s population lives in cities and this share is expected to increase to 70% in 2050. Thus, in 35 years, more than 2/3 of the environmental impacts caused by the use of final consumer goods and investment in infrastructure will be directly related to how people live, produce and consume in cities, and how this city infrastructure is organized. It is hence essential to develop indicators for social, economic and environmental performance of cities.

3.2.1 Energy and other resources

The need for resources like materials, water, food is steadily increasing which is reflected in larger ecological footprints. At the same time ecosystems services are degraded so that the biocapacities are shrinking. This has partly led to “land-grabbing” causing increasing conflicts. The central resource for the urban metabolism is energy. Analysis of main statistical sources for energy shows that:

- Overall Global Energy Demand (all sources) by 2030/2035 will be 35-50% greater than present
- Electricity demand will be 80% higher in 2040 as compared with 2010
- Wind, wave, tidal, solar, biomass will still only account for only 4% of the overall global energy mix by 2030 despite the aspirations of many politicians and legislators
- Alternatives/ renewables are limited by viability, scalability, suitability and low returns on investment as compared to fossil fuels (IBM)

3.2.2 Environmental performance

Environmental-economic accounting methods that support analysing the ‘urban metabolism’ have been an important area of sustainability research in the past few years. However, these existing methodological approaches are not yet standardised and often require a large amount of data, emphasising the need for developing consistent and broadly implementable methods across urban areas world-wide.

Another point is that cities, even more than countries, now are embedded in global value networks and hence make use of a considerable ‘hinterland’ where resources are extracted and substances are emitted satisfying their final consumption. It is hence essential to use consumption based accounting methods to understand the environmental footprint of consumption and production activities in cities. Typical indicators for consideration are the carbon, material, water and land footprint of consumption (materials, water and land if desired taking into account weights for e.g. water scarcity in the region where water is extracted or biodiversity value of land). Approaches measuring such footprints and metabolisms may include:

a) Creating a picture of the city metabolism using e.g. city level economic statistics in combination with Life cycle inventory databases, and primary data on energy and water use. This gives information on resource inputs and waste outputs in that region and options for closing loops.

b) Linking such data, plus expenditure data of consumers in these cities, with global input output databases allowing for estimating footprints.

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28 [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5055480/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5055480/)
29 See also online portals such as: [http://metabolismofcities.org](http://metabolismofcities.org); [http://www.urbanmetabolism.org/](http://www.urbanmetabolism.org/)
3.2.3 Economic performance
According to estimates by McKinsey, 600 cities will account for nearly 65 percent of global GDP growth by 2025\textsuperscript{31}, making them major players in production and consumption systems. Via similar tools as indicated above, the economic performance of cities can be measured. It concerns for instance value added created, jobs created and maintained, household incomes, both at city level itself as in the value chains that are controlled by a city.\textsuperscript{32}

Commonly used indicators for economic performance of cities includes business stock and dynamics (the overall number of businesses in a city and the rates at which businesses are starting up and closing), productivity and innovation, employment rates and skills\textsuperscript{33}. Other aspects of the economic performance of a city would include the type of businesses a city has.

During the last decades on the 20\textsuperscript{th} century, many cities and major conurbations in the US and Europe experienced deindustrialization which was accompanies by a shift to service based urban economies, with an increasing importance of cultural industries, rapid growth of professional and business services and financialisation of urban economies.\textsuperscript{34} In Asian and many other developing country cities, indicators such as construction of infrastructure and residential and commercial buildings are important measures of a city’s economic performance.

3.2.4 Social performance
In sustainable urban development projects, the social aspects have become more important from a situation when environmental factors where in focus. Social performance can be expressed in factors like:

I. **Health and well-being.** Creating conditions for good health and well-being for people is a key issue for sustainable social development. Public health is influenced by everything from individuals' own choices and living habits to structural factors such as external environments and democratic rights.

II. **Equality, equality and social cohesion.** It is important to create conditions for equality, gender equality and social cohesion with respect for human freedom and opportunities, in particular the right to a good standard of living at reasonable prices.

III. **Participation and influence.** Lack of opportunity to influence living conditions has a connection with health. Therefore, participation and influence are a fundamental prerequisite and should apply to all with regard to gender, gender identity or expression, ethnicity, religion or other beliefs, function variation, sexual orientation or age.

IV. **Safe and secure living environment.** Today, many people experience a sense of insecurity when they are staying in public space, especially in the evenings and nights. Sustainable urban development includes the design of a safe and secure living environment where residents, residents and visitors can stay on equal terms.

4. Transformations and systemic changes

\textsuperscript{32} https://www.mckinsey.com/global-themes/urbanization/urban-world-mapping-the-economic-power-of-cities
\textsuperscript{33} http://www.centreforcities.org/reader/cities-outlook-2016/city-monitor-the-latest-data/
4.1 Institutional frameworks and governance

Efforts to drive a transformation towards urban sustainability, especially in terms of lifestyles and consumption behaviours, requires more than just development of appropriate infrastructures. It also necessitates institutional change – namely a change of norms, rules, laws, cognitive frames, policies and governance systems that shape actors’ way of viewing and thinking about the world. In turn, institutions and their change are shaped by a variety of different actors. In the urban sustainability space, new actors are emerging, including from civil society and community groups, businesses, academia, and governments at municipal and even national levels.

One key question is how these different actors, many of whom have very specific areas of interest or particular goals (i.e. gender equality, housing, sustainable transportation, biodiversity conservation) are able to collaborate to collectively drive institutional change processes. This is a fundamental issue, because improvements in one domain may compete with those in other domains. For example, improvements in infrastructure and services, while fostering well-being and better provision, lead to gentrification and growing inequality. In another example, increasing density may reduce energy consumption but may negatively affect well-being.

Furthermore, actors are embedded in multi-level systems, which can create both challenges and opportunities for institutional change. Many actors emerging at the city level are challenging the dominant incumbents, especially those who are more nationally or internationally connected. For example, there are cases of conflicts between city and national governments in terms of policies that would improve local sustainable consumption on the one hand, versus national priorities on the other (for example, London’s move towards local waste to power provision, in opposition to the UK’s larger policy incentives for biomass-based energy that requires imports of wood pellets from the USA).

Similarly, many city level activities involve local, often small-scale firms that challenge the practices of incumbent multinational enterprises (MNCs). Examples include local (often small scale) firms engaged with local production, local farmers markets, box schemes etc., from which MNC’s are often absent and which can challenge dominant trends towards integrated, globally connected and standardized supply chains. Similarly, while local universities can heighten their social impact by engaging with local initiatives of change they usually create conflicts with national and global standards of excellence in doing so. There are also issues that arise between local civil society actors (NGO’s, neighbourhood groups), and NGO’s that operate at the international, incumbent level.

Looking at these conflicts more closely we often find competing normative goals framed by different institutional logics. In the food sector, for example, local initiatives tend to focus on goals such as human and animal wellbeing, sufficiency, emancipation or participation whereas the incumbents focus more on aspects such as eco-efficiency, safety or independence.
framed by logics of precaution, deliberation, family ties or non-profit community organizations the latter operate within logics of global capitalist markets and (technological) progress. As urban sustainability is still an emerging field, the literature would lead us to expect this kind of contestation. However, more work is urgently needed on the dynamic patterns of such complexities, including the role of actors in intensifying or de-intensifying them.45

The complexity of institutional change is further amplified by the differences across geographical contexts. Specific actors and their embedment into different structures of power and competing institutional logics are all crucially shaped by local context. As such we need to understand institutional dynamics not only on an overall global but also specific contextual level. Historically, both scaling up and scaling ‘out’ of effective sustainability solutions has proven challenging.46

4.2 Learning as a form of replication and upscaling of small scale initiatives
The urban environment provides many opportunities to undertake small-scale initiatives that experiment with more sustainable social organization and lifestyles. However, from the broader perspective of social change such small-scale initiatives are viewed as having a rather limited power because they are very hard to replicate in new contexts or to scale up without losing innovative radical edge. A more optimistic perspective views small-scale initiative as incubators of innovations which will become engines of change when a window of opportunity opens up. The opportunity may come in various forms, for example a large-scale political movement, major technological breakthroughs, environmental and population pressures, and others.

Sociologist Eric Olin Wright reflects this view of small scale initiatives from the perspectives of political power and socio-economic processes.47 Wright sees great value in novel modes of social organization in the fractures of the dominant system, in niches where they do not seem to pose any immediate threat to dominant classes and institutions. While leaders of these small-scale activities do not usually regard their interventions as being focused on undermining the larger system they deliberately work to build new organizational forms and social relations. Such “interstitial” processes have, according to Wright, historically played a central role in large scale social change, including the capitalist forms of economic activity developing within the feudal society.

Wright’s theory of social change through small scale interstitial processes is in several respects closely related to the so-called multi-level perspective (MLP) on sociotechnical transitions.48 In that framework, small scale initiatives with new technologies and socio-technical systems incubate for long periods of time (years and decades) in niches; and when the opportunity presents itself through changes in the landscape and through growing tensions in the incumbent dominant socio-technical system the niche technology and system diffuses upward and eventually replaces – in an appropriately adapted form – the incumbent dominant system. The literature offers many retrospective case studies of such

niche-to-regime transitions as well as principles on the factors conducive to such transitions. The MLP complements the Wright’s formulation by stressing the importance of technology in producing social change and by pointing out how technical know-how, culture and institutions co-evolve. On the other hand, it essentially implies that small scale initiatives must compete with each other in their effort to grow when a window of opportunity opens up; and disregards the potential synergistic relationships among niches. Both frameworks moreover do not directly address the possible mechanisms of replication and upscaling, or the short and long-term impacts of the inevitable contestation among social actors. The interstitial and MLP frameworks also are less helpful in explaining change in dominant culture – for example, a shift toward less consumerist lifestyles – than they are with regard to political, institutional and technological breakthroughs.

We propose that viewing small scale experiments from a perspective of higher order learning effectively addresses these shortcomings. More specifically, we argue that higher order learning among participants, and its diffusion beyond the boundaries of individual initiative, are the essence of replication and upscaling and the critical vehicle for affecting social change through small scale initiatives.

Higher order learning is a radical change in interpreting observations (interpretive frames) and in solving problems and advancing objectives. (see also “...competing normative goals framed by different institutional logics” in the previous section). The term “higher order” denotes what in organizational sciences has been dubbed “double loop”, or “generative” learning, and in policy sciences as “conceptual” learning. It entails changes in the assumptions, norms and interpretive frames which govern the decision-making process and actions of individuals, communities and organizations, or which underlie a policy discourse. Higher order/double loop/generative/conceptual learning contrasts with lower order/single loop/adaptive/technical learning, respectively, in which problems are corrected or policies and procedures altered without changes in problem definition, interpretive frames or in norms and values.

Learning occurs through a feedback-stimulus mechanism, when the existing, well accepted, time-tested and trusted interpretive frames and competences receive feedback on their performance in solving a problem or advancing specific objectives. If, as a result of this feedback, it becomes apparent that the desired results are not forthcoming, these cognitive constructs become subject to reassessment and, if necessary, are replaced with new ones. A sense of urgency is an important facilitator of learning because it forces repeated trying (and failing) that is central to the learning process. This broad concept of feedback-stimulus is consistent across a wide range of disciplinary writings about learning, from cognitive sciences to organizational sciences to policy sciences. In previous publications we introduced the concept of Bounded Socio-technical Experiments, BSTEs, and showed that multistake-

holder interactions around solving a specific problem or reaching an objective provide fertile grounds for higher order learning.\textsuperscript{55, 56}

We contend that when the individuals, collectives, and institutions participating in a small scale initiative re-frame their problem definitions and interpretive frames they (or others in their network who come in contact with these ideas) are then enabled to initiate further initiatives in very different contexts, for which adaptation will mostly require the much easier technical learning. This kind of diffusion of interpretive frames and problem definitions is also more likely to diffuse vertically onto a larger scale. Finally, the small scale initiatives may find support from and commonality with other possibly very different small scale initiatives with, however, similar interpretive frames and/or problem definitions. It is through these mechanisms that small scale initiatives are most likely to contribute to replication and upscaling that are necessary for social change. For that reason, the research agenda around small scale initiatives in urban setting must focus on the learning processes and their diffusion.

4.3 The role of visions, scenarios and participatory visioning processes

Much attention in the KAN on SSCP is given to good practices of sustainable consumption in cities, often in combination with local production (e.g. urban gardening and urban agriculture), and how to diffuse and upscale those. However, there are also good reasons to take a more systemic and long-term perspective to sustainable consumption or SCP in an urban context. Bringing about SCP in urban settings requires profound systemic changes and transitions of current cities and SCP patterns in those cities, which are currently heavily locked into practices with high environmental impacts. Examples are the take-make-waste paradigm of the linear economy and the vested interests of existing players in the current global value chains, which are driven by a focus on lowering prices, enhancing the volume of consumption and seeking profit.

Taking a long-term and systemic perspective on SCP in an urban context calls for adequate methods to develop long term perspectives. There is a range of scenario methods like visioning\textsuperscript{57}, backcasting\textsuperscript{58}, transition management/governance\textsuperscript{59} and other advanced scenario methods\textsuperscript{60}. Participatory approaches such as involving stakeholders and citizens in visioning and scenario exercises can be seen as part of the KAN’s action pillar and could lead to processes of co-creation and co-production, facilitating learning and awareness raising among stakeholders and meeting rising calls for participatory openings of dominant decision making processes. Different varieties of backcasting\textsuperscript{61, 62} as


\textsuperscript{60} Börjeson L, Höjer M, Dreborg KH, Ekvall T, Finnveden G (2006) Scenario types and techniques: towards a user’s guide, Futures 38(7): 723-739.

well as transition management provide good methodological frameworks for such visioning exercises, which in their participatory versions could also contribute to commitment and endorsement among those involved. Interestingly, both in participatory backcasting and transition management there is emerging interest in consumption, lifestyles, communities and the local level. Methods are needed to assess those visions and scenarios, as well as to evaluate their impacts and spin-off.

Both backcasting and transition management have been criticized for focusing more on new (sustainable) technological options and neglecting the economic aspects of systems and changes. However, recently first attempts have been made to distinguish systematically between a green growth context and a sufficiency or de-growth context; and how sustainable consumption and sustainable lifestyles could look like. This can be seen as bringing a future society within the system under study, without making the economic structure an internal variable, but rather a dependent or change variable. This distinction between green growth and degrowth is especially relevant for cities in the developed world, whereas for developing countries it definitively needs to include equity and development.

Current good practices can be used as sources of inspiration for developing visions, and it is interesting to note that visions and scenarios can also give us a better understanding of what the benefits, implications and conditions of upscaling good practices could be, which may have significant policy relevance. Visions, visioning and vision assessment have also potential to create linkages to other WGs in the KAN on SSCP, in particular with the WG on social change and the WG on macro-economics.

5 More challenges connected to urban development and SCP

The rapid growth of cities creates new types of challenges. A slow development in line with economic growth and within environmental acceptable boundaries is the best solution for creating liveable cities for all. However, today’s growth of urban areas is often chaotic and exceeds local capacities for planning. This is especially valid for emerging economies. One of the fastest growing economies with a successful track record for poverty reduction is China. However, it is more and more obvious that China’s focus on economic growth has created problems when it comes to environmental degradation and social equity. It is therefore important to discuss if there are role models which can be used for emerging economies.


5.1 Shrinking cities in the global North

Research questions about shrinking cities offers valuable opportunities for examining questions at the heart of sustainable consumption and production research. Has urban shrinkage led to absolute reductions in material use and environmental impacts? Can shrinking cities provide for residents’ well-being without relying on economic growth? How can degrowth, or a ‘depopulation dividend’ be realized at the municipal level? What are the roles for metropolitan cities and middle-sized cities and the connection to rural areas? How can the green infrastructure implementation gap be overcome? How can ecological gentrification be avoided to make sustainable transitions equitable?

Shrinking cities represent a vital topic of study for sustainable production and consumption research, because they provide a window into a world without economic growth. In the global North, three major patterns of shrinkage have been identified in the literature. Among these, urban shrinkage as a result of economic stagnation or contraction has received the most attention. When a major factory closes or a whole industry declines (e.g., automobile production in Detroit), employment opportunities disappear. If this occurs in a country with economically growing regions elsewhere, cities in question experience a fall in population due to out-migration. As the second major pattern, similar out-migration has also been observed after large-scale political changes such as the collapse of socialist regimes in Europe (e.g., post-1989 Leipzig). Economic factors (closing of state-owned factories) coincide with sudden mobility (e.g., fall of the inner-German border), allowing residents to migrate to growing cities. The third pattern can be found in shrinking cities in countries with a falling total population (e.g., Japan), where the advancing age of residents as a demographic factor drives the decline in population.

Cities shrinking through economic, political, and demographic causes share both challenges and opportunities in provisioning and well-being. An eroding tax base represents a daunting financial hurdle in transitioning towards sustainability and adapting to climate change by overhauling grey, green and blue infrastructure. Yet the departure from the standard growth model of development also represents a chance for planners, decision-makers and residents to rethink their vision for the city. Substantial research has explored the potential of vacant land in its many forms to provide better green infrastructure and ecosystem services and redesign of the built infrastructure and thereby improve overall well-being.

5.2 Rapidly urbanizing cities in China

The flow of people from villages to cities in China since 1978 might be the greatest human-resettlement in the nation’s history. By 2016, 57.4% of the nation’s population dwelled in cities and towns (657 cities in China in 2016). In March of 2014, the government released the National New-type Urbanization Plan,

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**References**

which sets targets for China’s urban population fraction to rise by 1% a year to reach 60% by 2020. If the current trend holds, China’s urban population could top 1 billion people in the next two decades.

It might be fair to conclude that the rapid urbanization in past four decades in China is mainly a government-driven project, not paying sufficient respect to ecological rules, market rules, historic/cultural value and people’s needs. Administrative measures, such as household registration systems, land administration system, urban planning approaches, have caused misallocation of production elements, uneven and insufficient public services, low efficiency, ecological dysfunctionality of urban ecological systems, social conflicts, etc.

Since the beginning of the 21st century, increasing studies on the concept and approaches of city regeneration in China emphasized that constructions should be integrated into overall development of a complex urban eco-system and should strive for coordinating multiple objectives\(^{74}\), \(^{75}\). Nature-based solutions (NBS), broadly defined as the use of nature and ecological functions to address societal challenges, is a traditional but lost concept and set of practices for city planning and development in China. In urban areas, NBS are receiving increasing attention to tackle issues such as climate change adaptation and mitigation, population health, food security, and natural disasters. NBS in cities include, for example, green areas and corridors, ponds for phytoremediation, sustainable urban drainage systems, green roofs and walls, interventions to reduce soil sealing and to increase ventilation. Evidence is needed to improve our understanding of the range of economic, social, and environmental benefits provided by NBS in urban areas, as well as to promote their inclusion in urban planning and decision-making processes.

Although NBS and city regeneration have been framed in different ways, it is now high time to revitalize NBS to cope with all kinds of city diseases we face nowadays. At practice level, there are also many good and innovative practices with NBS in China, like ecological infrastructure, smart provisioning systems for food, energy and transportation, and community-based civic ecology. The Plan sets numerical goals (see ‘Government targets’) and as a guiding principle emphasizes a sustainable and people-cantered approach, paying more attention to welfare and well-being — a significant and positive shift from the current economic focus on land development. It also aims to rectify existing problems associated with the rapid urbanization in the past three decades.

Thus we propose to investigate further and promote NBSs as a strategy for sustainable city development, regeneration and transformation in China, in the era of New Normal and New Urbanization\(^{76}\).

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\(^{75}\) Bai et al., Realizing China’s urban dream. Nature 156, Vol 509 (2014)
\(^{76}\) Objectives and activities:

1. To understand how NBS is framed/interpreted and adopted by city planners, managers and other stakeholders in China.
   - Review and mapping existing NBS practices in Chinese cities
   - Conduct in-depth case studies in selected cities
2. To identify the opportunities and barriers for wider adoption of NBS by Chinese cities.
   - Review the national level institutional contexts for NBS
   - Identify needs, drives and concerns of cities via questionnaire survey
3. To develop practical approaches with selected cities to demonstrate co-benefits of NBSs.
   - To intervene at different stages of NBS in selected cities
   - To build local capacity via information exchanges, study tours and training
   - To monitor and evaluate co-benefits of established NBS
   - To develop guideline for cities to incorporate NBS in city development
4. To support dissemination of lessons and experiences to other cities in China and capacity building.
   - To development database of NBS practices in Chinese language
5.3 Equity Considerations in urban provisioning systems

It is estimated that by 2050, 4 out of 5 people around the world could be living in cities and towns. This rate of urbanization is unprecedented, and presents numerous challenges for urban provisioning systems. In particular, how can we ensure that sustainable consumption is realized by all, and what are the equity considerations?

UN-Habitat has proposed a New Urban Agenda\textsuperscript{77} that seeks to provide opportunities to answer these questions. Combined with the Sustainable Development Goals and Paris Climate Accords, the field of sustainable consumption has important criteria and metrics to apply.

Research and case studies can provide critical answers to these and other questions. In collaboration with The Next City\textsuperscript{78} we will collect features, news posts and op-eds, as well as Just Cities\textsuperscript{79} to raise critical questions for researchers and policy-makers, as well as point to possible areas for further investigation to advance common goals.

6 Research questions – elaboration

Following the main research question articulated in section 2 the research coordinated by this Working Group will combine qualitative social science approaches with quantitative methods such as material flows analysis and urban metabolism. In addition, existing case studies in the literature cited here will be evaluated and possibly enhanced from a SSCP perspective by focusing on the following clusters of research questions (as examples, not exhaustive):

1. Sustainable lifestyles in cities:
   - What constitutes sustainable lifestyles in cities (dematerialized, density, communality, efficiency and sufficiency)?
   - What are promising social innovations? How can they be supported? What role could researchers play in supporting and studying these innovations through action research?
   - What are conditions for success (strong sustainability vision from the top, supportive policies, conditions for bottom-up experiments, integration with other policies like local economic development)?
   - What are structural, institutional, and cultural impediments (e.g., dominant culture and advertising, infrastructure, economic incentives, competitiveness, wider economy and governance, globalization)?
   - What are interesting practices/case studies of SCP in cities, what can be learned from them and what are potentials for replication and/or scaling up? How can they better be communicated?

2. Transitions to sustainability

\textsuperscript{77}http://habitat3.org/the-new-urban-agenda/
\textsuperscript{78}https://nextcity.org/
\textsuperscript{79}https://nextcity.org/features/view/just-city-essys-toni-griffin-theaster-gates-angela-glover-blackwell
3. Communicating sustainable consumption in cities
   - What are the different narratives and approaches of SCP, the circular economy and the low-carbon economy and sustainable cities? How can they mutually reinforce each other?
   - What is the role of the circular economy practices for sustainable cities and lifestyles?

4. Megatrends
   - How does SCP in cities relate to other megatrends in the labour market, informatization and climate change?
   - What are the implications of current change processes (e.g. disappearing of potentially sustainable practices such as traditional housing, home cooking, etc)?
   - How do these implications meet (competing) normative goals?
   - How can emerging disruptive digital technologies, such as autonomous vehicles and platform-based economic exchanges be harnessed toward more SCP?
   - What is the future of work and community in future cities, and how will it affect material consumption levels and provisioning systems?

5. Policy and governance
   - What types of policies and steering processes on municipal level are required; and how can they minimize trade-offs among mutually desirable solutions?
   - What types of policies on a higher order political level are required?
   - How can the gap between research and practitioners be decreased?

7 Overview of most relevant actors

7.1 Organizations representing cities
   There are many cities and organizations representing cities that have programs and policies aiming at sustainability; much less so focusing on sustainable consumption. Most important are ICLEI, C40 Cities, 100 Resilient Cities, the USA Sustainable Cities Initiative, and the Bloomberg Mayors Challenge. The world’s largest urban conference, Habitat III, featured open registration to enable broad participation from a range of urban actors, and created the New Urban Agenda.

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80 http://www.iclei.org/
81 http://www.c40.org/
82 http://action.100resilientcities.org/page/s/join-the-global-resilience-movement#/ /
84 http://mayorschallenge.bloomberg.org/
85 http://habitat3.org/the-new-urban-agenda/
One of the few initiatives from cities specifically focusing on sustainable consumption has been from the US-based Urban Sustainability Directors Network (USDN). Jointly with SCORAI they created the Eugene Memorandum\(^{86}\) and a Toolkit for Sustainable Consumption\(^{87}\) aimed at City policy makers.

While these initiatives have received a fair bit of attention, they do still skew towards the global north, and their degree of impact remains limited\(^{88}\). This may be partially due to several factors. First, many of these cross-city programs are voluntary or about sharing of practices, and as such, their exact outcomes may be difficult to quantify. Secondly, cities do have limitations in terms their control over powerful incumbent actors and particular policy elements, such as infrastructure spending, land use policy, taxation, and other tools that may be required to support institutional change initiatives.

7.2 Relevant Research Centres

In this working group several research institutes on SCP in cities are collaborating. It is the aim of the WG to identify and contact other research institutions that are interested in supporting and developing this research agenda, and in collaborating to advance further research.

7.3 Relevant NGOs

In the Working group several NGOs are already represented, such as Next City\(^{89}\) and Shareable\(^{90}\). The working groups aims to identify and contact other NGOs that are interested in advancing this research and engagement agenda, to collaborate with researchers in action research, and to help to collect and access data.

8. Action and Policy; communication

- Blog, listserve, website: under consideration
- Approach Network of Mayors: under consideration
- IPCC Cities and Climate Change Science Conference, Edmonton, Canada, March 5-7, 2018
  [https://www.ipcc.ch/meetings/cities/](https://www.ipcc.ch/meetings/cities/) Panel accepted on “Climate Change and the End of Consumer Society” submitted by SCORAI members\(^{91}\)


\(^{87}\) [http://sustainableconsumption.usdn.org/](http://sustainableconsumption.usdn.org/)


\(^{89}\) [https://nextcity.org/](https://nextcity.org/)

\(^{90}\) [https://www.shareable.net/](https://www.shareable.net/)

\(^{91}\) Urban planners, climate policy makers, and others are beginning to recognize the need to urgently achieve significant absolute reductions in energy and material consumption to avoid the already palpable risks of dangerous climate and related ecological change. Given the role that cities play as crucibles for consumerist lifestyles, communities in both the global North and South will need to implement measures that go beyond customary emphases on “smart cities,” “greening” the economy, resource efficiency, renewable energy, and technological innovation. These types of interventions tend to be politically palatable but typically generate perverse rebound effects and have other untoward impacts. They also do not account for the dissimilar throughput volumes associated with different lifestyles and income levels as well as the effects that technological changes have on production-consumption systems. In addition, cities are manifestly reliant on precarious supply chains for daily delivery of goods and vast hinterlands for the appropriation of energy and disposal of waste byproducts. These circumstances
• SCORAI Conference June 2018, Copenhagen: session proposed on “Urban Provisioning Systems, Sustainable Consumption and Equity” by members of the WG SCP in Cities

9. Time line and fundraising

This Working Group aims to access funding opportunities such are to be provided by Future Earth and other global, regional, and national public and private funding agencies. Some identified opportunities are:

• Future Earth T2S
• COST action http://www.cost.eu/

raise profound questions for current conceptions of “sustainable cities” and the cultural constructs that underpin prevailing modes of urban living.

By contrast, numerous efforts are afoot to experiment with novel provisioning arrangements and these efforts include shifts toward non-motorized mobility, urban agriculture, cooperatively-organized systems of production and consumption, co-housing, local currencies, repair cafes, and numerous others. These initiatives promise to reduce the carbon footprint of urban dwellers and speak to some modest income groups but remain limited in size and scope and are distinctly fringe activities. Moreover, they are extremely hard to scale up, to replicate, and to substitute for dominant lifestyle modes.

This session aims to address two questions: 1) How to reduce the vulnerability of contemporary cities with respect to energy, food, water, communications, infrastructures, and other necessary basic services? and 2) How to expand, mainstream, and elevate current alternatives so that they could supplant incumbent physical, social, and economic infrastructures and provisioning systems.

To pursue meaningful answers to these questions we need to formulate more encompassing strategies toward sustainable cities, to include the underlying systems of social organization and associated configurations that enable the co-existence of dense aggregations of people. This challenge cannot be pursued by researchers or policy makers strictly on a top-down basis and primarily through technological innovation. Rather, effective measures will need to be undergirded by credible physical and social sciences and engineering while also entailing intensive processes of co-production of knowledge, transdisciplinary engagement, and higher order learning processes.