



# NaWiKo

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## **SustEcon Conference**

**The contribution of a sustainable  
economy to achieving the SDGs**

25–26 September 2017, Berlin

Programme Booklet



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# Conference Agenda

## Monday, 25 September

10:00-11:00	Registration and Welcome Coffee <b>Foyer</b>			
11:00-11:30	Opening Session: Opening and Welcome to the Conference <ul style="list-style-type: none"> <li>• Prof. Dr. Brigitta Schütt (Vice-President Freie Universität Berlin)</li> <li>• Dr. Camilla Bausch (Director Ecologic Institute)</li> <li>• Dr. Martin Hirschnitz-Garbers (Coordinator NaWiKo-Project)</li> </ul> <b>Hörsaal D</b>			
11:30-13:00	Plenary Session: Panel Discussion "The SDGs and the Sustainable Economy" <ul style="list-style-type: none"> <li>• Prof. Dr. Paul Ekins (University College London – Institute for Sustainable Resources)</li> <li>• Marilyn Mehlmann (Legacy 17)</li> <li>• Marie-Louise Abshagen (German NGO Forum on Environment and Development)</li> </ul> Moderation: Prof. Dr. Rainer Walz (Fraunhofer ISI) <b>Hörsaal D</b>			
13:00-14:00	Lunch Break <b>Foyer</b>			
14:00-15:30	Paper Session I: Measuring Sustainability in the Context of the SDGs: Developing indicators <b>Conference Room I</b>	Paper Session II: The enlightened consumer? Influencing factors on sustainable consumer behaviour <b>Conference Room II</b>	Paper Session III: Innovations for and governance of the supply chain in the context of the SDGs <b>Conference Room III</b>	Paper Session IV: Implementing the SDGs in regional contexts: capacity building on the local level <b>Hörsaal C</b>
	Trafo 3.0 WS I: Governance of transformations: the Trafo 3.0 project's heuristic <b>Akademischer Senatssaal</b>			

15:30-16:00	Coffee Break <b>Foyer</b>		
16:00-17:30	Paper Session V: Taking a closer look at the individual consumer: understanding consumers' daily decisions <b>Conference Room II</b>	Paper Session VI: Real-world laboratories and SDGs <b>Conference Room III</b>	Paper Session VII: Pathways towards sustainability: innovations in management and the role of social relationships <b>Hörsaal C</b>
	Trafo 3.0 WS II: Transformation towards light electric mobility (e-bikes) <b>Akademischer Senatssaal</b>	Trafo 3.0 WS III: Transformation towards sustainable meat production & consumption <b>Hörsaal D</b>	Trafo 3.0 WS IV: Transformation towards paperless publishing & reading <b>Conference Room I</b>
17:30-20:00	Reception <b>Foyer</b>		

## Tuesday, 26 September

09:00-09:30	Registration and Welcome Coffee <b>Foyer</b>		
09:30-10:30	Plenary Session: Keynote "Shaping transformations to Sustainability" <ul style="list-style-type: none"> <li>• Dr. Florian Kern (University of Sussex)</li> </ul> <b>Hörsaal D</b>		
10:30-11:00	Coffee Break <b>Foyer</b>		
11:00-12:00	Semi Plenary I: Panel Discussion "Innovations for the Sustainable Economy" <ul style="list-style-type: none"> <li>• Dr. Paula Kivimaa (University of Sussex – SPRU)</li> <li>• Prof. Dr. Derk Loorbach (Erasmus University Rotterdam – DRIFT)</li> </ul> Moderation: Dr. Martin Hirschnitz-Garbers (Ecologic Institute) <b>Hörsaal C</b>	Semi Plenary II: Panel Discussion "Measuring Sustainability" <ul style="list-style-type: none"> <li>• Prof. Dr. Philipp Lepenies (Freie Universität Berlin – FFU)</li> <li>• Lucas Porsch (Ecologic Institute)</li> </ul> Moderation: Dr. Klaus Jacob (Freie Universität Berlin – FFU) <b>Hörsaal D</b>	
12:00-13:00	Lunch break <b>Foyer</b>		
13:00-14:30	BK Sitzung I: NaWiKo Begleitkreissitzung <b>Akademischer Senatssaal</b>	Paper Session VIII: Innovation of food supply chains by designing sustainable food production and consumption systems <b>Conference Room I</b>	Paper Session IX: Decoupling, Circular Economy and Sustainable Business Models <b>Conference Room II</b>

	<p>Paper Session X: On the importance of motivation and cultural change for realising a sustainable economy <b>Conference Room III</b></p>	<p>Paper Session XI: Public discourse, perceptions and acceptance of sustainable economy issues <b>Hörsaal C</b></p>	<p>Paper Session XIII: The role of the SDGs in Sustainability Assessments <b>Hörsaal D</b></p>
14.30-15:00	<p>Coffee Break <b>Foyer</b></p>		
15:00-16:00	<p>BK Sitzung II: NaWiKo Begleitkreissitzung <b>Akademischer Senatssaal</b></p>	<p>Paper Session XII: Integrating users and employees in sustainability innovation <b>Conference Room II</b></p>	<p>Paper Session XIV: The role of actors, technologies and framework conditions in transforming towards sustainability <b>Conference Room III</b></p>
	<p>Paper Session XV: International perspectives on transition to sustainability in urban areas <b>Hörsaal C</b></p>	<p>Paper Session XVI: Influence of techno-economic change and public policy on transition pathways <b>Conference Room I</b></p>	
16:00-17:00	<p>Plenary Session: Panel Discussion "Scaling up"</p> <ul style="list-style-type: none"> <li>• Dr. Dominika Wruk (University of Mannheim)</li> <li>• Philip Vergragt (Clark University – The George Perkins Marsh Institute)</li> <li>• Arthur ten Wolde (Ecopreneur.eu)</li> </ul> <p>Moderation: Prof. Dr. Rainer Walz (Fraunhofer ISI) <b>Hörsaal D</b></p>		<p>BK Sitzung III: NaWiKo Begleitkreissitzung <b>Akademischer Senatssaal</b></p>
17:00	<p>Closing Session <b>Hörsaal D</b></p>		

# Abstracts

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## Paper Session I

### **Measuring Sustainability in the Context of the SDGs: Developing indicators**

#### **How can we measure the impact of the sharing economy? A conceptual and empirical impact model**

**Authors:** Achim Oberg, Dominika Wruk, Marina Friedrich, Maren Rottler, Bernd Helmig, Michael Woywode

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What is the impact of the sharing economy? This question occupies both the academic and public discourse. Researchers and experts often argue that the sharing economy may be an important part of a sustainable economy, for instance by promoting a more efficient use of natural resources, by encouraging social inclusion or by strengthening social cohesion in communities and cities (Botsman & Rogers, 2011; Heinrichs, 2013; Cohen & Kietzmann, 2014). If the sharing economy actually fulfills this potential, it contributes to the achievement of several sustainable development goals (SDGs). However, since the sharing economy is a rather new phenomenon it is still an open question whether and, if so, to what extent this promising potential is actually realized. So far, very few studies have measured and quantified the impact of the sharing economy. The few that exist have focused either on one particular part of the sharing economy (see, for instance, (Firnkorn & Müller, 2011; Martin & Shaheen, 2011) for work on car sharing) or on only one dimension of sustainability (for instance, (Zevras, Proserpio, & Byers, 2016) have studied the economic impact of shared accommodations on the hotel industry). However, there is no work quantifying the impact of different parts of the sharing economy and across all three dimensions of sustainability – economic, ecological and social. We argue that one reason is the lack of an adequate conceptual model and empirical approach to measure the impact. Thus, the aim of this paper is to develop a model for the assessment of the impact of the sharing economy and its contribution to a sustainable development.

We do so in three steps: First, we develop a **conceptual model** that captures the relationships between various influence factors. We use the input-output-outcome-impact (IOOI) model as a starting point that allows us to conceptualize the relationships between used resources (input), activities and services performed (output), effects on target groups (outcome) and consequences for economy, society and the natural environment (impact) (Bagnoli & Megali, 2011; Khandker, Koolwal, & Samad, 2012). So, economic, ecological and social impacts of the sharing economy are taken into account within our model. In order to get a differentiated picture of the relevant impacts, we adapt the IOOI model to

the specificities of the sharing economy. One necessary adaptation is that both absolute and relative effects are considered. For instance, to capture whether sharing economy organizations enhance social inclusion and thus reduce inequality in a society, we determine in absolute terms how many elderly people or people with migration background participate in these sharing organizations. However, for the interpretation of these absolute numbers, it is also relevant to know how many people from these groups participate in sharing organizations in relation to traditional offers. Moreover, the conceptual model also allows capturing the impact at different levels of diffusion of sharing concepts.

Second, since there are no established indicators for the assessment of the impact of the sharing economy on sustainable development, we develop a **set of indicators** to operationalize the conceptual model. Within this step, we take into consideration all levels of the impact model (input, output, absolute and relative outcome, absolute and relative impact) and all three dimensions of sustainability (economic, ecological and social). The indicators are based on research on organizational sustainability in general as well as potential sustainability impacts of sharing economy organizations in particular. The conceptual model is applicable to all types of organizations in the sharing economy.

Third, we develop an **empirical approach** for capturing the impact of the sharing economy. We suggest using three types of data sources:

1. Quantitative survey: Since no dataset on sharing economy organizations exists, we suggest conducting a quantitative survey among sharing economy organizations in Germany. In order to conduct this survey, we have identified more than 2,500 sharing organizations that may serve as a basic population for the study.
2. Expert interviews: We expect that representatives of sharing economy organizations might not have all the relevant information required for calculating the impact. Thus, we use expert interviews as additional data source.
3. Existing databases and statistics: We use data from existing databases and statistics to calculate some of the indicators. In addition, we use existing sources to calculate the relative outcome and impact.

By performing these three steps, we develop a conceptual and empirical model with which we can assess the impact of the sharing economy. Using this model will allow us to answer the question whether and to what extent the sharing economy is part of a sustainable economy and contributes to achieving sustainable development goals. As such, we argue, our paper fits well with the overall topic of the SustEcon conference. In particular, we hope to contribute to answering methodological questions: We develop a methodological approach and sets of indicators with which we can measure the contribution of innovative concepts and business models in the sharing economy to a sustainable development. We will test this model in an empirical study of the sharing economy in Germany in summer/autumn 2017. It would thus be very fruitful for our work to be able to discuss the

model and potentially some initial results at the SustsEcon conference with international experts from the field.

## **The Green Horizons Scoreboard: indicators on innovation for sustainable development**

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The RECREATE Green Horizons Scoreboard compiles, develops and analyses indicators for supporting the development of the European Union's research funding programme, Horizon 2020, and beyond, with a specific focus on "Societal Challenge 5: Climate Action, Resource Efficiency and Raw Materials". It does so by providing a dynamic evidence base on the development of the societal challenges themselves, the prevailing socio-economic-political framework conditions and the evolution of relevant research and innovation fields. These fields have a considerable overlap with the Sustainable Development Goals of Zero Hunger, Clean Water and Sanitation, Affordable and Clean Energy, Industry, Innovation and Infrastructure, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action as well as Life Below Water and on Land.

The Scoreboard operationalises the analytical frameworks of transition management, multi-level governance, National Innovation Systems and Technological Innovation Systems (TIS) in order to track and benchmark a range of different innovation systems, all relevant for sustainable development, over time, for up to 34 countries of the European Research Area.

The Scoreboard identifies core indicators for addressing the different functions of innovation systems or – if knowledge gaps prevail - points towards potential indicators and information gaps. The following functions are covered:

- Knowledge development and diffusion
- Influence on the direction of search
- Entrepreneurial experimentation
- Market formation
- Legitimation of technologies
- Resource mobilization

These functions capture the innovation processes on markets and within societies in a holistic perspective that points to opportunities for transforming currently unsustainable mass markets. Going beyond a simplified aggregation of various activities into the rubrics of, for example, "eco-innovation" or "resource efficiency" the Scoreboard provides indicators on eleven different innovation systems, or fields of knowledge, that are of high relevance to the areas of climate action, resource efficiency and raw

materials. The following innovation systems, or fields of knowledge, are covered:

- Agriculture and soil sciences
- Bioeconomy
- Climate adaptation
- Critical raw materials
- Energy Efficiency
- Environmental governance
- Fossil fuel efficiency
- Material efficiency
- Renewable energy
- Waste and recycling
- Water and waste water

The contribution describes the methodological framework, situates it within the landscape of similar initiatives, highlights major analytical results, points to limitations of the approach and outlines an agenda for further research.

### **Sustainability assessment of meals in the out-of-home catering sector: Links between the NAHGAST indicator sets and the SDGs**

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**Introduction.** The research project NAHGAST (Developing, Testing and Dissemination of concepts for sustainable production and consumption in the food service sector) focuses on the development, provision and dissemination of concepts for sustainable production and consumption in the out-of-home catering sector. The overall goal is to stimulate, facilitate and encourage the sector's transformation towards a more sustainable development.

In this paper we share insights from the development of a sustainability assessment tool for meals and the linkages to the Sustainable Development Goals (SDGs) (UNEP 2011) and to the German Sustainable Development

Strategy as well (Federal Government 2016). This paper aims at briefly describe the NAHGAST assessment tool focusing on the development of sustainability targets. Based on exemplary results of the applied assessment tool the implementation of the SDGs into practical use in the out-of-home catering sector will be discussed. Also, the validity of the assessment results, obstacles for creating valid results, and conclusions for SDGs implementation are discussed.

**Method.** Assessing the sustainability of meals in the out of home catering needs a selection of applicable indicators and a corresponding set of sustainability targets. Therefore we derived a list of possible indicators in the dimensions of ecology, health, social issues, and economy. Each of the dimensions is assessed by a set of indicators. However, there is a need of relevant targets to show the distance-to-target performance. Rockström & Sukhdev (2015) provide an orientation and show the broad linkages between the international sustainable development goals and the area of need "nutrition". However, they serve as a framework and need detailed translation into ecological, social, health, and economical targets. Based on an iterative testing of the developed assessment tool (incl. targets) with the out of home catering stakeholders we analysed the overall contribution to the SDGs.

**Results.** In total, the assessment tool is linked to the SDGs as it makes a contribution to the SDG 12 "Ensure sustainable consumption and production patterns" while it enables providers and customers of food services to analyse the sustainable performance of a meal and to improve it resp. to make another, more sustainable, choice.

This is also to be seen in the context with the high importance of stakeholder participation that is claimed in the SDGs and that is also an integral part of the transdisciplinary development and implementation of the NAHGAST sustainability assessment tool. Development processes, which are depicted in new indicator-based concepts, should not only be understood as a purely scientific or technical process. They should also be developed and further developed in the dialogue between stakeholders (Spangenberg 2002). It can be seen that a major focus on the integration and participation of stakeholders in this process is to be put into place in the future in order to make objectives as relevant to action as possible (RNE 2015).

But also on the level of indicators, the assessment tool is linked to the SDGs, e.g. in the form of calculating the carbon, water, material and land use footprints for combatting climate change, ensuring sustainable water management, and protecting ecosystems (SDGs 13, 6, 15), showing the use of fair trade and ecologic products or also sustainably caught fish to fight poverty, to promote sustainable agriculture and to conserve marine resources (SDGs 1, 2, 14), and working with different indicators related to a healthy life (SDG 3).

**Conclusions.** The SDGs have shown the scope of action in the development and selection of the indicators. For a valid determination of sustainability, it is essential to recognize and define the area of action. The SDGs present this action and target corridor. Especially the goal 12

"Ensuring sustainable consumption and production patterns" is the guiding principle, in particular the criterion of a significant reduction in resource use. However, in the out-of-home catering sector as well as in many other sectors, there are no detailed target values that relate to specific single items such as the meal as a measuring unit. Thus, directional and at the same time action-relevant target values were to be formulated and had to be, on the one hand, oriented on macro targets such as the SDGs, but had, on the other hand, to take into account the daily routine of action. The reference of the objectives to a practical unit is thus important in order to increase the practicability.

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## Paper Session II

# The enlightened consumer? Influencing factors on sustainable consumer behaviour

## Buying local or organic? – How consumers' sustainable food choice is influenced by the construal level of the advertising message and augmented reality technologies at the point of sale

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**Purpose.** The first aim of this study is to analyse whether the congruency between the framing of an advertising message and the perceived psychological distance of the advertised product (organic or locally produced food) affects product sales.

According to the “construal level theory” (CLT; Trope et al., 2007; Trope & Liberman, 2010), objects are represented on different mental levels depending on their psychological distance. Psychological distance is a subjective experience that something is close or far away from the self, here, and now (i.e. temporal, spatial, and social proximity; Trope & Liberman, 2010). Objects that are psychologically near are mentally construed in terms of low-level and detailed features, whereas psychologically distal objects are thought of more in high-level and abstract terms.

In the context of sustainable food choices, consumers often face the decision between different kinds of sustainable products – organic, fair trade and local produce. From the perspective of CLT, organic products are perceived as comparatively psychologically distant because the environmental benefits may be rather abstract and future-oriented to consumers and have no direct benefits. By contrast, locally produced food offer more concrete benefits and people expect more immediate effects (van Dam & van Trijp, 2011). Various studies show that a fit between the construal level of an object category and an advertising message can have a positive effect on consumer behaviour (Chang et al., 2015; Ramirez et al., 2015; Trope et al., 2007). Therefore, this study wants to test whether presenting low-level construal messages have a better effect for local food and high-level construal messages are boosting sales for organic food.

A second goal of the study is to test the effect of innovative, digital technologies at the point of sale (POS) for promoting sustainable products. Compared to the large body of literature on socio-psychological drivers much less is known about the impact of situational factors at the POS on

sustainable purchase behaviour (Simpson and Radford, 2014). Due to the rapid technical development of digital promotion tools, scientific evidence about their actual effectiveness is often lacking. Yet to stimulate sales of sustainable products, retailers and advertisers need to know whether their in-store instruments effectively enhance market shares (van Herpen et al., 2012). Therefore, we would like to compare the effects of stimulus presentation via static digital signage solutions with interactive augmented reality solutions in our field study.

**Relevance for a sustainable economy.** Although consumers' interest in sustainable products is growing steadily, they often remain niche products in the market and their sales remain behind those of conventional products (Vermeir & Verbeke, 2006; Young et al., 2010). Also in the area of organic food, market shares are still below five percent in most countries (Willer & Lernourd, 2016). One reason for this could be a wrong promotion of sustainable products at the point of sale. For instance, it might be that there is no "one fits all" solution for all types of sustainable products (organic, fair trade, local etc.) but that sellers need to know how to adapt the advertising messages.

Moreover, the use of innovative digital technologies in the store could help to generate more awareness for sustainable products and may remind consumers of purchasing sustainably when it is most important, i.e. at the point of sale.

**Methodological approach.** A two-week field experiment is planned which will be conducted with a 2 (product label: organic vs. local) x 2 (message framing: high vs. low construal level) x 2 (presentation technology: static digital signage vs. augmented reality) design. Products from the same category are compared, e.g. organic vs. local milk. High construal level messages are formulated in a future-oriented way and focus on collective benefits (i.e. high temporal and social distance): "*Because the future matters! Thinking about tomorrow and taking responsibility for the environment*". The low construal level message addresses the consumer at a temporally and socially closer level: "*Pick it, drink it, enjoy it! Do something good for yourself and your region here and now*". In order to link the purchase data from the store with the advertising condition, a balanced display rotation is created in which each of the four resulting conditions is presented equally long in the market.

Moreover, two stores will be selected where advertising screens are positioned and provided with the stimulus material developed. In one store, the stimuli will be presented as a static message and in the other store as an interactive augmented reality solution. The technology is provided by the startup Sensape. In the augmented reality version, a camera is integrated in the screen and the customer sees him-/herself; the messages are shown in speech bubbles around him/her.

**Expected results.** In this field study, real purchase data are analyzed which results in a high external validity of the outcomes. In addition, qualitative interviews will be conducted in each market to provide further insights how the technology and the messages are perceived by consumers. Data collection and evaluation will be completed by July 2017.

For the data analysis, multivariate statistical methods (MANOVA) will be conducted to analyse the effects between groups. As already indicated, an interaction between the product-label category (organic vs. local) and the message framing of the advertising message (high-level vs. low-level) is expected. It may also be assumed that the use of an interactive augmented reality solution has an additional positive effect on product sales (compared to static posters) due to the increased involvement of customers.

**Practical implications.** The results of this study will in any case provide relevant practical implications for marketers and retailers. If our assumptions are confirmed, this would encourage advertisers to adapt their messages and formulating them in either a more abstract or more concrete way. Through our study, the effectiveness of static digital signage and augmented reality solutions at the point of sale can be verified for the first time which could motivate retailers to break new ground and expand their toolbox of in-store marketing instruments.

## **Fostering sustainable consumption through mindfulness training? Insights from a mixed-method intervention study**

**Authors:** Sonja M. Geiger<sup>1</sup>, Anna Sundermann<sup>2</sup>, Laura Stanzus<sup>1</sup>, Pascal Frank<sup>2</sup>, Daniel Fischer<sup>2</sup>, Tina Böhme<sup>1</sup>, Paul Grossmann<sup>3</sup>, Ulf Schrader<sup>1</sup>

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Recent research has identified several potentials by which mindfulness may indirectly enhance sustainable consumption behavior. In a systematic literature review Fischer, et al. (2017) summarize these potentials as improved concordance between attitude and behavior, a sense of well-being independent of material welfare, promotion of pro-social behaviors and disruptions of unsustainable routines and habits.

Most published studies are cross-sectional and have found small, positive associations between sustainable behavior and questionnaire measures putatively indexing mindfulness. Only one earlier prospective investigation employed an actual intervention aimed at training mindfulness, but without a control procedure. Because of these methodological shortcomings, it remains uncertain whether there is a causal relationship between mindfulness and sustainable consumption.

To address this issue, the project entitled BiNKA (German acronym for *educating sustainable consumption through mindfulness training*) carried out a randomized controlled intervention trial with pre, post and follow-up measurements (n= 137). The study focused on two possible effects of mindfulness practice: 1) narrowing the so-called attitude-behavior gap and 2) fostering wellbeing independent of material welfare. The intervention comprised an 8-week mindfulness training including elements of mindfulness-based stress reduction (Kabat-Zinn, 2013) and other mindfulness practices, as well as subtly introducing consumption topics into

the program curriculum. The training was tested in two samples, employees and university students.

Self-report measures of consumption related to nutrition and clothing were based on the dice model of sustainable consumption behaviors (Geiger, Fischer, & Schrader, 2017). Findings indicated that mindfulness training effected large improvements on a self-report measure used to index mindfulness (Bergomi, Tschacher, & Kupper, 2014). However, the intervention neither altered sustainable consumption nor affected extent of the attitude-behavior gap. Nevertheless, the questionnaire data evidenced a positive effect of training upon wellbeing (OECD, 2013) and a decline of orientation toward material values (Müller et al., 2013), together indicative of a so called "sustainable happiness" (O'Brien, 2008).

Quantitative results were supplemented by congruent and discrepant examples of qualitative assessments (cf. Lee & Greene, 2007), obtained from in-depth interviews of a subsample of participants (n= 25). More evidence for subtle effects of the training is offered by the reconstruction of subjective, individual experiences which reveal insights into participants' increased introspections of their needs and need satisfaction. Results are discussed with a focus upon level of agreement between qualitative and quantitative findings, highlighting respective strengths and weaknesses of each approach. Finally, our findings call into question the utility of cross-sectional studies of mindfulness and sustainable consumption.

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## **Smart disclosure - The potential of informing consumers via applications for mobile devices for a sustainable development**

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Getting consumers to adopt more sustainable consumption patterns is a key challenge for achieving a sustainable development. One reason for unsustainable consumer behaviour is that the information required to make sustainable choices is either inexistent or costly to search. Consequently, information disclosure is increasingly being used by governments as well as private organizations to inform decision-makers in a multitude of settings. Examples of government-mandated information disclosure are nutrition facts on packaged food, health warnings on alcoholic beverages and tobacco products and energy efficiency labels on appliances. From a regulatory perspective, information disclosure has advantages over alternative policy interventions like rules and standards or taxes, as it preserves freedom of choice, is relatively cheap to implement and faces less opposition by stakeholders in the legislative process. To inform a particular decision, the disclosed information has to be accessed and cognitively processed to a point where it can actually be utilized in a decision. Empirical research shows, that decision-makers are less likely to access and process information, as these tasks become more costly. Well-designed information disclosure thus attempts to provide information that is easily accessible at the moment of decision-making and does not require too much processing on part of decision-makers. In this regard, the increasing accessibility of the Internet, in particular through mobile devices, has unprecedented potential. It allows to provide decision-makers with information virtually in any point in place and time. In contrast to printed information, for example in the form of product labels, information delivered through the Internet can be readily personalized based on the specific information needs of an individual and updated as soon as new choice-relevant information is available. It is not bound by limited physical space and can be provided by non-governmental entities more easily. The use of information technology for government-mandated information disclosure has been advanced by the Obama Administration, which coined the term of "smart disclosure". One example of this kind of smart disclosure is the "ToxFox", an application for

mobile devices which informs its users on endocrine disruptive substances in cosmetics. Users can obtain the information simply by scanning a product's barcode. The application is operated by the German non-governmental and environmental organization *Bund für Umwelt und Naturschutz Deutschland* (BUND) and has attracted more than 1.2 million users since its launch in July 2013. Since the application's launch, more than 22 million products have been scanned. The purpose of this study is twofold. First, to find out how users interact with the application, usage data obtained from Google Analytics was examined descriptively. Second, to identify the effect of the application on the extent of information search undertaken by consumers a survey was conducted. It has a quasi-experimental design, where information search is contrasted between users and non-users of the application, while controlling for potentially confounding variables such as risk perception, education, gender and age. The analysis of the Google Analytics data suggests, that a large share of users install the application after they have learned of endocrine disruptive substances in cosmetics and the ToxFox through media coverage. Having installed the application, the intensity of usage drops significantly over the course of a few days. Therefore, despite an increasing number of cumulative users, the overall use of the application is mainly driven by new users. A viable hypothesis is, that first-time users check their whole inventory of personal care products and search for alternatives if necessary. Assuming that most consumers do not frequently switch cosmetics, the low retention rates and decreasing interaction do not necessarily imply that the application is not used to assist consumers' decisions. Inferential analysis of the survey data shows that individuals using the application, significantly search more information and buy less cosmetics with endocrine disrupting substances. These differences in behaviour can partly be explained by differences in search costs. While perceived risk is positively related to information search, there is no self-selection of individuals to using the ToxFox based on perceived risk. Despite its potential for informing consumers, there are a number of shortcomings of information disclosure. First, most forms of information disclosure require active information search by individuals. Awareness of the problems associated with a certain behavior, such as health risks or unsustainability, are a prerequisite for active information search. Unaware individuals can only learn about these problems when "accidentally" exposed to this information. In the case of the information disclosure through applications for mobile devices, accidental exposure is very unlikely as individuals have to actively download the application and retrieve the information using their mobile devices. Second, research has shown that the knowledge or awareness of choice-relevant information is related to socio-economic status, in particular education. Therefore, information disclosure selectively benefits highly educated individuals. This also applies to ToxFox users. The survey revealed that ToxFox users' educational qualifications are above German average. For example, about 38 % of participants using the ToxFox hold some sort of academic degree as their highest educational qualification. Based on the micro-census carried out by the Federal Statistical Office of Germany only 16 % of Germans hold an academic degree in 2016. Research on risky behavior such as poor nutrition, smoking, drinking alcohol and sedentary

live-styles shows that information may be insufficient to induce behavioral change. Individuals usually exhibit present-biased preferences and lack self-control when facing choices with immediate gratification and delayed negative consequences (and vice versa). What characterizes the mentioned choice-sets is the lack of risk-free alternatives. The availability of sustainable, but otherwise equivalent alternatives poses a problem for information disclosure policies that aim at fostering sustainable consumption, as well. Put differently, for information disclosure to affect choices, consumers do not only need to be aware of the sustainability of their choices but also motivated to act accordingly. Under these circumstances, smart disclosure can prove to be a suitable regulatory instrument.

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## Paper Session III

### **Innovations for and governance of the supply chain in the context of the SDGs**

#### **Approaches to Reducing Food Losses in the Fruit and Vegetable Production in Germany**

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**Introduction.** Food losses occurs in all agricultural value chains. Depending on the crop the share of food losses varies across the different value chains. Against this background the collaborative research project "Pathways to Reduce Food Waste (ReFoWas)" was designed. The main objectives of ReFoWas are to quantify food losses in the agricultural sector and to identify measures to reduce food losses in order to achieve more sustainable production and consumption patterns in Germany. Therefore reasons for the emergence of food losses need to be identified. In this regard ReFoWas is based on top down and bottom up analyses of the agricultural sector and respective value chains. Since comparatively high shares of food losses occur in the fruit and vegetable sector, among others, in this study fruit and vegetable value chains will be analyzed in detail. The main objectives of this study are (a) to identify main reasons for food losses occurrence, (b) to quantify food losses at different stages, (c) to develop efficient measures for the reduction of food losses and (d) to assess the costs and implications of implementing these measures. As a part of the ReFoWas project this study is funded by the German Federal Ministry of Education and Research.

**Research Question and Approach.** The study is part of the collaborative project ReFoWas which firstly aims at investigating agricultural production and food consumption in a holistic, sectoral analysis ("top-down" approach)

and secondly focuses on selected case studies for fruits and vegetables, bakery products and school catering ("bottom-up" approach).

For the fruit and vegetable sector four case studies have been carried out in collaboration with practice partners from regional horticultural consultancy services. Interviews and discussion workshops with producers, traders as well as representatives of producer organizations and the food retail were and will be carried out. It was the aim to identify options for reducing and avoiding food losses at the production level and at the different downstream marketing stages of the value chains. Further, approaches to reduce food losses were developed and discussed in order to assess implementation opportunities.

Fruits and vegetables vary in storage suitability. For this reason one product with a long and another with a short shelf life was selected for each category. Hence, the fruit case studies are carried out focusing on apples and strawberries and the vegetable ones with carrots and lettuce as the research subject. Each product is investigated in two important production regions in Germany.

**Preliminary Findings.** First results are already available for the vegetable case studies. The food losses are estimated and the main reasons for these losses in the value chain are identified. Weather conditions, pest or disease outbreaks and economic reasons are main reasons for food losses in both vegetables. In the case of lettuce feed damages from rabbits etc. contribute to overall losses. With respect to its short shelf life the market situation, i. e. low product prices, at harvesting time may have a tremendous influence on the amount of food losses. In carrot production the shape of the product and the fruit sizes, as a consequence of the prevailing quality criteria, are main reasons for losses in carrots.

Potential measures to decrease food losses in the vegetable sector have to distinguish between the producer level and the downstream value-added chain elements. On the producer level improvements in the management of production, harvesting and marketing the vegetables could help to reduce food losses. The measures have to consider also the shelf life of the products. For carrots (long shelf life), measures such as ice water cooling, an improved handling of carrots to reduce the rejects and the search for further marketing channels are discussed. Measures which are suitable for lettuce (short shelf life) are vacuum cooling, the search for new production methods and ways to reduce the structural supply surplus.

Food losses in the value chain could be reduced by cooling systems and/or humidification devices in food retailers and in the storage center and by more specialized knowledge of purchasers and retailers. Further options could include supply contracts for the fresh market sale, a greater product differentiation in the food retail and the sale of lettuce by weight.

**Outlook.** These results from the vegetable case studies will be completed with the results from the fruit case studies. Finally efficient measures to reduce food losses in the value chains of fruits and vegetables can be developed and their costs and implications of implementing have to be assessed.

## **Innovation for Sustainable Production in the Global Textile Supply Chains**

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Sustainable production and consumption (SPC) aims at sustainable, inclusive and equitable global growth, poverty eradication and shared prosperity. The concept intends to align growth with the “planetary boundaries” while at the same time pursuing inter-generational as well as intra-generational justice. It has been incorporated into a number of declarations and resolutions on UN level, notable in SDG 12 of Agenda 2030. The “10-year framework of programmes on sustainable consumption and production patterns” (10YFP), adopted by the UN General Assembly at the so-called “Rio+20” summit in 2012 and reflected in Agenda 2030 targets 8.4 and 12.1, gives structure to SPC policies.

According to the UN Environmental Programme, textile and clothing is the world’s second-biggest economic activity for intensity of trade. At the same time, textiles are heavily intertwined with environmental, social and governance issues. Textile supply chains are globally interwoven and volatile; production sites are traditionally located in countries with low environmental and occupational health standards. In the past, efforts of textile brands and retailers have primarily focused on improving the social aspects of textiles. Over the years, however, there has been growing concern about their environmental impacts.

Against this background, our contribution analyses development perspectives for SPC in the textile sector.

In a (textile) product context SPC basically means sustainable and efficient management of resources throughout the entire life cycle, and in all stages of the supply chain. In this respect, as highlighted by Agenda 2030 target 12.4, one of the major SPC challenges is to manage and thus control input and output of hazardous materials and toxic chemicals in global supply chains. We therefore focus on SPC issues related to the use of chemicals in textile processes and products – a topic which has gained momentum recently: the textile sector faces normative requirements not only in the perspective of product safety, but also with respect to emissions into the environment along the value chain. Raised awareness in the countries where the “textile mills” are located in combination with the well-orchestrated “detox”-campaign by Greenpeace draw the attention on the fact that problematic substances are released as waste water and endangers fresh- and seawater as well as the drinking water in these regions. Greenpeace “invites” global players in the textile and sporting goods sector to sign so-called “detox-commitments” (among the 79 signatory companies are H&M, Adidas and Aldi). These commitments contain demanding goals not only in the handling of problematic substances but also far reaching transparency obligations. Industry alliances such as

“Zero Discharge of Hazardous Chemicals” (ZDHC) are forged to tackle these challenges.

Besides, due to (normative) circular economy claims recyclability of textile products gets increasingly important.

Our contribution pursues the central research question how SDG 12 relevant innovations in the global textile supply chains can emerge and what barriers currently in place are impeding respective developments. To this end, we can access comprehensive empirical data (qualitative interviews, scenario analysis, workshops) as to the incentives and impediments of textile supply chain actors, gathered in different research contexts.

Up to now textile supply chains can be characterized as volatile, complex and “self-organizing”. The knowledge of brands and retailers as to the questions “Who produced what where under which circumstances?” is quite limited; and so are possibilities to influence the performance of the various actors along the supply chain. In the chemicals management state of the art, brands and retailers employ comprehensive but *reactive* product test strategies, mostly steered by (manufactured) restricted substances lists and taking into account risk considerations, which are very costly but not necessarily effective. However, innovations in the direction of SDG 12 can only emerge if brands and retailers are able to *actively* manage problematic chemicals in their supply chains, i.e. they must know what chemicals are used in the products and process steps. Hence, one central driver for sustainable textile economies are traceability and related business models.

Against this background, the contribution also asks for appropriate institutional innovations. In the light of the detox-commitments the delineated status quo situation confronts the global players with far reaching challenges: they can either opt for a vertical integration of the upstream suppliers or establish a new dimension of material data management covering also the process chemicals and the related emissions to the environment. In fact, it is to be expected that both elements are crucial to meet the societal expectations laid down in SDG 12 increasingly underpinned by international, national and regional legal obligations as well as normative expectations by civil society actors such as Greenpeace and other NGO’s finally – at least so some extent – influencing also the consumer perception.

In this respect it has to be noted that the 10YFP is meant to draw on experiences such as the Strategic Approach to International Chemicals Management (SAICM), a multi-sector and multi-stakeholder approach in pursuing the sound management of chemicals. In the SAICM Chemicals in Products Programme (CiP) different tools and approaches to manage material information in global supply chains have been analysed. IT-supported information exchange systems providing for ‘full material disclosure’ in terms of chemical content of supplied (part) products provide the arguably most advanced solution. The automotive sector, including most major original equipment manufacturers (OEM), has successfully implemented such an approach (called “International Material Data System”, IMDS), designed to ensure compliance with chemical substance

related requirements and at the same time facilitating circular mass flows. In our contribution we argue that such positive substance and material reporting could help overcoming barriers in the status quo and significantly contribute to innovation for sustainable production in the global textile supply chains.

## **Governing towards a sustainable Bioeconomy: A conceptual Framework for Lifecycle Governance Analysis**

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**Introduction.** An economy based on the sustainable use of renewable biological resources is often proposed as a viable strategy to reduce fossil resource dependency and to meet global sustainable development goals (SDGs), i.e. by switching to renewable feedstock for material and energy production. Technological innovations, social and political advancements, and consumer behaviours are crucial factors among others for initiating, steering and adjusting transitional pathways towards sustainable economic systems. Institutional and regulatory frameworks, as well as policy and legal structures, are necessary when establishing emerging bio-based supply chains not only to further economic, but also environmental and social achievements. This will involve a large number of actors, from the stages of biomass production, extraction, processing and manufacturing up until a final product or service is created. Hence, sustainability actions must be adopted from a supply chain perspective, in order to enhance coordination among actors towards common goals. Although studies have been conducted in the fields of supply chain management and supply chain governance, an analytical tool able to capture multiple levels of governance structures on multiple levels of socio-economic organisation concerned in developing bio-based transformation pathways is lacking. As such, in this paper we present a theory-informed methodological approach that goes beyond the too often firm-centred organizational and institutional approaches, by also addressing the influence of local, regional and international factors in a telecoupled world.

**Methods.** The conceptual framework we derive by integrating life cycle and multi-level governance approaches aims to: a) characterize main policy and legal structures, as well as public and private actors involved in governing bio-based supply-chains in specific contexts; b) identify regulatory challenges and gaps that can arise from scaling up specific technologies; and c) supporting policy development, formulation and implementation for the organisation of value chains in order to minimize unintended social and environmental outcomes. It consists of a three step procedure, taking into account the ISO standards 14040:2006 for Life Cycle Assessment adapted to analytical governance perspectives. The three steps are the following: a) goal and scope, specifying the supply chain configuration and system boundaries; b) life cycle inventory of stakeholders and institutions within the system boundaries at the institutional, regional, and international levels

(multi-level analysis); c) impact analysis to evaluate the effects of changes in the governance of supply chains on production patterns from a multi-sector perspective. This includes the necessary interlinkage of conceptual sub-steps involved in governance and life cycle analysis approaches. Being at a first development stage, this paper only addresses the first two steps, although the goal is to develop a set of themes to capture governance effectiveness of alternative bio-based pathways based on novel technologies. The application of this Life Cycle Governance Assessment (LCGA) framework is illustrated by employing the production of Polylactic Acid (PLA) as a case study, which stands out as the fastest growing bio-based and biodegradable plastic in the global market. PLA is currently produced by fermentation of starch- and sugar-based ethanol feedstocks into lactic acid. At the current state of market penetration, PLA is only produced in relevant quantities in the United States and Thailand, based on corn and sugarcane, respectively, involving the risk of repeating unsustainable practices associated with the promotion of biofuels.

**Results.** Preliminary results are obtained from the application of the LCGA framework to two production pathways in the bioplastic industry, by means of a comprehensive network analysis. This provides, for each case, a roadmap of socio-economic actions and sociopolitical accounts corresponding to the interplay of structures and agents within specific contexts involved in the supply chains for producing PLA. As such, our proposed theoretical themes for analysing governance comprise structures, agents and contexts. Nevertheless, it is their interplay in praxis relevant for the production of PLA that stands at the core of our approach. In other words, global standards are rarely effective in national domains, unless engaging with national, regional and local social contexts as socially embedded and historically grown values, which are implicit in the practical application of external standards into local milieus. Comparing value chains of the US and Thailand PLA examples and the related forms and modes of governance employed to achieve national development goals can serve as a basis for discussion on the development pathways that exist in governing bioeconomic transformation in an industrialized and emerging economy. A greater importance of national regulation standards is present in the US, while the production patterns of PLA in Thailand are not comprehensively regulated from a national point of view, but are mainly subject to international standards in the bioplastics sector. Further technological development may require more specialized regulation as regards product specifications and safety. These can enhance industrial competitiveness of new firms entering the bioplastic market, although the risk exists for pushing social and environmental pressures further down the supply chain. Hence the need to capture these upstream effects, which are deemed to involve farmers, directly and also indirectly due to increased biomass trade.

**Conclusions.** A framework for LCGA is proposed as incremental procedure for the multi-level assessment of governance risks and gaps in the Bioeconomy. In this way, it can also be applied to the study of increased biomaterial production scenarios, e.g. with bioplastic supply chains becoming transnational or involve global dimensions. Once fully developed, our conceptual framework can contribute to reducing resulting systemic

complexities and uncertainties in bio-based transformation pathways providing the conceptual starting points for a regulatory structuring of socio-economic processes and actors along bioeconomic value chains. Our overall goal is to further spark scholarly discussions around governance approaches to foster, but also regulate the Bioeconomy towards more sustainable production pathways.

## **Chances for more sustainability in clothing production and consumption**

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The contribution to the conference follows the following research questions: Which innovations could contribute to more sustainability in the clothing sector? What are the chances of their realization? How can the diffusion of these innovations be promoted?

To identify possible innovations besides desktop researches interviews were carried out with actors from science and research as well as from enterprises along the textile chain. In these interviews the chances of the identified innovations to be realized were also discussed. To get a broader assessment of the developments in the clothing market in the next few years, an expert survey was conducted. The questionnaire comprised the following categories: political and social conditions, consumer preferences and design / fashion trends as well as the steps of the textile chain of the fibre, yarn and fabric manufacture to recycling. The survey took place at the end of the year 2016. Involved were experts in science and research, economy, civil society, and media.

To examine the openness of consumers for innovative products and services that lead to more sustainability in the consumption, a representative survey is currently conducted with 2,000 people in the German-speaking population. This was preceded by focus groups with consumers from modern and well-established social milieus. The focus groups aimed at the ascertainment of the meaning of clothing and fashion in the different social milieus and the – milieu-specific – factors which can have a restraining or supporting effect on the change of the clothing consumption in the direction of more sustainability. The knowledge-leading question of the representative survey is: Which factors influence the consumption of clothing and the openness to more sustainable alternatives? In addition to socio-demographic and socio-cultural factors attitudes towards fashion and clothing purchase are considered. Other factors to be examined are the importance of social norms and the influence of perceived collective efficacy on consumer behaviour.

The examined innovations for more sustainability in production and consumption of clothes should contribute to reaching the Sustainable Development Goals. With about 12 kg per head and year the Germans are world champions in clothing consumption together with the Swiss and the

US-Americans (Neugebauer & Schewe 2015). The purchase of clothes is stimulated by faster and faster changing fashions and trends. This *fast fashion* is only possible due to low costs for raw materials, transport, and labor, poor working conditions, and heavy negative environmental impacts. A transformation to more sustainability in the clothing market and consumption will only be achieved if a more efficient use of resources (efficiency strategy) and an environmentally and socially responsible design of production, use, and after-use phase of clothing (consistency strategy) is combined with a reduction of the mass throughput in the clothing sector (sufficiency strategy). For the latter strategy the term *slow fashion* has become widely accepted. It stands for a slowing down of the consumption by lengthening the phase of utilization of clothes or textile materials. In all strategies the clothing industry has to make substantial contributions, but the consumers are also requested to act, that means to buy clothes that are produced in a socially responsible and environmentally sound way, or even to limit their consumption.

The results of the expert survey show that the experts tend to think that till 2030 public pressure on companies to make their production methods socially and environmentally acceptable will increase. Most experts regard it likely that European regulations will be passed in this time span defining higher demands on the production of clothes. Accordingly, they assume that the consumer demand for environmentally and socially responsible manufactured clothes will increase. This is likely to have sustainability benefits in the areas of poverty reduction, health, environment, and employment especially in the production countries. Regarding the conservation of resources the - - necessary slowdown of consumption is unlikely to happen until 2030 in the experts view. The experts expect that the demands for services related to 'do-it yourself', repair, and the altering or upcycling of clothes will increase and that the sharing of clothes will be more widespread as today. But they are skeptical that the average lifetime of clothes will increase and that the trend to buy more clothes at always lower unit prices will decrease.

This fits to the results of the focus group study with consumers from different milieu segments. A voluntary slowdown in consumption seems to be unattractive for most consumers, at least today and in near future. Too many secondary functions are associated with clothing and their acquisition.

Only persons from the critical-creative milieus show a tendency to question and limit their own consumption. A longing to slow down their own clothing consumption and to escape from the necessity to adapt to ever-changing fashions shined through in the mainstream milieus. However, this requires a social appreciation of the clothing style over a longer period. So far, fashion and longevity are often perceived as contradictory. For most of the participants in the focus groups, limiting their own clothing consumption is not acceptable. Especially in the younger milieus, many want to acquire as much clothes as possible for as little money as possible. Many also enjoy the shopping experience. A slowdown of clothing consumption, as described by Vivienne Westwood's formula "Buy less, choose well, make it last" formula, is out of question for them.

Without a societal change in values and a clear orientation towards the goal of an environmentally and socially responsible way of life, sustainable consumption behavior, which has to be accompanied by a reduction in resource and energy-intensive practices, cannot be achieved. It is necessary to create incentives for sustainable consumption and to make the alternatives to purchasing 'conventional' clothes more attractive. Here, in addition to the providers of such alternatives, the conventional clothing manufacturers and suppliers are particularly challenged.

Neugebauer, C. & Schewe, G. (2015): Wirtschaftsmacht Modeindustrie – Alles bleibt anders. In: Aus Politik und Zeitgeschichte, Vol. 65, Nr. 1-3/2015, S. 31-41

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## Paper Session IV

### **Implementing the SDGs in regional contexts: capacity building on the local level**

#### **Spatial Determination of the SDGs for Activating Regional Management in Spree Forest and Lusatia Region and its Lusatian Traditional and Modern 21st Century Landscapes**

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This research is treating the approach of and scope for gaining a transition into sustainable regional management and economy on the basis of a spatial, environmental, regional and landscape management related case study with spatially determining the globally set SDGs in Spree Forest Region and its inhabiting, surrounding, greater Lusatia Region. The research question and hypothesis of the possibility for implementing the SDGs in spatially determined areas within regional management and economy will be verified in the assessment process and methodological description of how processing this scale-overarching endeavor.

The Spree Forest Region with its Spreewald (Spree Forest) UNESCO Man and Biosphere (MAB) Reserve and the surrounding Lusatia Region are located in the eastern part of Germany, situated between the cities of Dresden and Berlin in the federal state of Brandenburg. As the in 1991 to a MAB Reserve declared Spree Forest inhabits a 475 km<sup>2</sup> wide perimeter of a protected area, the intensively through Spree River and human-induced land use-forms in this protected area as well as in Spree Forest and Lusatia Region influenced cultural landscapes need estimations, assessments and planning directions for further supporting sustainable development coupled to regional management and marketing on landscape scale. This needed regional management and marketing has to be ensued through strongly implementing globally important development directions such as sustainable development and the SDGs. In the same way economical efforts on regional level should consider and would benefit from acknowledging and sustainably influencing environmentally or socially, culturally positive or negative (spatial, landscape, regional) changing factors and grades in the entire region, its inhabited landscapes and surroundings: already former swamps, being reclaimed and turned into the existing cultural landscape as well as climate and global change syndromes next to influences through the transitional area of the River Spree and diverse partially economic land use forms by e.g. settlement, agrarian and forestry use as well as by lignite open-cast mining are giving ideas about the complex-cause and effect syndromes or more uncertain parameters of insecurities and (global, climate) change risks being partially responsible drivers for landscape or land use changes as well as for economical mismatches. Further drivers like enhancing, shifting and varying land use concerns, globalisation pressures

and dynamical processes in general together with influences of current political directions or spatial planning procedures are combined with more uncertain parameters for the economy, environment and society. These are some of the impacts foremost influencing the traditional or modern (natural and cultural) landscapes of the 21st century in general, protected sites such as UNESCO MAB Reserves or the regions' sustainably economic management capabilities.

So the for answering the research question and hypothesis important transition-topics of this research are (1.) organizational innovation and its management on spatial placement of global SDGs in regionally implemented locations, (2.) sustainability assessment within context of transformation research on landscape, regional, spatial and environmental planning level and (3.) communication in the matter of sense of supporting information provision for diverse stakeholders as well as the support of institutional or political decision making processes. This case study shows within the background of geographical and landscape planning instrumentations, that a transition into sustainable societies as a whole is possible in a stepwise and incremental way without leaving (sustainable) economy behind.

The special focus is laid on methodological questions and the development of a methodological approach through the geographical and landscape planning instrument of landscape units for providing the spatial information of application possibilities for the SDGs based on spatial, environmental, regional and landscape planning foundations. Further an analysis of potentials and requirements for the spatial placement and therefore for supporting processes of scaling and propagation of these innovations is supported within the methodological suggestions. Strived is – within the environmentally based assessment – the DPSIR-approach with acknowledging driving forces, options for shaping of transformations towards a sustainable economy, but also key barriers for scaling and propagation of the SDGs within spatial concrete applications. The diverse existing policy domains are somehow reflected and adapted within the context of different economical land use interests in the landscapes of Spree Forest and Lusatia Region.

Emphasize will be laid on the relevance of a landscape-based, protective as well as sustainable regional economy and its challenges, but also combined opportunities for sustainable economy with integrating landscape conservation and sustainable, smart as well as adaptive development options. The outcome of supporting economic benefits through SDGs and coupled landscape management in the region of Spree Forest and Lusatia should be fostered. The main relevance is laying in the fact of having developed a methodology for settling down global SDGs on regional level and landscape scale and thereby activating regional sustainable economy. So the main objective of this article is to assess through primary and secondary data the sustainable economy possibilities within Spree Forest and Lusatia Regions landscapes while in the same time including driving forces, its changing factors and supporting fundamental goals of maintaining and improving environmental stability of and throughout parts of landscapes. An already in the entire Lusatia Region applied observation

on landscape scale and regional level will help to advance sustainable economy while enforcing regional management through implementing the SDGs and protecting the sustaining grade of landscape parts in Spree Forest and Lusatia Region.

## **Socio-Economic Enhancement of Kalabadha Green Village of Jamalpur District: A Planning Approach for Sustainable Countryside Management in Bangladesh**

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***Presentation will be held by Sandra Reinstädler (BTU Cottbus).***

The rural area of Bangladesh has owned its unique hydro-geological setting and deltaic floodplain which is jointly formed by the deposition of the Ganges (Padma), Brahmaputra (Jamuna) and Meghna Rivers. The physical characteristics of the geographic location, river morphology and the monsoon climate render Bangladesh highly vulnerable to natural disasters, primarily, floods and cyclones. Floods, natural calamity and anthropogenic influences have exerted a greater impact on the culture and rural socio-economic activities. The Brahmaputra River is playing an impending role in making floods and river bank erosion which is threat for the farmer dwellers of Kalabadha village those are living in the Brahmaputra catchment area. The rural people and their livelihoods are under threat due to floods and associated river bank erosion and unplanned rural development activities of the local government. The excess of water happens during the monsoon season because of widespread flooding that damages agricultural crops, infrastructures and communication networks. There are 70% of inhabitants are living in the rural areas in Bangladesh and struggle against the floods and associated river bank instability and uncertainty of livelihoods. In Bangladesh the revenue village is called *mouza* and some *mouza* create a village. Kalabadha village is located in the Brahmaputra River catchment area. The area of kalabadha village is 3.7 km<sup>2</sup> and there are three *mouzas* (Kalabadha, Digor-Kalabadha and Gokulerpara) are associated under Kalabadha which is an ideal green village of Durmut union of Jamalpur district. Over 65 % rural village people are living in the villages and directly dependent on natural resources. The kalabadha Village is playing a coordinating role between aquatic and terrestrial micro level country side ecosystem services that are very much interlinking and important for sustainable rural micro ecosystem management. The study found four type of benefits are available in this green village such as ecological benefits, economical benefits, social benefits and cultural benefits. The benefits are ensuring the livelihoods and community health and indigenous medicinal plants and biodiversity sustainability in countryside areas. The investigation also recognized over 55 prospective medicinal plants species are still representing the hotspots of rural biodiversity. The countryside natural resources is enormously important for socio-economic enhancement. Kalabadha is one of the model village of Jamalpur district in Bangladesh whose landscape and landuse pattern are continuously altering. The north eastern portion of the village is affected by annual floods, as a result the farmers and poor people have to face socio-economic problem in their daily life. Over 840 village dwellers have improved their socio-economic and livelihood status through application of livelihood framework with seven

livelihood assets which has been approved by UN to achieve MGDs (human capital, natural capital, financial capital physical capital, political capital, social capital and culture and heritage capital) for rural e economic enhancement and countryside sustainability. The dwellers of this village are divided into economically high class, middle class, lower middle class, farmers, wage labour class and poor inhabitants. The study has been carried out based on primary and secondary data sources. Couple of PRA practices were introduced with the village dwellers concerning land use changes, income pyramids and livelihood scenario analysis. GIS (Geographic Information System) and Remote Sensing (RS) images were used for mapping and data interpretation on landuse changing pattern and countryside develop planning in particularly in Kalabadha village. This study has revealed that the land use changing pattern, ecosystem services and people efforts for rural socio-economy and livelihoods are gradually improved, the national GDP of Bangladesh is 1,629 \$ US and the similar scenario has been seen at Kalabadha village. The study also seeks the achievement and success of MDGs in micro scale level and which is moving to SDGs in the rural areas in Bangladesh as well as at the Kalabadha Green village and lessons learnt from this village that could be implemented in other rural villages in Bangladesh. The findings of this study is the shed light on the rural landaus changing pattern, livelihoods, socio-economic development and micro level ecosystem services management of Kalabadha green village in Bangladesh.

### **Urban Level Climate Change Mitigation and Adaptation in Turkey: The Role of Local Government Networks, International Organisations and Development Finance Institutions in Developing Local Level Capacity for Achieving SDGs.**

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Sustainable development has been on the agenda of environment-development debates since the 1980s. In 2015 the United Nations (UN) renewed its efforts for sustainability and have adopted the "2030 Agenda for Sustainable Development". In this process, a new list of Sustainable Development Goals (SDG's), entered the agenda as a comprehensive list of actions to transform world towards a more sustainable future. Almost all seventeen items in the SDGs list are socially, politically and economically desirable global goals and they are connected to each other in various ways.

Yet again the problem lies in their implementation and as it has been observed since the 1990s, achieving targets envisaged in SDG's requires a major institutional change in respective countries. As it was outlined in the CfP's broad diffusion of innovation often appears difficult, especially when existing policy discourses on economic priorities clash with SDGs. Powerful interests which rely on unsustainable forms of production and consumption

likely to exert a major pressure to block sustainability transition. This is especially the case in less developed countries with varying capacities for policy integration, and co-ordination of efforts for sustainability transformation. Overall, path dependencies create important barriers for policy change, but, this need not to be the case given the mutual benefits of a possible positive sum game between the realisation of SDGs (development of a sustainable society) and improved performance of economic system. In other words, an economic system is likely to develop positively if it considers the various dimensions of sustainability. However, developed countries do have significant responsibilities in diffusing this transformation in the rest of the world.

In this paper, the potential role of local government networks, international organisations and development finance institutions will be discussed with reference to developing local level capacity for climate change adaptation and mitigation. In doing so, two SDGs, SDG 11- "Make cities inclusive, safe, resilient and sustainable" and SDG 13 - "Take urgent action to combat climate change and its impacts" will be taken together in analysing the special role of developed countries and development cooperation in achieving SDGs in a developing country case.

Climate change is a global phenomenon and a perfect example of complex interdependence on planet earth and sustainable development objectives cannot be reached without paying a due respect to climate change. Cities, on the other hand, have seriously contributed to climate change through their intensive overall consumption levels and high energy consumption levels. More than half of the global population now live in cities and urban areas account for more than half of global primary energy use and energy - related CO<sub>2</sub> emissions. Taking account of direct and indirect emissions urban areas account for 67–76% of global energy use and 71–76% of global energy-related CO<sub>2</sub> emissions (IPCC, 2014). As a result, urban centres are the place where problem originates to a large extent and action in urban centres is essential to successful global climate change adaptation.

Although governments are responsible of co-ordinating efforts for mitigating and adapting to climate change, some governments are not so keen in committing themselves to reductions in their carbon emissions and tend to keep business as usual, either due to their energy culture, domestic pressures or their various short term interests. However, attainment of both sustainable development objectives and climate change policies require involvement of non-state players. Some local governments and city administrations act independent of their governments in committing themselves to emission reduction targets, as a part of global networks of local government initiatives against climate change. Those players share their knowledge and resources through communication, new policy ideas and discourses flow across different localities and scales, thereby connecting different spaces. Overall, implementation of two SDGs and a modest sustainability transition were made possible with the involvement of a number of players from all levels of global governance system.

This paper aims to focus on practices of some Turkish municipalities which played active roles in mitigating and adapting climate change through their

activities as a part of global networks of local governments. Since successive Turkish governments have been dragging their foot concerning climate change through a discourse of "special circumstances", some local governments bypassed the national level, translated and brought international impulses, into sub-national and local policy development processes. Turkish experience illustrates that it is not only the membership in global networks, but also involvement of international organisations and development finance institutions play a major role in developing a local level capacity in attaining certain sustainable development objectives in a developing country context like "making cities inclusive, safe, resilient and sustainable" and "taking urgent action to combat climate change and its impacts".

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## Paper Session V

# Taking a closer look at the individual consumer: understanding consumers' daily decisions

## "I tried sustaining myself by reducing my needs": The role of responsibly handling financial resources in sustainable consumption

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**Research Question.** Consumerist lifestyles appeal to many people, although their negative effects on ecological balance, social equality, and individual well-being become more and more obvious. To design successful strategies for the Sustainable Development Goal 12, "Responsible Consumption and Production Patterns", a realistic and holistic understanding of consumers' daily decisions is essential. The economic perspective of sustainable consumer behavior rarely enjoys its deserved amount of attention, although consumers prefer engaging in financially rewarding activities (Bolderdijk and Steg 2015). As more sustainable qualities of a product often come with a price premium, this is a barrier for the diffusion of sustainable consumer behavior. It also causes concern about social exclusion. Literature confirms that consumption can only be sustainable when it does not exceed consumers' financial resources, but secures their economic wellbeing in the long term (Sheth, Sethia, and Srinivas 2011). Debt avoidance and long-term savings are highlighted as patterns within economically sustainable consumer behavior (Nepomuceno and Laroche 2014). Balderjahn et al. (2013) broaden these perspectives. In their scale to measure the Consciousness for Sustainable Consumption, the economic dimension captures the decision *not* to purchase a product. It includes the consciousness for voluntary simplicity, collaborative consumption and living within the financial means. To our knowledge, these patterns have not yet been thoroughly explored to relate the responsible handling of financial resources to sustainable consumption behavior. By conducting an exploratory study, we hope to answer the following research questions: What does responsibly handling their financial resources mean for consumers? How is their understanding related to sustainable consumption patterns?

**Research Method.** Our qualitative research approach investigates economically sustainable consumer behavior by asking for the perspectives of pioneers who personally practice, explore and promote the economically sustainable patterns of voluntary simplicity, collaborative consumption and living within the financial means. The interviewees are consultants,

bloggers, activists, scientists as well as managers and spokespeople of companies, consumer unions and citizen initiatives in Germany. Although some apply rather radical means, such as living without money, we maintain that those who practice transformative activities should be heard in future-oriented research. The 24 interviews were conducted with a semi-structured guideline, voice-recorded and transcribed verbatim. The analysis follows a mixed deductive-inductive coding procedure. The interpretation reveals four principal topics, presented below.

### **Preliminary Findings.**

A) Status quo: The interviewees agree that overspending is related to excessive material resource consumption, which burdens the environment, and afflicts the financial and psychological wellbeing of individuals. Most identify a public climate favoring intense consumption as threat to financial stability and human wellbeing.

B) Alternatives: Most interviewees understand simplicity as a conscious strategy of resilience against the social coercion to earn and spend money existing within the prevalent economic system. When consumers reduce their purchases of dispensable market goods and services within the conventional market system, they potentially reduce their impact on environmental destruction and inequitable social production conditions. The experts suggest alternative consumption activities like sharing goods and services within a community, recycling, and agricultural self-supply in order to save costs and resources. When individuals reduce the material amount of their consumption, money becomes available for alternative use. The experts show little concern about rebounds, meaning the threat of re-investing saved money in other harmful consumption activities. They rather argue for quantitatively less, but qualitatively increased product purchases.

C) Unexpected savings: Simplicity pioneers report that they do not only need less money in their daily lives, but also feel more content through avoiding social and economic pressures, enjoy more freedom to use their time and a feeling of belonging within a social community, and realize greater self-fulfillment. Instead of saving money for their long-term financial security, they pursue economic independence through a reduced need to cover costs of consumption. Therefore, one suggested public policy goal is a better communication of the monetary benefits of sharing and simplifying to people burdened by limited financial means. Some interviewees argue for reduced working time, to strengthen consumer citizenship in the increased free time.

D) Debts: Although debts are commonly utilized in consumption, over-indebtedness is not only individually harmful, but also burdens society through social inequality and expensive social transfer systems. In the interviews, debt avoidance is associated with a greater consciousness of environmental and social values, and the ability to reflect critically on individual needs and desires. Supporting debtors in liberating themselves from their obligations also strengthens their economic participation in society, an important part of social equality.

**Preliminary Conclusion.** The interview analysis suggests a broader understanding of resources beyond environmental aspects to explore sustainable consumption. The financial opportunities of consumers, their connectedness within a social community and allocation of time for employment, welfare commitment and leisure are influential factors for materially reduced and qualitatively increased purchase decisions. There are opportunities for further research on social and public policy implications.

Sustainable development is a common interest affecting the quality of life of all people, and should therefore be a mutual duty and opportunity. It will only reach its necessary relevance if consumers from all financial backgrounds are involved. Attracting consumers' interest in securing or improving their financial situation can also make the implementation of more sustainable consumption patterns more efficient. One prerequisite is that secured financial means are not myopically aligned with increased levels of environmentally harmful and socially inequitable consumption.

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### **An undefined friend increases registrations to a swap party**

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Studies report that peer endorsers are successful in persuading people to take part in certain activities (Keresztes, Piko, Pluhar & Page, 2008; Scalici & Schulz, 2014) or buy specific products (Childers & Rao, 1992; Makgosa & Mohube, 2007). The more similar the peer endorser is considered by the recipient, the more successful his message or actions can become (Goldstein, Cialdini & Griscevicus, 2008). Also, motive activation can bring people closer to choose a specific product. It is examined that altruistic

motives can increase the purchase of sustainable products (Honkanen, Verplanken & Olsen, 2006) but that generally, egoistic motives may be also successful in case nature is considered as having a benefit for the person (Kibbe, Bogner & Kaiser, 2014). Only few studies examine a combination of both motives on pro environmental behavior (Kareklas, Karlson & Muehling, 2014) and, to the best of our knowledge, none tested it subject to the sender of a message. To evaluate the influence of both motives and an undefined friend in comparison to the organizers of a swap party on the number of interested participants, we conducted an experiment in Halle and Hamburg, Germany. A questionnaire including the announcement for a swap party in the Hafencity of Hamburg was distributed in different Universities in Hamburg. The announcement text was varied; egoistic motives were activated by emphasizing the financial benefits for the self, while benefits for the environment and other people were pointed out in the altruistic condition. Also, the swap party was recommended by a friend or the organizers of the event. The control group was given only neutral information about the procedure of the swap party. Data was analyzed by interpreting crosstabs to compare the number of interested people per condition. Furthermore, we used configural frequency analysis for more accurate comparisons. Using an unknown friend as a peer endorser persuaded more participants to send us their email-address to get to know the time and place of the swap party compared to the organizing team. This is in line with other studies who report a high influence of friends on decision making (Kurt, Inman & Argo, 2010). Contrary to our expectations altruistic and egoistic motive activation had no significant influence on behavior. Further results follow.

The results will be discussed for interventions to support sustainable consumption. The study is part of the interdisciplinary Slow Fashion project subsidized by the Federal Ministry of Education and Research.

## **Thinking green but buying thoughtless? An empirical examination of the attitude behavior gap among German clothing consumers**

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**Purpose.** Reinforced by the recent factory collapse at Rana Plaza in Bangladesh [1], public attention paid to sustainability in clothing has risen considerably over the past decade [2]. Besides fair domestic working conditions, sustainable aspects of clothing often refer to the organic production of materials [e.g. 3, 4]. The growing public awareness of sustainable clothing is, however, not found to manifest in actual consumer demand [2]. Such phenomena of discrepancies between individuals' attitudes and actual behaviors are known as attitude behavior gap (ABG) [5].

The ABG has received a lot of attention in research on sustainable consumption, primarily in the context of organic food [6]. However, only

little is known about the nature of the ABG in clothing. In order to promote a shift towards more sustainable modes of clothing production and consumption (12th SDG: Responsible Consumption and Production), this paper deals with the following research questions: First, it examines whether an ABG exists in sustainable clothing. Second, it aims to identify factors that promote or hinder purchase behavior towards sustainable clothing.

**Conceptual Model and Method.** For this purpose, a set of hypotheses was developed based on two well established models in the field of sustainable consumer behavior: the value-attitude-behavior hierarchy of Homer and Kahle [7] and Schwartz' [8, 9] value theory. Thus, the study investigates the influence of self-transcendence values (i.e. altruistic and biospheric values), self-enhancement values (i.e. egoistic and hedonic values) and a positive attitude towards sustainable clothing on purchase behavior towards sustainable clothing. A literature review led to the integration of further potential determinants such as online and catalogue shopping affinity, quality orientation, fashion orientation, price sensitivity and socio-demographic factors.

By means of structural equation modeling, the hypotheses were tested against empirical data from a market research study commissioned by a major German organic clothing retailer. The data was gathered with an online questionnaire administered to a sample of 1,085 German women.

**Results.** Overall, this analysis indicates a discrepancy between consumers' positive attitude towards and their actual purchase of sustainable clothing. As hypothesized, the findings suggest that self-transcendence values promote a positive attitude towards sustainable clothing, whereas self-enhancement values hinder the development of such an attitude. The latter, in turn, positively affects purchase behavior towards sustainable clothing. Moreover, online and catalogue shopping affinity was identified as an enabler of purchasing sustainable clothing. Contrary to the previous assumption however, quality orientation was identified as a purchase barrier, although it positively correlates with a sustainable attitude. Moreover, fashion orientation and price sensitivity were not found to be relevant determinants at all.

**Conclusions.** Practitioners in the sustainable clothing industry can learn from the analysis that, for instance, sustainable clothing consumers have a strong need for product longevity, which has not yet been addressed properly by the market offers. Quality signals such as guarantees might help to minimize the ABG in sustainable clothing.

From a policy perspective, the findings provide indication that self-transcendence values should be further promoted in society. Importantly, educational measures seem to be more effective if they address the specific industry, rather than sustainability in general.

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## **Effects of a consumption-focused mindfulness training – qualitative evaluation of an intervention study**

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The promotion and advancement of Education for Sustainable Consumption (ESC) has been considered a high-priority issue in Sustainable Consumption Research (SCR). Not least because both ESC and Sustainable Consumption are prominently addressed as distinct SDGs (numbers 4 and 12) in the United Nations' post-2015 agenda, the search for evidence how consumer behavior can be more effectively influenced towards sustainability remains a pressing issue for the SCR agenda (Kaufmann-Hayoz et al., 2012). To develop key competencies for SC that 1) nurture both cognitive, motivational and volitional dispositions, (2) are guided by the idea of critical, self-determined and self-reflexive individuals and (3) promote the capacity of learners to actively and responsibly contribute to advancing overall societal progress towards sustainability is the primary educational objective (Fischer & Barth, 2014b) of ESC. The consideration of affective components plays a major role in this advancement (Power et al., 2017). In particular, it is essential that social actors develop an understanding of the individual affective processes underlying their consumption patterns, as such an understanding can be considered a prerequisite for change

(Dittmer, 2011). Nevertheless, affective components have been largely neglected within ESC, which so far primarily focuses on cognitive aspects.

The concept of mindfulness has the potential to support this endeavor and strengthen ESC in multiple ways. Armstrong and Jackson (2015), for example, hypothesize that such meditation practices could provide a deeper access to our thoughts, emotions, values and aspects of personal identity that unconsciously guide our consumption patterns. Bringing these facets to consciousness might allow people to engage in personal transformational paths leading toward more sustainable individual consumption. However, despite manifold theoretical connections and increased research activity in the field, the potentials of mindfulness for (E)SC remain a scarcely researched area (Rosenberg, 2004), even less so when it comes to intervention studies (Fischer et al., 2017).

The research and development project BiNKA (German acronym for education for sustainable consumption through mindfulness training) set out to empirically explore the question of a potential relationship between mindfulness and its prospective effects for sustainable consumption in an intervention study. Whether or not mindfulness *training* increases sustainable consumption in individuals and helps them to align their consumption attitudes with their actual behavior (thus closing the attitude-behavior-gap) was the second main research question. In order to address these questions, a consumer-specific mindfulness intervention, inspired by the well-researched Mindfulness-Bases-Stress-Reduction (MBSR, Kabat-Zinn, 1991) and enriched by selected ESC elements, was developed by the research team and practice partners. It was carried out with three target groups; secondary school students, university students and employees.

Data inquiry in the BiNKA project was directed both at answering aforementioned research questions and at exploring unforeseen effects of the specific mindfulness training on consumers. To attend to the complexity of combining those tasks and guarantee a holistic coverage of participants experiences, a mixed method design was chosen, including a pre-/post-/follow-up quantitative questionnaire survey and a qualitative in-depth interview study (n=25). Considering the specificities of the research agenda, isolated qualitative analytical approaches such as Content Analysis, Grounded Theory or hermeneutic approaches came along with significant shortcomings. To fit the pioneering character of the study and the complexity of the phenomenon under investigation, a combined analysis instrument was consequently designed.

The quantitative findings of the BiNKA project do not show a direct effect of the mindfulness training on consumer *behavior*. These results notwithstanding, the here-presented paper will demonstrate that such a training does indeed show promising impacts on individual's relation to consumption. The qualitative investigation provides empirical evidence that the BiNKA intervention led people to sharpen introspective access to inner states and processes, such as emotions, motivations and values. Also, the qualitative part of the BiNKA study indicates that participants hold a stronger awareness of the discrepancy between personal values and actual behavior as a consequence of course participation. Indeed, qualitative data

vindicated the quantitative findings that the training did not significantly influence consumer behavior of course attendees. However, it could provide evidence-based explanations why such effects might not have appeared and thus infer possible adaptations of the training for designing a more efficient consumer-focused mindfulness intervention.

In our presentation, we will discuss methodology and findings including possible adaptations for further development of the intervention.

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## Paper Session VI

### Real-world laboratories and SDGs

## **Real-world laboratories and SDGs**

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Despite decades of research, key challenges are still increasing. Parts of the science community reacts by debates on post-normal science, Mode2, social robust knowledge or transdisciplinary. These approaches are connected to the goal of a transformative role of science. Elements are linkages to real world problems, interdisciplinarity, co-production of knowledge by collaboration with practice. Over the last years, real-world laboratories (rwl) became key instruments, by which to generate transformative results and conduct transformative research. They show a high potential to achieve SDG. They ask fundamental questions regarding the role of researchers and how to design them in a way that enables the creation of innovations and the generation of far-reaching transformative results and the diffusion of innovations.

These are the dimensions we address. It reflects the approaches and experiences from projects intending to implement real world challenges – connected to the SDGs. This session is based on insights from ongoing research projects.

### **Structure of the session:**

1. Introduction on background/context (IÖW)
2. Oral presentations:
  - a. Dr. Jutta Deffner, Dr. Konrad Götz, Dr. Immanuel Stieß / (ISOE)
  - b. Dr. Christina West (Heidelberg University)
  - c. Prof. Mark Blaschitz (State Academy of Arts and Design)
  - d. Free slot for interesting submitted paper
  - e. General discussion

### **Abstract paper 1:**

#### **“Real-world laboratories and the role of the researchers” (ISOE)**

In the project “WohnMobil” rwl have been implemented to test the integration of shared services for mobility and housing based services into the business models of housing companies and initiatives. The objective is to investigate “the making of” innovative services and business models in housing companies and initiatives on sharing services at the place of living. The services focus mainly on the SDG on sustainable consumption and production and sustainable cities and communities.

After an intense period of transdisciplinary work with residents and housing companies, we are at a point to derive first conclusions for scaling up. The following points are reflected in our presentation:

We observe a multiplicity and contradicting roles, changing between the different process phases. Based on the rwl conducted in WohnMobil we

reflect on the roles and draw first conclusions. Another aspect is that all rwl are highly context specific. Success factors and hindrances but also differences of innovation processes have to be regarded, e.g. the comparison of the rwl in regard to similarities and context framing. The question is how validity out from the single cases can be defined. And how the interventions we initiated as scientists are legitimized with the aim to assess at the same time its impacts.

### **Abstract paper 2:**

#### **“Doing a New Urban Agenda: the Transversal City - Reflecting Concepts, Narratives and Research Agendas of Sustainability and Social Justice in Urban Development” (University Heidelberg)**

Since 2009 more than 50% of the global population lives in urbanized regions - these continuously growing agglomerations disproportionately contribute to the total economic growth. Therefore, the UN in their SDG11: “Sustainable Cities and Communities” urge for a new urban agenda to “make cities and human settlements inclusive, safe, resilient and sustainable”.

While the goals are thoroughly described, there is little mention of the “How?” – the processes to reach the SDG’s. Therefore, our focus is on urban processes, required to accomplish a transformation to sustainable urban development and social justice. Especially, the forms and routines how knowledge is produced need to be altered to cope with the increasing dynamics and complexity of urban life. Social justice can also be understood as a “Right to Knowledge Production”, leading to a much more radical rethinking of urban development (planning) paradigms. The question of the role, the “How?” and the legitimation of research agendas contributes to the concept of the “Transversal City”, developed for taking into consideration recent complexity in urban dynamics and focusses on co-design of research questions and co-production of knowledge between actors from research, politics, public administration, business e.g. and individuals in urban development processes.

Real-world labs for transformative research for sustainability offer chances and challenges - which will be discussed at the examples of two RealLabs in Heidelberg: “Urban Office – Sustainable Urban Development in the Knowledge Society” and “Decentralised Living”, project of the RealLab “Asylum Seekers in the Region Rhein-Neckar: Language Competences, Labour Market, Social Integration”, and of the recent pro RealLab initiative „Urban Innovation Center Heidelberg”.

### **Abstract paper 3:**

#### **“Space sharing by a real world laboratory approach” (Stuttgart State Academy of Art and Design)**

Growing urban regions show an increasing demand for usable space and built volume as more people live and work in cities. In addition, the specific

space demand have been increasing over the last decades as well and reached on average 45 m<sup>2</sup>/person for dwellings in Germany. These trends trigger an increasing cost of ground and space. The trend of space as an increasing valuable resource also impacts the social mix of space users and type of uses - if space is not affordable anymore for specific user groups then the urban social mix changes will transform. Moreover, this trend also impacts an increase of commuters from the suburbs to the city and therefore individual car traffic, carbon emissions and impact on urban quality.

The demand for additional space use increases, whilst cities are limited in growth without negative side effects on the economic, ecological and social scale. Furthermore, the density of space use declines – in contradiction to goals in sustainability and resource efficiency and sufficiency. This is an international, contemporary and popular issue in the development of modern urban agglomerations. The research project “Space Sharing” sets up the thesis that there is a positive potential of using built space more effectively. It is based on the circumstance that indoor space use intensity in a mixed use urban environment is generally low and that spaces rest unused in unoccupied time periods.

The project explores the tapping of underused spaces resources by increasing space use intensity by means of organizing space use by multiple users and use types. It is carried out by a transdisciplinary/interdisciplinary team of academic, institutional and business partners.

## **Real-world laboratories to transform the out-of-home catering sector in the direction of sustainability**

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**Introduction.** The NAHGAST project focuses on the development, provision and dissemination of concepts for sustainable production and consumption in the out-of-home catering sector. The overall goal is to stimulate, facilitate and encourage the sector’s transformation towards a more sustainable development, taking both, production of more sustainable dishes as well as consumers’ food choices into account.

In this paper we share insights from five different real-world laboratories with special focus on consumers` food choices. The goal is to compare for the first time the effects of different, sequential interventions (i) in the same setting and (ii) across out-of-home catering settings.

The experiments conducted with the practitioners are developed in an intensive discursive process which was based on a scientific literature review.

In the paper we present the results of the extensive literature review identifying personal and situational factors influencing food choices in out-of-home catering settings. The main section displays how the identified factors are investigated empirically by implementing selected interventions in various settings in the field. The results of these empirical investigations are discussed in the following part. The discussion of implications for future research in real-world scenarios, the transfer of the results towards different actors in the sector under investigation and the contribution of these real world laboratories to a sustainability transformation conclude the paper.

**Theoretical background.** Human nutrition plays an essential role in the sustainability discussion due to the impact caused by production, processing, distribution, consumption, and disposal of food and food waste. Consumers' food choices play a significant role in shaping these processes by generating demands for products with complex sustainability characteristics (German Advisory Council on Global Change, 2014; Goebel et al. 2015). As eating out-of-home is a rapidly growing market (Rückert-John et al., 2005; Nestlé, 2011) with 11.5 billion guests per year in Germany alone (BVE, 2016), a growing body of research coming from various fields like environmental psychology, economics and sustainability sciences focusses on mitigating the effects of this sector on sustainability issues (e.g. Honkanen et al., 2006; Goebel et al., 2015; Wahlen et al., 2012; Lorenz et al., 2016). Different approaches to shift consumers' food choices in out-of-home settings towards sustainability can be applied: (1) provide information on the sustainability performance of dishes, (2) nudge consumers, (3) offer participation opportunities. We aim to improve the sales of the most sustainable dish offered by different, sequential interventions deduced from these approaches.

**Methods.** So far, no research has aimed at comparing different interventions across settings and against each other in different settings. Different challenges, namely to get a sound data basis for comparison and an appropriate assessment tool to determine and compare dishes' environmental impact, are associated with this approach. Harmonized weekly menu plans and dishes are our step to solve the first issue. The development of an assessment tool is the second. As Engelmann et al. (2017a; b) argue science has not yet developed reliable instruments for measuring and benchmarking sustainability of food, which are available to end-consumers and businesses in the out-of-home catering.

The assessment tool was developed based on desk research, discussed in project workshops and expert meetings and tested with a number of about 100 dishes. It elaborates existing multi-criteria assessment methods as well as relevant research on selected issues within the four dimensions ecology, society, economy, and health (see Engelmann et al. 2017a; b). As a result, in NAHGAST all interventions are based on a sustainability assessment of dishes with indicators in these dimensions. Dishes are assessed in 11

categories such as stew, potato dishes, etc. typical for all of our practitioners. The intervention strategies chosen for real world application were selected in close collaboration with all stakeholders. Basis was a compilation of interventions described in scientific literature (Lorenz & Langen), expert meetings with the catering service providers and a focus group (Langen et al. 2017).

**Procedure.** Interventions take place in five different real-world out-of-home settings in four German cities between autumn 2016 and spring 2017. The settings include two company restaurants of which one is also open for the public, one clinical canteen, a university canteen, and a school canteen. By standardising dishes in different settings during baseline measurements and intervention weeks, we compare the effects of the same intervention in different settings and the effect of different, sequential interventions. The nudging interventions include changes in the choice architecture, e.g. improved visibility and accessibility of the most sustainable meals on the menu and at the counter (Campbell-Arvai et al., 2014; Just & Wansink, 2009; Levy et al., 2012; Rozin et al., 2011), as well as changing the names of offered dishes (Morizet et al., 2012). The information interventions test labelling formats also in combination with prompts in all settings while the participation approach focused on the school canteen. For creating flagship meals, recipes of the best-assessed meals out of the list of harmonized dishes have been optimized with respect to their sustainability performance.

Interventions last one week and take place with a temporal distance of six weeks each. They are evaluated using objective sales data as well as questionnaires for subjective factors and additional food waste observations.

**Results.** We examine the collected data to identify connections between personal determinants, characteristics of various settings, and effects of the different interventions with respect to our goal: the enhancement of the sustainability performance of nutrition out-of-home. We find different effects of different (types of) interventions and between the different settings: e.g. guests of the two workplace canteens react differently than students, pupils, and patients. Overall, we expect to find effects of interventions (sales of sustainable dishes to rise), which will help foster demand for sustainable dishes regardless of settings or personal factors.

**Conclusions.** Results are used to generate recommendations for a sustainability transformation in the out-of-home catering sector in general but also specific for the different settings through practical intervention methods targeting different consumer segments (school children, company staff, guests) as well as those involved in meal planning (kitchen staff, sourcing, marketing). Besides, theoretical implications for further research activities in this field are derived.

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## Paper Session VII

# **Pathways towards sustainability: innovations in management and the role of social relationships**

## **Transformation towards a sustainable economy by Davids or Goliaths? Driving forces and challenges for sustainable business practices in small vs. large companies**

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The 2030 Agenda for Sustainable Development, adopted by the UN General Assembly in 2015, calls for a collaborative partnership to “take the bold and transformative steps which are urgently needed to shift the world on to a sustainable and resilient path” (UN 2015). It outlines 17 so-called Sustainable Development Goals (SDGs) to “end poverty, protect the planet, and ensure prosperity for all” (UN 2016a). SDG 12 addresses the need to “ensure sustainable consumption and production patterns” (UN 2016b) worldwide, but particularly in the Global North. Targets under SDG 12 include the adoption of sustainable company practices and sustainability reporting, sustainable procurement, and the restructuring of taxation and subsidies (UN 2016c). Businesses are asked, inter alia, to design “solutions that can both enable and inspire individuals to lead more sustainable lifestyles” (UN 2016d). SDG 17 on “partnerships for the goals” emphasizes that a “successful sustainable development agenda requires partnerships between governments, the private sector and civil society” (UN 2016e).

A civil society movement addressing many of the issues covered by the SDGs outlined above is the so-called “Economy for the Common Good” (ECG), which aims at aligning economic activity more strongly with values such as ecological sustainability, social justice and democracy (Felber 2015). Companies, which play an important role in the movement, assess the extent to which they contribute to these values by publishing a so-called Common Good Balance Sheet. Participation in the ECG can be seen as a proxy for the transformative ambition of companies towards a more sustainable economy.

In line with the literature on sustainability transitions (e.g., Grin et al. 2010), the ECG can be seen as a social innovation with an explicit ambition to change the regime level. So far, much of the transitions literature focuses on innovative niches – mostly sociotechnical innovations (Geels/Schot 2010, Smith et al. 2010), but increasingly also grassroots or social innovations (Seyfang/Haxeltine 2012, Haxeltine et al. 2015) – and how these can influence or alter the regime level (Seyfang/Haxeltine 2012,

Avelino et al. 2016). Recently, the role of incumbents, i.e. large companies which can be conceptualized as regime actors, is also increasingly discussed. For example, authors examine incumbents' potentially ambivalent role, being able both to accelerate and to impede transformative change (Augenstein/Palzkill 2016), and see incumbents – also labelled as 'Greening Goliaths' – as complimentary to small, innovative firms – labelled as 'Emerging Davids' (Hockerts/Wüstenhagen 2010). In this paper, we focus on business actors at both the niche and regime levels and examine their company practices with regard to their potential contribution to a transformation towards a more sustainable economy.

For our empirical data, we draw on qualitative, semi-structured interviews with and the Common Good Balance Sheets of eleven small and medium sized ECG companies from Germany and Austria as well as from all economic sectors, covering the niche level. Additionally, concerning the regime level, we draw on case studies on the applicability of common good oriented indicators and practices in five large multinational enterprises from different industries headquartered in Germany. In workshops with representatives of these companies, we use a combination of visualised discussion technique, backcasting and focus group methodology.

Based on this data, we will give an empirical account regarding the following questions:

1. What specific practices contributing to sustainable production and consumption do we find, in the small ECG companies (on the niche level) and the large companies (on the regime level), respectively?
2. What enforces, drives or restrains more sustainable company practices of the niche and regime actors from their perspectives, respectively?
3. Concerning future developments, which changes in framework conditions, such as e.g. governmental policies, are seen as beneficial to steer their company practices into a more sustainable direction?

Concerning the first question, we find a number of practices the incumbents as well as the niche actors employ to reduce their ecological impact in production and to enable more sustainable consumption. Amongst others, they use eco-management systems and support their employees' environmentally friendly mobility. Some of the companies encourage sufficient consumer behaviour, e.g., by offering repairs or by producing only durable products with a long life-span. Differences between niche and regime actors occur e.g. regarding their finances: All small companies from our sample are customers of ethical, cooperatively-organised or local banks often focussing on socially and ecologically sustainable investments whereas the large companies claim the current capacity of these banks to be too small to serve their needs.

Secondly, companies in the niche and the regime are driven towards more sustainable practices for different reasons: While niche actors are predominantly intrinsically motivated to actively change society for the better and, hence, even accept fewer profits, regime actors rather react to changing demands and pressures within their competitive environments. In

one case, a new ecological orientation even became essential for the incumbent to survive a fundamental legislative change. However, both are restrained, inter alia, by an insufficient availability of ecological raw materials and (primary) products.

Thirdly, to strive towards a more sustainable orientation in the future, joint efforts and cooperation within an industry respectively among niche actors are regarded as key needs according to our study. While all companies declare that either regulatory pressure or a more conscious consumer behaviour is a necessary precondition for change, the companies in the niche, moreover, utter the need for a lobby to achieve legislative changes such as tax reductions for ecological forerunners.

## **Chances and risks of integrating sustainability-oriented employees in sustainability innovation processes**

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An increasing number of consumers is interested in sustainability issues. They are concerned about environmental and social problems and they try to contribute to a sustainable society by consuming more responsibly.

Consumers with a special interest in sustainability are often employees in companies (e.g. Muster/Schrader 2011). Thus, we define them as sustainability-oriented employees. Even though boundaries between working life and private life are increasingly blurring, both life spheres are still characterized by different framework conditions. While consumers have the freedom to translate their values into concrete action in their private life, sustainability-oriented employees might often feel restricted to live their values at the workplace, when they work for companies with a low sustainability performance.

Since sustainability-oriented employees possess fruitful experiences and values and are often motivated to integrate their experiences and values at the workplace, companies that try to improve their sustainability performance have been advised to promote them (e.g. Buhl et al. 2016; Schrader/Harrach 2013). However, the empirical basis for such an advice has been limited.

Within the research project "Integration of employees as consumers in sustainability innovation processes" ([www.imkon.de](http://www.imkon.de)) we suppose that the integration of sustainability-oriented employees in sustainability innovation processes can bring about positive effects for innovation management and human resource management. First, it has been assumed that sustainability-oriented employees, as "sustainable embedded lead users" are higher motivated, more creative and bring about better solutions. Second, it has been assumed that the integration of sustainability-oriented employees has positive effects regarding commitment, satisfaction and retention.

However, we have also anticipated possible negative effects. It can be assumed that sustainability-oriented employees have higher expectations and a concrete understanding concerning the sustainability innovation process and its outcome. If companies are not able or willing to meet those expectations, negative effects concerning commitment, satisfaction and retention could be provoked. We also assume that sustainability-oriented employees could be reluctant to participate in a formal and determined innovation process, since they might prefer creating and implementing ideas more independently. Moreover, corporate measures to integrate personal experiences and values could be perceived as an "exploitation" of private life with again negative effects for commitment or satisfaction. In order to validate our assumptions we have conducted employee surveys and qualitative interviews within six German companies.

In our presentation, we are going to illustrate the chances and risks of integrating sustainability-oriented employees in sustainability innovation processes. First, we present the theoretical background of sustainability-oriented employees. Second, we briefly outline the research context and the main research questions. Third, the empirical results are presented. Finally, we want to discuss our results with the audience.

#### **Literature:**

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### **Anti-consumption as a pathway to well-being: the role of social relationships**

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**Conceptual Framework and Research Questions.** Anti-consumption can play an important role in the context of the Sustainable Development Goals (SDGs). On the one hand, Balderjahn et al. (2013) describe the core of economically sustainable consumption as anti-consumption. Following Brown and Kasser (2005), anti-consumption positively affects the conservation of natural resources. Thus, anti-consumption can make a substantial contribution to fulfill "responsible consumption and production" (SDG12). On the other hand, initial research indicates positive effects of anti-consumption on personal well-being (e.g. Lee and Ahn 2016), which is, for example, attributable to lower indebtedness and lower dependence on

products (Seegebarth et al. 2016). Thereby, anti-consumption supports the achievement of SDG3 "good health and well-being". However, the link of anti-consumption and well-being is only examined to some extent. Especially reasons for varying effects on well-being are not investigated yet, but are of further interest for public and consumer policy. Therefore, this study aims to explore a) the direct effects of anti-consumption on well-being and b) the role of social relationships within this link, because anti-consumption practices are commonly described as collective actions or social movements.

In general, anti-consumption describes an attitude against consumption (Zavestoski 2002), which manifests itself in various practices. One practice is voluntary simplicity (Ballantine et al. 2011), which encompasses consuming less and valuing the possession of fewer goods and can be seen as a social movement (Alexander and Ussher 2012). Another practice is collaborative consumption, which contains activities like sharing and borrowing (Seegebarth et al. 2016), and fosters the social community (Belk 2014). Furthermore, anti-consumption comprises boycotts (Hutter and Hoffmann 2013) and consumerism resistance (Cherrier 2009). Both represent collective acts (Penaloza and Price 1993; Sen et al. 2001) where consumers reject the purchase of products because companies are deemed unethical (Friedman 1985), or because of general criticism against the (market-)system (Cherrier et al. 2011). The term well-being comprises subjective as well as psychological well-being (Keyes et al. 2002). In the specific field of anti-consumption, Seegebarth et al. (2016) and Iyer and Muncy (2016) show that individuals practicing anti-consumption for personal reasons indicate stronger feelings of different well-being facets. Following these works, we postulate a positive effect of anti-consumption on well-being.

Research has identified various determinants of well-being including different factors of social relationships like marital status (Lyubomirsky et al. 2005) or relationship quality (Saphire-Bernstein et al. 2013). As the aforementioned forms of anti-consumption are defined as collective actions or social movements, we postulate an important role of social relationships or of the human factor on the relationship between anti-consumption and well-being. Based on that, this study aims to examine whether the following factors moderate this relationship: willingness to use own resources (e.g. time, money) for social relationships, social support of family and friends, importance of existing relationships as well as building new relationships.

**Data and Preliminary Findings.** Data were collected in an online-questionnaire in February 2017 with 370 German students. Respondents were asked about all mentioned forms of anti-consumption, well-being and social relationships. With some exceptions, all constructs were measured by reliable and valid scales from literature. We use multiple regression analysis in SPSS with the macro PROCESS to analyze moderation effects.

Initial analyses concentrate on the relationship between boycott (BOY) and psychological well-being (PWB) and willingness to use own resources for social relationships (WILLING). Results show a) a positive significant effect of BOY on PWB ( $b = .115$ ;  $p < .05$ ) and b) a strong moderating effect of

WILLING on the BOY-PWB relationship ( $b = -.106$ ;  $p < .05$ ). A higher willingness to boycott enhances the psychological well-being. This effect is especially strong for those individuals who are characterized by a low willingness to use their resources for their social relationships. However, although the effect is particularly strong for this group (characterized by low WILLING), they do not reach the psychological well-being-level of those individuals with a high willingness to use their own resources for their social relationships. Overall, these findings give first evidence of significant interactions between social relationships and anti-consumption.

**Discussion.** Drawing on the findings, we have shown that SDG3 can be attained through anti-consumption and thus, a positive relationship between SDG12 and 3 exists. Furthermore, high willingness to use own resources for social relationships can be interpreted as a necessary precondition for a high psychological well-being drawn from boycott. It seems, that the role of communities or the human factor in anti-consumption practice is much greater than research has shown so far. Possibly, social participation in terms of symbolic anti-consumption (Hogg et al. 2009) is more important than rejecting consumption itself. The increasing individualization of our societies is in conflict with anti-consumption lifestyles and thus, with the fulfilment of SDGs, as it means that individuals are investing less and less in long-term relationships with their family members, relatives or neighbors (Bertmann 1996). By providing platforms for social exchange, politics can foster the precondition for a high well-being out of anti-consumption.

Further research is planned to explore the role of other aspects of social relationships (social support, importance of existing relationships and building new relationships) as well as other moderators (living conditions). Currently, data collection is extended to Poland, a strong growing economy in EU.

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*\* Only basic literature is given here; detailed references are available upon request*

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## Paper Session VIII

# **Innovation of food supply chains by designing sustainable food production and consumption systems**

## **Sustainability Assessment and Climate Change Resilience in Food Production and Supply (Project ILoNa - Innovative Logistics for Sustainable Lifestyles)**

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Regional impact scenarios of climate change show a high risk of supply deadlocks in food supply chains. Accordingly, there is an urgent demand for "integrated" and system related assessments and solutions taking into account related effects of resource scarcity as well as demographic change, interlinked demand shifts and accessibility in the exposed regions.

Considering the structures of supply systems and the fundamental pattern of sources and sinks, more complex interconnected substructures of sourcing, production, distribution and consumption as well as closed loops (the "supply chain") become highly necessary to be defined. To do so, Sustainable Supply Chain Management (SSCM) can fertilize the analysis of climate change impacts and risks/ sustainability gaps, corrections in operational economical/ industrial action fields, proactive counter measures as well as policy improvements.

A conceptual integration beyond the primary/agricultural sectors due to examination of critical supply chain system compartments and levels of service ("integrated food production and supply systems") should be carried out in respect to food security. Using System Dynamics modeling (SD) will open up perspectives for supply and value chain alternatives with a higher climate change resilience as well as operational efficiency and structural quality (climate friendliness). Thereafter, implications can be derived for concrete business and value chain innovations in terms of infrastructure development, business models, operations, cooperation and service management as well as determining transformational socioeconomic frameworks.

For creating systematic results a platform integrating various perspectives of the experts in the field has been established. During the series of meetings, the main actors, success factors, challenges and communication strategies have been identified for shaping a sustainable food supply chain using Participative System Mapping. Three parallel workshops have been conducted for three key points: "Choice of the Distribution Channel",

"Sharing Economy", and "Transparency in the supply chain". Summarizing the results of all the workshops, a business model has been developed using System Dynamics method. In general, System Dynamics is seen as a probate instrument to analyze problems with dynamic complexity in a wide range of settings. For that, firstly, a Causal Loop Diagram (CLD) has been conducted using all the parameters highlighted by the participants into a logical feedback mechanisms. Consumer with his lifestyles has been stressed on, assessing the relative attractiveness of the new model in comparison to the older one, the purpose of which was to gain new consumers for sustainable food supply chains. Later on, the CLD has been transformed into a Stock and Flow diagram, in order to simulate various scenarios. The central question was to answer to which price sustainable food supply chains may be organized, which would be acceptable for a wider range of consumer. This question has been answered during the other series of workshops, where innovative business models for sustainable food supply chains have been created using business canvas model.

## **Assessing consumer attitude towards sustainability regarding food logistics in combination with personality and shopping behavior**

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In their 2030 Agenda for Sustainable Development, the United Nations member states have adopted 17 Sustainable Development Goals (SDG) as part of a new sustainable development agenda (United Nations, 2015). According to the UN, the civil society is required to do their part just as the private sector and the governments are. Goal 12 discusses sustainable consumption and production patterns. From a psychological point of view, we have focused on the consumer's role within this goal. As consumption is a wide field, we have concentrated on grocery shopping. In order to know how to tackle today's problems, it is important to understand basic mechanisms. For this, we have addressed the following research questions (RQ):

**RQ 1. How can the consumer's attitude towards sustainability in a food-logistics context be assessed?**

**RQ 2. Do people with a positive attitude towards sustainability in this field also show a sustainable grocery shopping behavior?**

**RQ 3. What individual characteristics are beneficial and which ones are cumbersome in this regard? For RQ 1, we have developed a new questionnaire** about the individual attitude towards sustainability

regarding food logistics. An exploratory factor analysis revealed 2 factors with 4 items each, which are to be answered on a 6-point-Likert scale (1 = totally disagree; 6 = totally agree). The structure is as follows. **Factor 1** can be seen as a factor that describes a **strictly sustainable attitude** (sample item: "If a product I intend to buy was not stored and moved in an environmentally friendly manner, I decline to buy it."). **Factor 2** describes a **milder sustainable attitude**, but still with a preference for sustainable products (sample item: "I would prefer a product with environmentally friendly logistics to a comparable product."). **For RQ 2, we have formulated behavioral questions about shopping preferences.** These were to be answered on the basis of a frequency scale that allowed a quantitative data analysis (1 = never; 5 = always). **For RQ 3 we employed standardized questionnaires of personality constructs.** We selected those personality constructs that previous research has found to be relevant regarding sustainable attitudes. These were the Big 5 personality traits (see works by e.g. Hirsh, 2010; Kvasova, 2015; Luchs & Mooradian, 2012; Milfont & Sibley, 2012), materialism (see works by e.g. Kilbourne & Prickett, 2008), and delay discounting (see works by e.g. Gattig & Hendrickx, 2007). Delay discounting describes the subjective extent to which a future reward is worth less than an immediate reward, depending on the delay and the amount. Everybody has an individual discounting parameter that indicates how long a person is willing to wait for a certain reward (e.g. Kirby, Petry, & Bickel, 1999; Kirby & Marakovic, 1996). Preferring sooner smaller rewards to later larger rewards is a sign of impulsivity (Ainslie, 1975).

We invited a total of 149 participants to answer all of the above mentioned questions. The instruments we used were: first, the newly developed questionnaire about the attitude towards sustainability in a grocery-shopping context, second, questions about how often consumers shopped in organic supermarkets and discounters as well as how often they bought organic products and fair-trade products. Third, we employed standardized questionnaires to assess individual characteristics: the Big Five Inventory by Rammstedt and John (2007), the Material Values Scale (comprised of two factors) by Müller et al. (2013), and the Monetary Choice Questionnaire by Kirby et al. (1999) for assessing delay discounting.

To address the RQ, we investigated the relation between the extracted factors and questions about shopping behavior as well as individual personality traits. Regarding RQ 2, we found a positive correlation between the frequency of buying in organic supermarkets and both factors of the new questionnaire. Furthermore, we found a negative correlation between buying in discounters and both factors of the new questionnaire. Moreover, both the frequency of buying organic products and the frequency of buying fair-trade products correlate positively with both factors of the new sustainability questionnaire.

Regarding RQ 3, we found correlations between neuroticism and the milder attitude towards sustainability (factor 2). However, we found no correlations between any of the other Big 5 personality traits (extraversion, conscientiousness, agreeableness, openness to experience) and the new

questionnaire. Concerning materialism, Pearson's correlations revealed a negative relationship between both materialism factors and the milder attitude towards sustainability. We found a similar pattern for delay discounting: negative correlations between delay discounting and the milder attitude towards sustainability in a food-logistics context imply that individuals who are able to wait for a later larger reward have a more positive attitude towards sustainability in the context of grocery shopping.

Overall, the results suggest that first, **neuroticism, anti-materialism, and the ability to wait longer for rewards (i.e. low impulsiveness) are associated with a positive attitude towards sustainability in a food-logistics context.** An implication of this is that future campaigns should stress the immediate positive effect of a sustainable lifestyle more, so that not only consumers with low discounting-parameters are interested in sustainability. Second, **people with a positive attitude towards sustainability tend to prefer organic products, fair-trade products, organic supermarkets, and they tend to avoid discounters.** As a possible implication of this, one could discuss what kind of products should be offered in supermarkets. For instance, if non-organic products were gradually banned from supermarkets and discounters, not only those consumers with a positive attitude towards sustainability would buy organic products; instead, at some point, everybody would be forced to do so. This would help people to contribute towards the achievement of the SDG, especially those who do not know very much about this topic. Third, it is interesting to note that all standardized personality variables correlate with the milder sustainable attitude factor of the new questionnaire. The question of why they do not correlate with the strict sustainable attitude factor will be discussed. Future studies should use these findings to go beyond a correlative analysis and check possible mediation effects.

## **The resource nexus and a systemic approach to innovation in the food system**

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The water-energy-food nexus addresses the interlinkages across how societies use natural resources. The concept has been formulated as a response to "silo" thinking in traditional planning, where the provision of these resources had been treated separately. It emphasises that it is important to look at trade-offs and synergies in the use of resources a more integrated manner. The nexus can be defined as the set of context-specific, critical interlinkages between two or more natural resources used in socio-economic systems. Its novel narrative lies in addressing:

- Human security, a 'nexus on the ground,' and livelihoods of the one billion plus people living below the poverty line;
- Political security, mainly as tool for analysing conflicts related to natural resources within regions or across borders;

- The interlinkages across systems of provision.

This contribution shall give an overview about recent nexus thinking, based on substantial work that has been completed recently (nexus handbook Routledge 2017).

More specifically it shall address what are the main critical resource interlinkages to assess food chains towards achieving the SDGs. It will present findings on the use of water for food systems, the energy use, and the use of minerals fertilizers. Thus there are trade-offs that will need to be discussed in the SDG implementation: achieving zero hunger will require more water use, more energy use, and more use of mineral fertilizers, IF a nexus approach is not part of the SDG implementation.

As this is an issue requiring those systems of provision to change rather than a transformation of agriculture alone, we will discuss how future food supply chains could positively contribute to achieving the SDGs. We will introduce cases of what we call 'nexus eco-innovations', changes that addresses critical interlinkages of at least two resources, while not posing additional risks on others. Those cases are, inter alia, sanitation in the urban nexus, bio-digestion, tropical fruit waste valorisation.

Looking ahead we will make a snapshot on what foresight intelligence, scenario development and socio-ecologic innovations could address issues of sustainable farming, reducing food waste, managing fair trade, and sustainable resources by introducing two recent models, the Integrated Dynamic Assessment nexus model (IDA3) and a macro-economic model, UCL ENGAGE.

Finally we will conclude on how could governments and smart international incentive schemes enable consumers and shape market developments – open for a discussion with participants at our proposed session.

## 4PL strategy dynamics and supply chain responsibility – insights from three online food retailing cases

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**Introduction.** Logistic services are being continuously expanded and adapted in accordance with changed customer demands. Hereby, logistics service providers support the overall logistical planning of the system in terms of configuration and coordination of supply chain partners. Especially social issues (such as working conditions and wages) are questioning the producer and distributor business relations with the logistic industry significantly after scandals and public debates increased the logistical awareness of consumers. Consequently, the role of logistics service providers is today understood as a decisive determinant for the sustainability in supply chains. In the past, logistics services have been defined in purely monetary terms (e.g. Halldorsson and Skjott-Larsen, 2004). As concerns for the environment and social issues rise, logistics service providers' capabilities to facilitate sustainable practices in the supply chains are coming to the fore.

**Literature.** By now, the literature on sustainable logistical practices is still rather small (Mejías et al., 2016). In general, the literature encompasses all logistics management processes of transportation, warehousing and inventory management including the management of logistics service providers itself (Ciliberti et al., 2008). Despite the importance of *Corporate Social Responsibility* (CSR) in the logistics industry (so called *Logistics Social Responsibility* (LSR)), most of the existing studies address single logistics functions rather than providing cross-functional investigations (Ciliberti et al., 2008). Furthermore, research on CSR practices carried out by the focal company dominates the literature (Spence and Bourlakis, 2009) while logistics service providers rather play a passive role in adapting green processes. In the last years, social issues were addressed more intensively in a supply chain context stressing the importance of a supply chain wide implementation of CSR strategies (Andersen and Skojett-Larsen, 2009) and, for this reason, should be explicitly incorporated into the case studies. Although the so called *Supply Chain Responsibility* (SC Responsibility) does not take an explicit logistics service provider perspective, LSR can be seen as a subset of SC Responsibility. Particularly, the following research questions guided our case studies: *How can 4PL strategy dynamics support sustainable practices in the supply chain?*

**Case environment.** Within the food industry, customers create a dynamic environment through quickly adapting their consumption habits which currently characterized by a growing demand for sustainable produced food (Beske et al., 2014). In the literature, several authors already paid attention to local food supply chains and networks (e.g. Bosona and Gebresenbet, 2011). Although local production networks consisting of small farmer have sustainability potentials with regards to resource usage,

environmental friendliness and social standard assurance, a missing logistics professionalism prevents them from implementing further sustainable practices. Moreover, an insufficient integration of small decentral production units limits growth such that these business models remain in a niche. Furthermore, the missing broad effect hinders necessary investments in logistics infrastructure and more innovative distribution channels, allowing more competitiveness against conventional food supply chains. The studies focus the decentral production of (organic) food and its local distribution using online applications.

**Scope of the study.** In order to analyze these interdependencies systematically, the scope of the study was narrowed to the Last Mile logistics responsibility, since the Last Mile serves as “meeting point” of logistics services and consumer behavior. In the literature on sustainable Last Mile strategies (e.g. Bosona and Gebresenbet, 2011; Validi et al., 2014), CO<sub>2</sub> emissions as indicator play a major role so far. Here, the Last Mile is seen as the most expensive part of the entire logistics SC (Schliwa et al., 2015) and, at the same time, is accountable for a large proportion of total CO<sub>2</sub> emissions (Edwards et al., 2011). Furthermore, the Last Mile is considered to be one of the most complex units of a SC. This complexity is generated by tight delivery time windows and a growing number of small orders which have to be delivered to rural areas (Kull et al., 2007; Punakivi et al., 2001). With regards to physical distribution services in the Last Mile, several authors emphasize indicators based on consumer wishes and judgments (as defined by Eisenhardt and Martin, 2000). For instance, Rabinovich and Bailey (2004) developed a theoretical framework for physical distribution service quality in a general online retailing context. Others, like Punakivi et al. (2001) and Yrjölä (2001) examined different Last Mile configurations in online retailing in order to increase the economic profitability of such distribution channels explicitly considering consumer behavior. In contrast, the paper on hand analyzes promising Last Mile configurations from an integrated sustainability point of view.

**Research Design.** Based on an interview outline developed with the help of a literature analysis, nine qualitative interviews were conducted. In qualitative research, interviews are used as methodology for knowledge production (Alvesson, 2003). Following Alvesson (2003), most of the literature about interviewing is concerned with the practice to use the interview as efficient and valid source of knowledge production. Particularly, three qualitative interviews were conducted with suppliers, logistics service providers and online platform operators of each case. Due to the complexity of qualitative interviews, careful interpretations of the interview results are necessary to analyze to which extent the findings serve the research purpose (Alvesson, 2003). In that line, an expert workshop was performed to compare the cases as well as secondary data was collected evaluating the interview results.

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## Paper Session IX

# Decoupling, Circular Economy and Sustainable Business Models

### **Applying a quantitative decoupling indicator as a methodology to evaluate the sustainability properties of an economy.**

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Measuring waste prevention is a complicated issue; to be able to assess the success of waste prevention policy measures, the measurement of 'waste that was never generated' is necessary. A standard measurement procedure that compares waste generation data over different years is not able to identify waste prevention due to the many other potential influencing factors involved. Decoupling offers a feasible alternative by focusing on the assumed causal relationship between the generated waste and its driving force, rather than on the prevention outcome. As successful waste prevention actions are expected to lead to decoupling, measuring decoupling relationships can provide insight into the degree to which the prevention actions are successful, even though decoupling is no synonym for waste prevention.

#### **What is decoupling?**

The concept of decoupling, as defined by OECD, indicates the breach of a causal relation between a driving force and the environmental impact it would generate. Driving forces can be multiple, all defined by their own metrics and indicators, such as economic growth expressed in GDP trends, consumption expressed in private consumption expenditure, demographic growth expressed in its own specific metrics. Environmental impacts can also be multifold, like the total generation of municipal waste for which demography may be the driving force, the average generation of municipal waste per capita, for which the consumption level may be the driving force, the total material consumption for which the economic growth may be the driving force. Decoupling describes how the environmental impact increases or decreases at a different (decoupled) speed compared to its driving force. This makes decoupling suitable as an indicator for the success of waste prevention initiatives.

Decoupling should not be restricted to waste or material related issues, as described in the examples above. The concept is applicable on each driving force and each associated environmental impact. Often decoupling is described in literature and in policy strategies by referring to a graphic representation of two diverging lines; one for the driving force and one for the environmental impact. This visual and to a certain limit subjective approach is, however, unfit to quantify decoupling or to define policy

targets based on decoupling. We therefore present a method to make the assessment of decoupling more objective. This can contribute to the development of methodological approaches and indicators for evaluating contributions to the sustainable economy.

## A decoupling indicator

Decoupling is defined as the ratio between the growth rate of the environmental pressure and the growth rate of the driving force, for values of a set of (for example five) preceding years.

Formula:

$$D_{(y-5) \rightarrow y} = \left( \frac{b(DF)_{(y-5) \rightarrow y}}{b(EP)_{(y-5) \rightarrow y}} \right)$$

With

$D_{(y-5) \rightarrow y}$ : the decoupling indicator for a time interval of five years from  $y-5$  to  $y$

$b(EP)_{(y-5) \rightarrow y}$ : the slope of the linear regression of the environmental pressure over the last five years | EP expressed as an index with  $y-5 = 100$

$b(DF)_{(y-5) \rightarrow y}$ : the slope of the linear regression of the driving force over the last five years | DF expressed as an index with  $y-5 = 100$

EP: environmental pressure, for example generation of municipal or household waste, database EUROSTAT [env\_wasmun].

DF: driving force, for example private consumption expenditure, database EUROSTAT [nama\_co3\_k].

## Typology of decoupling

The decoupling indicator points towards eight different scenarios (see graphs):

[figure]

Depending on the value of the decoupling indicator, the status can be described as:

- Absolute decoupling: the environmental pressure drops, even if the driving force increases.  $D > 2$
- Decoupling, the environmental pressure follows then driving force, but not completely.  $0 < D < 2$
- Coupling, environmental pressure and driving force are strictly linked, and evolve in the same way.  $D \approx 1$
- Reverse decoupling; environmental pressure evolves in a more prominent way than the driving force.  $D < 0$

## Decoupling of municipal waste generation from private consumption

The methodology has been tested in various projects for which an assessment was made of decoupling in the EU-28 between municipal waste generation and private consumption expenditures. The results show that municipal waste generation is clearly decoupled from private consumption expenditure. The decoupling indicator is 3,19 which indicates absolute decoupling.

[graph]

A further analysis on individual Member States shows a level of decoupling or absolute decoupling for all countries, except for Greece which shows negative decoupling. This may be caused by quickly decreasing

consumption expenditures while waste generation continues to increase. Eastern European Member States tend to show higher levels of decoupling, which may indicate that although consumption and economy are growing, purchasing power is still at a rather low level which makes people repair goods or keep them into function instead of quickly discarding them. Southern European Member States tend to show lower levels of decoupling than northern Member States, which may be caused by lower levels of waste awareness and waste prevention. No data on the Croatian driving force were available.

Belgium	4,02	absolute decoupling	Lithuania	1,83	decoupling
Bulgaria	7,47	absolute decoupling	Luxembourg	5,41	absolute decoupling
Czech Republic	0,40	decoupling	Hungary	2,10	absolute decoupling
Denmark	2,17	absolute decoupling	Malta	6,17	absolute decoupling
Germany	1,23	decoupling	Netherlands	2,97	absolute decoupling
Estonia	4,84	absolute decoupling	Austria	3,49	absolute decoupling
Ireland	4,16	absolute decoupling	Poland	4,62	absolute decoupling
Greece	-6,65	reverse decoupling	Portugal	2,95	absolute decoupling
Spain	3,11	absolute decoupling	Romania	8,22	absolute decoupling
France	2,36	absolute decoupling	Slovenia	3,67	absolute decoupling
Croatia	n/a	n/a	Slovakia	1,72	decoupling
Italy	2,51	absolute decoupling	Finland	3,40	absolute decoupling
Cyprus	2,81	absolute decoupling	Sweden	6,04	absolute decoupling
Latvia	0,45	decoupling	United Kingdom	6,33	absolute decoupling

[map]

## Conclusion

The description of decoupling could be harmonised by using a quantifiable indicator. This allows to discern between distinct levels of decoupling, and could thus enhance the debate on environmental performance. The proposed formula and approach allow for such a harmonisation. Therefore, decoupling can be used to set waste policy targets and benchmark environmental performance. The formula has the flexibility for using various driving forces and environmental pressures, as long as data in sufficient time series is available.

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## **Circular business model innovation and experienced economic barriers in the construction sector: Experiences from Scandinavian frontrunners**

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In the next 30 years, the number of people living in urban areas is predicted to more than double, from 3.6 billion to nearly 7 billion. In the developing urban areas, 75% of the infrastructure needed by 2050 is still to be built (Global Infrastructure Basel 2014). This causes challenges to urban infrastructure and construction at unprecedented levels in human history. Clearly, one of these challenges is the exorbitant need for resources and the waste generation associated with building and construction projects. Already to date, from all industrial processes in the European Union (EU), cement and steel production – the two main pillars of the building industry – are responsible for half of the greenhouse gas (GHG) emissions. Moreover, construction and demolition projects generate about a third of the total waste in the EU, with a significant share being landfilled (Bio Intelligence et al. 2011). Reducing resource intensity and waste generation in the building and construction sector can thus be regarded pivotal to meet the United Nations Sustainable Development Goals (SDG) on sustainable production and consumption (goal 12). Especially, goal 12.2 (the sustainable management and efficiency use of natural resources) and goal 12.5 (the reduction of waste generation through prevention, reduction, recycling, and reuse) will depend on concerted efforts to innovate current building practices to increase resource efficiency.

An increasingly recognized approach to reduce resource consumption and waste generation in the industrial system is the concept of a circular economy (Yuan et al. 2006; Ghisellini et al. 2016). In a circular economy, products, components and materials are envisioned to be circulated at their highest utility and value possible, while minimizing virgin material input and material leakages (Stahel 1994). As identified in a recent report by the Ellen MacArthur Foundation, the building sector can be considered as one of three high-potential sectors to seize the economic and environmental benefits from implementing a circular economic system (EllenMacArthurFoundation 2017). Adopting circular practices in the building sector would include to prolong the useful life of buildings, reuse components and materials, and favour secondary materials over virgin materials. While this has potential to retain the embedded economic and environmental value, it requires a holistic change in the current design and management of buildings. Practices as using secondary, recyclable, and non-toxic materials, as well as adapting, rebuilding and reusing buildings need to become mainstream and economically viable (BAMB 2016; EllenMacArthurFoundation 2017).

To advance such systemic shift, circular business models are identified as a key enabler to diffuse circular practices in the private sector (Planing 2015). Circular business models are regarded to reconcile commercial value creation with reducing resource intensity through innovating how a

company creates deliver and captures value around a resource efficient and closed-loop offer (Bocken et al. 2016; Whalen and Nussholz 2016). Yet, companies in the building sector that want to innovate their business model to realize resource efficient and circular practices face a number of generic challenges (BAMB 2016). For instance, the difficulty to arrange take-back of components and materials as buildings typically have an exceptionally long lifetime, during which they undergo changes in ownership, functions and use patterns. Compared to other sectors, there is little standardisation of design and component use and many priorities in terms of delivering the built environment exist (e.g. affordability, health, safety, and reducing energy consumption)(BAMB 2016; Durmisevic 2006). Moreover, value chains from commissioning to decommissioning are characterised by a larger number of actors with diverse roles and interests. This requires strong collaborative efforts among actors to maintain embedded value. Thus, to realize diffusion of circular practice, a systemic change along the value chain is pivotal, with all actors at each stage innovating their business model to contribute to resource efficiency and closed loops.

Despite the environmental and economic potential of circular practices in the building sector, knowledge on the specific challenges for companies is still underexplored. Recent investigations in the field show that the majority of barriers is of commercial nature (BAMB 2016; EllenMacArthurFoundation 2017). These include for instance the risks related to longer investment payback times when business models are used that are service based; a lack for structuring projects that link investments to the benefits realised in urban developments; or costly disassembly processes compared to demolition (BAMB 2016; EllenMacArthurFoundation 2017). Yet, to this date no holistic overview on the bottlenecks throughout the value chain is available. Depending on the value chain position and business model operated, different barriers impede effective business model innovation. As only the value chain as whole can move towards more circularity, it is only through such holistic understanding of the diversity of barriers - and where these occur exactly - that these can be addressed effectively and a systemic transition initiated (BAMB 2016).

To attend to this knowledge gap, this research investigated front-runner companies along the building value chain that have innovated their business model to implement circular practices. The research was undertaken via a literature review on circular business model innovation in the building sector and potential commercial barriers. Three snapshot case studies of circular business models at different value chain stages studied and discussed in light of their experienced barriers. For case studies, the Swedish and Danish context was selected due to its longstanding tradition of innovative business models, and strong government support to resource initiatives. Findings include an overview on possible business model innovation at the various steps of the building value chain and their experienced barriers. While some barriers are generic, others are specific to the value chain position. Recommendations are provided, which business model innovations as well as political framework conditions could remove barriers to enable the diffusion of more circular practices in the building sector.



## **Recycling of Steel, Aluminium, Paper and Glas and their Energy-Economic Scope**

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Recycling as part of the overall concept of a 'circular economy' becomes ever more important as a topic of discourse with respect to issues of climate mitigation, resource efficiency and regarding the nexus of responsible consumption and production (SDG 12) patterns. Recycling also becomes ever more significant given a growing global consumer class that seeks to achieve material-rich lifestyles comparable to those prevailing in industrialized countries and given a growing anthropogenic stock of resources incorporated in infrastructure and capital goods.

Recycling reduces demand for scarce primary raw materials and keeps materials in the value chain which would otherwise be wasted. Recycling reduces energy use and greenhouse gas emissions related to extracting and processing of raw materials and regarding the deposition of waste. Recycling may also contribute to securing the raw material supply that is required for key future technologies of decarbonisation (e.g. renewable energy technologies, battery electric vehicles). Numerous political agendas stress the importance of recycling as an element of a strategy towards a resource and material efficient economy arguing in favor of major socio-economic and environmental benefits. In contrast to the broad discourse on recycling as part of a circular or green economy concept stands the empirical basis on recycling impacts in terms of value added, employment, energy and greenhouse gas emissions saved. For instance, the contributions of the recycling industry to economic growth and employment are not quantified and therefore do not constitute established statistical parameters. In Austria, recycling is an integral part of the statistics of the environmental goods and service sector but the contribution of the recycling branch to employment and value added is not quantified separately.

The proposed paper is an explorative study and examines the macroeconomic effects of current recycling and reusing secondary raw materials for four major groups of substances in Austria, namely iron and steel, aluminium, paper and glass. In particular, net employment, income and output as well as environmental impacts in terms of global energy use and CO<sub>2</sub> emissions saved are quantified on newly collated data on material flows.

We model the impacts by using the WIFO.DYNK (Dynamic New Keynesian) model. WIFO.DYNK is a dynamic macroeconomic multi-sector model based on supply and use tables that covers the interlinkages between several industry branches. The DYNK model also captures structural change driven by technological change and demand as well as economy-wide repercussions (e.g. indirect effects). For the purpose of the present study WIFO.DYNK was extended to link detailed information on (primary and secondary) technologies in recycling and production. Physical material flow data was integrated into the data structure. This includes the integration of

data on primary and secondary production processes, in particular the material-specific (value-based) shares of resource and energy input, wages and capital in production. The physical material flow data of the primary and secondary production, which were provided by the Austrian Environment Agency, were converted into monetary flows using market prices and transferred to the model structure. The data were attached to the data structure existing in WIFO.DYNK and the existing production functions were expanded correspondingly to reflect the substitution of recycled and non-recycled goods in factor input. Based on a comparison of the actual situation in 2014 with a counterfactual "no-recycling", the value creation and employment effects of the recycling of the individual substance groups were determined. Based on material flows and emission factors, the global CO<sub>2</sub> emissions saved for the same level of production were quantified.

The analysis shows that the recycling industry contributed a relevant share to the economic development in Austria in 2014. The overall effects of all substance groups show a net GDP effect of 0.52% or 1.7 billion €. Net employment amounts to 14,759 employees or 0.38% of total employment. The largest economic effect is due to the recycling of the analyzed metals (iron and steel, aluminum), followed by paper. The recycling of glass has a comparatively low economic effect because the economic effects of recycling are generally more pronounced the more dependent the economy is on raw material imports and the higher the price of imported raw materials. This is reflected most in metals as the main driving force behind recycling. Here, relatively high prices characterize primary and secondary raw materials and Austria shows a net import position for these raw materials. The recycling of locally collected or traded and then processed metal scrap already contributes significantly to the substitution of primary raw material imports and creates additional employment and added value. Also in the area of global GHG reduction, recycling of the two metals shows the greatest potential (7.2 MtCO<sub>2</sub>).

However, due to the substitution of primary raw material imports by secondary raw materials, domestic energy consumption may increase as a result of secondary production. But from a global perspective on climate mitigation and a regional economic perspective, this approach is advantageous because net global emissions are reduced and the local economy is triggered.

In terms of energy policy, there derives a weakness in national GHG accounting, which does not consider indirect emissions from imported goods, thus incentivizing energy-intensive imports. From this analysis the following conclusions may be drawn: recycling activities shall be extended to other (pricy) material groups (e.g. required for PV and wind installations etc.) and recycling shall be intensified in existing sectors in order to enhance global emission mitigation and regional environmentally-friendly production (and consumption). However, this requires a production policy that enables straightforward recycling of materials from the outset in contrast to using composite materials that are difficult to regain.

## **Regulation and regenerative eco-innovation: the case of extracted materials in the UK**

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To respond to the United Nation's Sustainable Development Goals, one target for policy makers is to stimulate eco-innovation through regulation. Regenerative eco-innovation is arguably the most important type of eco-innovation to address the pressing challenges of sustainable development. The aim of this paper is to explore the effectiveness of the regulatory framework to stimulate regenerative eco-innovation. This is especially relevant for the built environment, a sector that is highly regulated and where rates of innovation are typically slow. We combine a secondary analysis with an interview programme involving key sector stakeholders from the built environment sector in the UK. We extend and elaborate our understanding of regenerative eco-innovation in three ways: (1) the relationship between regulation and regenerative eco-innovation, including what constitutes 'quality' regulation in the context of regenerative development; (2) the regulatory roots of the inter-related multiactor regenerative eco-innovation process; and (3) the contextual conditions that hinder further diffusion of regenerative eco-innovation.

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### Paper Session X

## **On the importance of motivation and cultural change for realising a sustainable economy**

### **Involving green employees for eco-innovation development**

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Innovative solutions are often conjured as a key factor for companies to come closer to the goal of ecological sustainability. Furthermore, proactive eco-innovation activities can entail competitive advantages [1]. Companies are therefore well advised to tap any available source of innovation. However, although employees' innovative and environmental capacities have often been described, to date, their manifold potentials for eco-innovation processes have hardly been examined in detail. The recently introduced concept of employee-driven eco-innovation (EDEI) addresses this gap by describing ordinary employees' voluntary engagement in innovation activities that lead to environmental improvements [2]. In particular, green employees, who hold strong pro-environmental beliefs and values, seem promising in this regard [3]. Green employees are expected to

strive for introducing their private environmental attitudes, expertise and practices to their work environment. Due to their intrinsic motivation to protect the environment also at work, we expect green employees to be particularly inclined to proactively start eco-innovation projects [4]. Accordingly, in case a green employee is denied to transfer her private sustainability values to her work environment, she might perceive an inconsistency between her personal convictions and actual behavior options. Cognitive dissonance and inner conflicts resulting from a mismatch between personal and organizational values might lead to a decrease in employee satisfaction [5]. However, literature on employee-driven innovation (EDI) and organizational citizenship behavior for the environment (OCBE) so far does not distinguish between green, less green, or non-green employees. Accordingly, it is still unclear to what extent they actually differ from other employees regarding eco-innovation activities. Therefore, the overarching research questions guiding this paper are *To what extent are green employees more inclined to engage in EDEI activities than other employees? How does their pursuit to synchronize environmental behaviors between home and work settings influence their contribution to eco-innovation processes?*

To test our hypotheses, we conducted an online survey among employees of 6 German eco-pioneer companies. The process of case selection was not based on the requirement of ensuring a representative sample of German companies. Instead, it was opted for a strategic or purposeful selection [6] which means that cases were chosen based on the research team's expectations regarding the potential information richness [7]. We collected a total of 804 completed surveys. Of these, 188 were eliminated because participants did not answer all questions. We then focused the analyses on the remaining 616 respondents. We use a structural equation model to evaluate the effects of employees' green orientation on their engagement in EDEI activities in their work contexts. Furthermore, we use a mediation analysis to assess to what extent the effects of employees' personal characteristics (e.g. green orientation) are mediated by employee empowerment. Preliminary results indicate that employees who score high on the green scale have a stronger feeling of self-efficacy. We also find that green employees are more often involved in EDEI activities. In addition, the more green employees synchronize their private and work lives, the more they are active in eco-innovation activities. Based on these insights, we argue that green employees' involvement in eco-innovation processes can be advantageous for two main reasons. On the one hand, organizations do benefit from their green employees' comprehensive environmental expertise and skills. On the other hand, green employees are able to act out their environmental convictions and reach attitude-behavior-consistency between their private and their work lives.

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## Sustainable consumption and the need for economic and cultural change

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Sustainable consumption is often seen as changing individual behaviors or advancing small-scale experiments; however such initiatives have little chance without changing macro-level issues as the economic system, dominant institutions, technologies and culture. Sustainable consumption is embedded in consumer society, which needs to be conceptualized as a social construct, purposefully created by powerful social actors after WWII. This paper will reflect on recent advancements in sustainable consumption research as developed in a recent edited book[1] ; and also on two-way communication as developed in a recent report for UNEP[2] . The main conclusions from the report are that transformations to sustainable lifestyles are essential for reaching SDGs, especially SDG 12; that communication and education are essential but need to be a two-way dialogue between stakeholders: away from elite-framings of sustainability, towards understanding stakeholder issues and learning from small-scale experiments. The main argument as developed in the book follows below.

National economies in a growing number of countries are profoundly dependent on private consumption and on economic growth. Therefore we need a major systemic change: a different economy, change in key institutions, culture and social practices in which consumerism would play a significantly diminished role, the production sector focused more on services and public goods and less on consumer goods, and application of technological innovations in the service of less, rather than more, consumption.

This process would most likely be incremental, meaning a variety of small-scale initiatives in policy, business, and non-profit and civil society. If such initiatives are to become real agents of change they need to **have a directionality**, so that the social and technical learnings will converge in a consistent and powerful way. That necessitates that the proponents of such initiatives must keep in mind the broader context in which their projects operate. Four elements of this broader context are:

**Macroeconomics:** In the current economy national wealth as measured by GDP is largely created through private consumption. The price we pay for that is (1) ecologically unsustainable demand for energy and materials, and (2) lack of attention to the equity dimensions of this economic activity vis-a-vis the actual social needs and well-being. The questions are: Do initiatives contribute to the necessary shift toward an economy less dependent on consumption?

**The power of ideology.** The neoliberal ideology delegated the job of improving the well-being of people to the free market. In Karl Polanyi's words, it facilitated the disembedding the economy from society. The price we pay for it is growing inequalities in income, wealth, access to services, and in opportunities. The solution would be to **balance the market forces**

**with investments in public amenities and alternative forms of ownership**, such as cooperatives and others.

**The need to look at post-consumerism through a cultural lens:**

Culture **evolves together** with the underlying economic structures and institutions in a particular historical and geographic context. Take for example the cultural change that accompanied the rapid shift in the US, in the years following the WW II, from cities to suburbs. This created new values and beliefs: the understandings of what good life is in a democratic and prosperous society. This was driven by the need to find new markets for the enormously productive war-time industrial complex and to find employment for the returning war veterans. A **new cultural understanding of good life emerged**, grounded in consumerism.

**How to unleash the potential of technological innovations:** When innovations in information technology gave rise to the so-called sharing economy, there was an intense interest in these new economic forms as potential social change agents. The optimists hoped for a change in the culture of consumption and social relations to more solidaristic and communal forms and for less material consumption. But the power of free market ideology and incumbent institutions resulted in "platform-capitalism" rather than "sharing economy". However, the more socially-oriented variants have not disappeared: Cooperatively owned car sharing services, tool libraries, Makers' Spaces are established niche activities, and bike sharing programs have been fabulously successful world-wide. New technologies **can be channeled into** the service for social change but this needs to be a deliberate effort.

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How to create the conditions under which social and technical learning alters the mainstream? We need to recognize and take advantage of windows of opportunity. Erik Olin Wright argues that nurturing novel modes of social organization in the fractures of the dominant system, while not threatening the incumbent institutions and power relations, may provide the ground work for future more radical social transformations by providing the vision, social and technical learning, and building social capital.

What can provide such windows of opportunity? It could be social movements against, for example, growing unemployment and underemployment and the need to turn to the caring and educational sector for economic opportunities. *To draw again on Karl Polanyi, this would be a second movement emerging in response to the excesses of the first movement, namely, the free market.* Or it may come from protests from millennials who are interested in urban life but are priced out of the gentrifying cities. Or it could come from a challenge to the industrial food production system from the public health sector fighting against obesity and diabetes, or from an acute health disaster, such as another mad-cow disease outbreak, or from the environmental advocates concerned about the food production's externalities. Or it could come from the economic interests which see financial opportunities in retrofitting the failing deep suburbs in the US or in bringing economic life into the declining post-industrial cities. Or it could come from technological innovations, such as

self-driving cars, which might make suburban garages obsolete and might facilitate the re-examination of land-use policies.

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[2] P Vergragt et al (2016) *Fostering and Communicating Sustainable Lifestyles* <http://scorai.org/communicating-sustainable-lifestyles/>

## **Pro-environmental behavior: On the interplay of intrinsic motivations and external conditions**

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A key issue for ecological economics concerns the processes whereby people engage in ecologically responsible behavior and contribute to environmental quality even when that comes at a personal cost for a shared benefit.

This paper explores the relative impact of intrinsic motivation versus external conditions and economic incentives on eight pro-environmental behaviors (PEBs). It also investigates the influence on PEB of seemingly unrelated factors such as financial problems and attitudes towards the future.

Like human behavior in general, PEB is jointly determined by cognitive processes internal to the individual and by the external context that surrounds her. In the past, most studies, and consequently policy recommendations, have typically focused on one of these two aspects; favoring either educational interventions or alterations of external conditions through incentives or taxes (Fehr and Gintis, 2007; Guagnano et al., 1995; Turaga et al., 2010). However, these one-pronged approaches ignore the insights from the other perspective; any conditional effect that the variables in one approach may have on variables of the other; as well as interactions between them (Guagnano et al., 1995).

This paper proposes an integrated framework to address these shortcomings in support of two-pronged policies. It contributes to the understanding of the conditions under which external factors are conducive of PEB, and when providing external incentives—such as the provision of monetary incentives and green infrastructures— can be effective.

Using a dataset measuring PEBs and environmental attitudes in the European Union's 28 member states, it represents the first empirical test where the interaction of intrinsic and external factors is considered on a wide set of countries. Previous studies have been limited to case studies and field experiments, which restricted the potential applicability of their findings to the particular socio-cultural context involved.

Findings suggest that both intrinsic motivation and external conditions positively contributed to the likelihood that an individual behaved PE. Yet,

among the two, intrinsic motivation, —as measured by an individual's norm recognition, ascription of responsibility and awareness of consequences proxies—, dominates over external conditions. This finding was consistent across the eight PEBs examined. In particular, individual ascription of responsibility for the environment appears to be an essential precondition for the individual to respond positively to external incentives: e.g., less prone to negative influences (such as economic constraints) and more receptive to enabling conditions (such as the availability of economic rewards). Guagnano et al. (1995) proposed that intrinsic motivation can predict behavior outside of extreme external conditions (positive or negative); symmetrically, this paper analyzes the limits of external incentives and suggests that they can only be effective in promoting PEB on individuals who have a minimum level of intrinsic motivation. The considerations above lead us to conclude that a policy mix combining both intrinsic and extrinsic incentives is needed to secure a high observance rate of PEBs in the population. Raising intrinsic motivation through education and the perception that observance of the norm is dominant should in the long term decrease the number of non-intrinsically motivated individuals (i.e. defectors). Meanwhile, in the short term, improving external conditions will likely facilitate norm observance among those who are already motivated above a minimum threshold.

The framework proposed goes beyond directly related factors such as attitudes towards the environment or incentives to behave pro-environmentally (PE). Studies suggest that the activation of a norm into behavior also depends on the salience of such norm in a particular situation (Cialdini et al., 2006). An individual's ability to focus on environmental norms could for example be negatively affected by other more pressing preoccupations such as financial constraints. The paper demonstrates that pressing economic preoccupations can distract the individual from behaving pro-environmentally, even when the PEB observed is cost neutral. In this case, reframing the choice context into economic terms —by attaching an economic value to the behavior— can be successful in repairing this "loss of focus". Although a thorough test of the often-cited motivation crowding out effect is not the scope of this paper, it can be noted that, providing an economic incentive to recycle (e.g., as implied by a Bottle Bill legislation) did not decrease recycling rates, but rather increased it. Additionally, the economic incentive was effective only in individuals with a medium to high personal commitment (e.g., ascription to responsibility) to act PEB, supposedly because the economic payoff is generally too small to be even noticed by people who do not minimally commit towards the environment. Thus, the evidence collected in this paper suggests that monetary incentives did not crowd out moral motivation but positively interacted with it.

Additionally, since PEB implies a cost today for increased environmental quality tomorrow, future environmental quality might be more salient to individuals that do not discount future outcomes too much. Thus, through a series of indicators measuring respondents' attitudes towards the future, this paper investigated whether more future oriented individuals behave more PE. More specifically, we tested whether an individual who has i) a

personal stake into the future —i.e. is a parent—; ii) an optimist attitude towards it; or iii) a more long term oriented mindset —i.e. as proxied by the grammatical structure of future tense in her native language— is more likely to act PE[1]. These indicators supported the hypothesis that individuals who have a stake into the future; have a more positive attitude towards it; and have a more future oriented mindset are more likely to adopt a higher number of PEBs. Linking attitudes towards the future and a person's financial preoccupations with PEB is a novel attempt in the literature.

The wider significance of these results for environmental policy is discussed.

[1]Chen (2013) and later Chen et al., (2015) and Guin, (2015) proposed that the primary language that an individual speaks correlates with the likelihood that she will engage in future oriented behavior. The use of language as proxy for measuring cultural differences is frequent in the literature (Ginsburgh and Weber, 2014).

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## Paper Session XI

### **Public discourse, perceptions and acceptance of sustainable economy issues**

#### **Perception of sustainability activities of small and medium-sized enterprises by citizens. A regional case study in a rural area in Germany.**

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Transition processes towards a sustainable economy need to integrate many different actors. In order to motivate small and medium-sized enterprises (SME) to act more sustainably it can be very important to show that social and ecological activities are appreciated by the local citizens. In this article, we will focus on the question if and how citizens in rural areas perceive social and ecological activities of regional enterprises. We therefore approached 1,000 households – selected by the random route method – and interviewed personally or via telephone in the administrative district of Steinfurt (North Rhine-Westphalia, Germany). The first results of this explorative study show that less than one fifth of the interviewees feel well-informed about the social and ecological activities of regional SME. This points towards a lack of information that could be tackled by more communication. Especially social activities for employees – such as flexible working models or workplace healthcare promotion – are considered to be very relevant among a majority of the interviewees. In the ecological field, a majority favors local enterprises to take action in order to prevent

environmental damage in the surrounding area. Furthermore, citizens underline the role of the local economy in regard to establishing and maintaining employment for a sustainable development of the region. There are different possibilities how social and ecological activities of SME can be better communicated inside a region, which will be also addressed in this article.

## **Consumer discourses on meat consumption – recommendations for alternative approaches to more ethical poultry production in Germany?**

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The successful implementation of the sustainable development goals (SDGs) requires that they are embedded within business and society. However, in the case of food especially the achievement of SDG 12 on sustainable consumption is challenged by the intention-behaviour-gap. It is often empirically confirmed and discussed as a main barrier for the development of more sustainable food systems e.g. in the case of more animal welfare based meat consumption. At the same time, countries like Germany have seen intensive societal discourses in the last years about sustainable consumption, e.g. on “good” food; where paleo, vegetarian or vegan lifestyle are promoted; but also more animal welfare products. From the perspective of the French economy of conventions these discourses can be conceptualised as potentially emerging new orders of justification of quality attributes for a more sustainable food production and consumption. In practice, however, entrepreneurs or farmer initiatives engaged or willing to engage in a more ethical animal production, face various challenges on how to identify and assess the actual market potential and willingness to pay of possible target groups. This causes high uncertainties and is therefore a critical lack of orientation in innovation processes. Knowledge about those changes of conventions are essential to develop an appropriate sustainability marketing and communication strategy, for technological and social innovations allowing to take entrepreneurial advantage of these market opportunities. The persisting gap between actual consumption behavior and discourse intensity can be contextualised on the example of poultry production and consumption. Currently, different German initiatives strive to solve sustainability challenges of chicken production, such as extinction of male chicklets in egg laying hybrids, health and behavior problems by different technological (mobile barns), breeding (dual purpose breeds) or organizational (cooperative raising of male egg hybrids) approaches. All of them face the difficulty that they lack knowledge on the actual market potential and the resources to generate information on how to communicate the alternative approaches to consumers for effective scaling and diffusion. Our study of consumer discourses on meat consumption with a focus on poultry departs from the example case of the dual purpose breed initiative *ei care*, introduced in 2011 in the Berlin-Brandenburg area.

The aim of our study was first to develop a methodological approach that allows to analyse and describe current public discourses on animal welfare (poultry) production as a basis to identify and describe possible target groups and to develop suitable marketing and communication strategies in the light of secondary data. Secondly, we aimed to derive methodological and practical conclusions how entrepreneurs and farmers can handle conflicting and contradicting discourses to better target their innovation activities.

Based on pre-existing target group segmentations in the food sector, six possible target groups for sustainable meat were identified: DINKS (Dual income, no kids), families, meat lovers, flexitarians, foodies and political consumers. Studies on the media habits of these target groups have shown that many Germans obtain information about food and nutrition via print media and that reporting about meat influences consumer attitudes about animal welfare and consumer behavior (Max-Rubner-Institut 2008, Cordts et al. 2014). Therefore a total of 61 newspapers and magazines were studied from 2011 to 2016 on animal production in Germany, especially on different animal welfare issues and animal welfare farming practices. Foucault's discourse analysis was operationalised to understand how the target groups' values affect their consumption of sustainable meat. Three articles per consumer group (18 total) were analysed in a detailed discourse analysis with MAXQDA. The described value attributes within the target groups were tested with secondary data to ensure the connectivity for marketing processes by considering the principles of sustainability marketing.

Six key value attributes were identified across the discourses in all groups that were stable across media, namely health, quality, transparency, ethics, environment and exclusivity. They were all relevant but of varying importance to each group and relate to different orders of justification of meat consumption. The match between the results of the discourse analysis and the *ei care* initiative's own brand attributes showed that demand for quality and freshness of produce were found in most of the target groups. Despite of overlaps between the target groups and their discourses, consumers might move from one group to the other (e.g. from flexitarian to foodie) and yet, stay loyal customers for ethical poultry products. The identification of underlying values which shape consumption patterns are not subject to prompt change. More communication possibilities beyond freshness and quality and also critical communication aspects were revealed.

Our research shows that it is useful to gather information from public discourses about consumption patterns to develop a basis for marketing strategies that support the diffusion of innovative sustainable products. Due to limited resources of SMEs and farmers for this methodological step for the development of a sustainability marketing, rather single parts following such a comprehensive analysis may be implementable with a narrower focus on regional newspapers and single target groups. Developing and implementing suitable marketing and communications strategies would be a next step of a sustainability marketing that aims to support the

implementation and diffusion of the SDGs in the field of more sustainable food systems.

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## **OBSTACLES TO SUSTAINABILITY – IN PUBLIC DISCOURSE (The Case of a Transitional Economy – Poland)**

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Requirements for the sustainability in economy and society should be tailored to a given country or region. General models which often dominate in academic discourse are an important part of necessary social knowledge (of decision makers, media, NGOs etc.). They are formulated in universally relevant categories; they constitute a kind of preamble of the sustainability ideology. This framework adopted by politicians in the form of the UN SDGs does not automatically ensure a smooth sustainability transformation. Implementation of the SDGs is dependent not only on diverse contexts of countries in question, but also on an evaluation of these goals (their feasibility, costs, urgency, prioritization etc.) and their mutual conditioning (not easy to recognize and forecast). Strategies and policies are not clearly evident and should be a subject of public debates (there is also a substantial diversity of type and level of democracy, public engagement, citizens' activism, media actions and the like) and public participation in determining them. This is not rarely overlooked in the Western scientific and political debates. A good case is such country as Poland with its transitional economy and changing political system. Poland's problems with sustainability transformation are substantially different from the highly developed Western democracies (which is not necessarily manifested in media and politics). This difference is often underestimated, in spite of that it explains well difficulties, failures and ineffectiveness on a way to sustainable development.

The paper will analyze the state of sustainability ideology (in education, media, politics, religion), strategies and policies (of government and businesses), human behaviors (attitudes, convictions, lifestyles, models of consumption). The analysis will be conducted to recognize and interpret the barriers and obstacles in order to join a sustainability wave propagated by the UN Agenda for Sustainable Development.

There are many factors, conditions and contexts, and activities (e.g. foreign businesses, trade unions) and actions of citizens (consumers, NGOs) to be investigated. The list is long. Below are exemplary issues (emerging partially, often biased, in media and political discourse):

- history and heritage (historical peripherization, role of religion, opposition to Pope Francis, political nationalism)
- path dependence (agriculture, industrial structure, coal mining , employment structure)
- shallow modernization hypothesis
- structural problems (domination of SMEs – not producing and not demanding innovation)
- clashes of different rationalities (government, business, civil society, national vs local, the EU integration and crisis)
- small and poor public sphere (overprivatization of environment – new regulations, saint property right)
- R&D sphere poorly financed (0,7% GDP) for decades (lack of interdisciplinarity), few innovations and patents, lack of eco-innovations, weak TA research
- education not environmentally-oriented; religious interpretation of life, subjugation of nature to man (Bible), animals as things
- public media conservative-controlled by government (environmentalists treated as public enemies – leftists, anarchists, vegetarians, animal laws defenders)
- media reporting “both sides” – pros and cons (not clear solution)
- traditional lifestyles – outgoing from the poverty, meat diet, waste not important, not really segregated, water not saved, quality of life not important
- priority of growth (and individualism) and its ideology and idea of becoming rich (environment just a source)
- lobbies (in parliament, in media, in trade unions) of old industries (coal, energy, hunting) and nomenclature management (anti-market)
- weak civil society (short traditions, lack of money)
- populist policies (further coal dependence, alternative energy not supported – presumption), nationalistic attitudes to the European integration and environmental international cooperation (e.g. in climate policy, CO2 emission, migration).

Considering the aforementioned issues one can construct a kind of descriptive model comprising them and investigate imaginatively all mutual feedbacks and influences. Such map of factors, mechanisms, conditions and contexts can be prospectively evaluated and transformed into a kind of impact model.

Then strategy and policy actions model-based on descriptions and impacts – can be set up with supplementing recommendations from SDGs program.

Of course some changes connected with the Poland’s transition and functioning within the EU should be especially underlined, not to mention international surroundings and generational change; globalization (role of

FDI and TNCs) and the Internet are to be included as values and/or challenges for the sustainability transformation. Parameters of time and costs accountability as well as socio-cultural dimensions, often disregarded in political discourse should be stressed to make this transformation real.

## **Barriers to acceptance of bio-based product innovations – Insights from a multi-method test of the influence of schema incongruity**

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**Purpose.** This study aims to analyse the influence of schema incongruity on the acceptance of bio-based product innovations. Numerous studies have shown that consumers evaluate new products using previous knowledge (Binsack, 2003). More precisely, they evaluate new products in comparison with a reference point, which is often represented by products they already know. A schema 'is a person's knowledge about some aspects of the environment'(Goldstein, 2011). It can be understood as a cluster of knowledge describing typical aspects of a concept it represents. Schemata are a main component in human knowledge processing, as they steer perception, simplify mental processes, and organize information memory (Kroeber-Riel and Gröppel-Klein, 2013). They influence the interpretation of perceived information as well as expectations and conclusions (Fiske and Linville, 1980). Hence, schemata affect the attitude people have towards new products and consequently are a crucial factor for the acceptance of bio-based product innovations (Ram and Sheth, 1989). Thus, it can be assumed that schemata influence the acceptance of bio-based product innovations.

Particularly important for schema-based product evaluations is the perceived congruity between the schema and the product (Mandler, 1982). In the case of schema congruity, the new object fits the schema and meets the individuals' expectations. This results in a positive evaluation. However, in the case of schema incongruity that cannot easily be resolved, a strong negative evaluation can be expected. In the context of new bio-based products, schema incongruity could arise, for instance, if the "bio" schema is not congruent with schema for main product attributes (e.g. the schema for professional cleaning/DIY tools which should be "strong", "powerful").

**Relevance for a sustainable economy.** Bioeconomy encompasses the production of renewable biological resources and their conversion into bio-based products with less environmental impact (e.g. bioplastics). Bio-based substitutes can at the same time help solve ecological problems while fostering company growth and contributing to a country's economic development (Beise and Rennings, 2005). To boost the bioeconomy, it is crucial that companies not only develop these products, but also successfully market them. However, companies are often confronted with poor product acceptance by end-consumers. This paper seeks to contribute to understanding and overcoming acceptance barriers by analysing product

acceptance of green product innovations using the schema theory. It is hypothesized that if associations with the core product attributes do not match the associations with environmentally friendly products, consumers are likely to experience schema incongruity.

**Methodological approach.** An online survey was conducted that included an Implicit Association Test (IAT), an experiment, and a questionnaire. The participants were invited to the survey through a panel, personal contacts, social networks, and a newsletter of a DIY store. In total, 985 respondents participated in the survey, out of which 651 completed the survey and answered all questions (dropout rate: 33%). The sample covers all important socio-demographic groups of German consumers that are responsible for the main purchases of their household above 16 years of age, but the distribution is not absolutely representative (older age groups are under- and persons with an university education are overrepresented). The mean age is 39.9 ( $\sigma=14.4$ ). The sample is rather evenly distributed in terms of gender: 52% female ( $n=337$ ), 43% male ( $n=278$ ), 5% did not specify their gender.

The IAT, developed by Greenwald *et al.* (1998), is an established tool from the field of psychology which is used to measure implicit associations between concepts. For this study, an IAT was used to demonstrate associations between conventional and environmentally friendly products with attributes of strength and gentleness. The IAT measured the reaction time which reflects the strength of the associations and thus, which characteristics are closely connected to the schemata (Segal, 1988).

Additionally, a bio-based product innovation (dowel made from renewable resources) was identified which might provoke schema incongruity and examined using an empirical setting. In the experiment, the level of schema incongruity (high/ moderate/ no incongruity) was manipulated by showing three different product advertisements. Each product presentation consisted of a picture of a package of dowels and a short product description. In the highly incongruent product presentation, the environmental benefit of the product was in the foreground, whereas the environmental aspects were less pronounced in the moderately incongruent stimulus.

**Preliminary findings.** *Product associations:* To test the assumption of the experiment that dowels are typically associated with strength, the survey participants were asked to write down three characteristics they associate with a dowel. Attributes like 'stability' (26%), 'durability' (24%), and 'strength' (21%) were most often named by the participants. Thus, it can be assumed that a dowel is a product associated with attributes like stability and strength and that it can be used for the experiment to test incongruity with environmental friendliness.

*Experiment:* After the participants had seen the product presentation, they were asked to evaluate the product regarding its stability and environmental friendliness. When looking at the overall MANOVA results, the perception of stability and environmental friendliness differed significantly between groups ( $L = 0.74$ ,  $F(4, 1296) = 53.58$ ,  $p = .000$ ). Furthermore, the analysis revealed a significant effect of the product presentation on perceived stability ( $F(2, 649) = 6.18$ ,  $p = .002$ ) and on

perceived environmental friendliness ( $F(2, 649) = 75.98, p = .000$ ). A Hochberg's GT2 post-hoc test confirmed that the group with the highly incongruent product presentation evaluated the product as significantly less stable than the group with the congruent product presentation ( $p = .001$ ).

**Practical implications.** The results show that environmentally friendly products are somewhat more strongly associated with 'gentle' than with 'strong'. There was also a significant effect of the product presentation on the perception of stability and environmental friendliness. Thus, to market bio-based product innovations, companies should consider that emphasizing environmental friendliness might weaken core product characteristics like strength. Hence, the product presentation should focus on information regarding core attributes and market sustainability as an additional product benefit.

*References are available upon request*

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## Paper Session XII

### **Integrating users and employees in sustainability innovation**

#### **Living Labs for user integration and sustainability: Mapping the German research infrastructure and experiences of user-integrated innovation in three Living Labs**

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The Living Lab concept has gained increasing recognition among innovation practitioners and within sustainability and transition science (Keyson et al., 2017; Ley et al. 2015; Liedtke et al., 2015; Keyson et al., 2013; Geibler et al., 2014). The concept supports a key requirement within applied sustainability science and transformative research - the involvement of non-academic actors into research processes in order to integrate best available knowledge, reconcile values and preferences and create ownership for problems and solution options (Lang et al., 2012). Sustainable Living Labs offer a structured open innovation processes integrating users (and other key stakeholders) in their socio-cultural environments (Liedtke et al. 2015), aiming to e.g. reduce resource use and carbon emissions, avoid risk of insufficient market acceptance or unexpected rebound effects of innovations

(Baedeker et al., 2014; Geibler et al., 2014; Buhl et al., 2017). However, the Living Lab concept still reveals a lack of clarity of the applied methods.

In this paper, we illustrate the Living Lab concept and the main results of its application within three practical case studies with specific focus on the user integration and its potential for sustainable innovation. Based on a literature review of different relevant Living Lab definitions and classifications (e.g. Erdmann and Berner, 2012; Geibler et al., 2014; Liedtke et al. 2015; Meurer et al. 2015; Masek, 2016), we derive a definition and key characteristics of Living Labs. The characteristics include their research setting and user involvement, sustainability reference, fields of application, type of ownership and degree of institutionalisation. Based on these characteristics, we suggest a new classification scheme for Living Labs as key elements of a transformative research infrastructure supporting a Green Economy and illustrate the classification by a mapping of more than 85 Living Labs in Germany. Furthermore, we present the results of a comparative analysis of three Living Lab innovation projects developing prototypes of technical assistance systems for sustainable user behaviour in the areas of housing, shopping and mobility. The three case studies and review have been conducted within the INNOLAB project in order to explore application of Living Lab methods and the potential of user integration for sustainable innovation and the green economy. The paper presents the summary of case study experiences and their evaluation based on surveys and workshops with the practitioners. The results and experiences will be discussed in light of the need for effective user engagement in Living Labs (e.g. to address rebound effects in early innovation phases) and for the contributions of Living Labs to the sustainable economy.

The paper is based on results of applied research within the project "Living Labs in the Green Economy: Real-world Innovations for User Integration and Sustainability" (INNOLAB, [www.innolab-livinglabs.de](http://www.innolab-livinglabs.de)). The paper is specifically based on work on the case studies (Krein et al, 2017, Kahl et al., 2017; and Meurer, forthcoming). The overall project aim is to demonstrate the potential of Living Labs in the Green Economy. Within the project innovations for assistance systems in the key areas of sustainable consumption ("living", "retail", "mobility") are developed. In three German Living Labs companies and research organizations create and test new prototypes and business models with specific involvement of users. The project is funded by the German Ministry of Education and Research under the framework programme "Research for Sustainable Development" (FONA) and within the funding programme „Sustainable Economy“. The grant number is 01UT1418A-D.

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## **Making and Sustainable Development: Potentialities and Conflicts**

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**Background.** In Germany, a variety of open creative makerspaces are recently emerging that could be subsumed under the term “open production” or “open labs”. These places cultivate new forms of collaborative work and provide access to the necessary technical infrastructure for decentralized production. Being social innovations themselves, the novel innovation practices of interacting with others and combining different knowledge backgrounds provide a breeding ground for new solutions that might be path-breaking, also in terms of sustainability.

The existing literature is barely able to describe and systemically classify the diversity of open workshops. From the search for technical solutions to the foundation of start-ups, from the empowerment and inclusion of socially disadvantaged people to experimenting with new production methods and lifestyles of sufficiency, or just a nerdish tech enthusiasm – the range of motivations for joining open workshops is large. Moreover, it remains unclear whether and how the diverse concepts of makerspaces are interrelated. Hence, this study aims for a disambiguation of concepts and provides a review of the phenomena of open workshops and the maker movement. What are the main dynamics that underlie the emergence of open workshops? Which types of open workshops can be distinguished? Who are the main stakeholders and what are their motivations?

**The landscape of makerspaces.** A comparison of open workshops shows a broad variety of forms with significantly different characteristics (Simons et al. 2016). Apart from different technological specializations (3D printing, laser cutting, electronics, woodworking, metalworking, bike repair, textile fabrication, etc.), there are relevant differences among the operators of open workshops and the communities of makers regarding their motives and values. Due to the heterogeneity of actors, the landscape of makerspaces is rather fragmented. It is characterized by many small and isolated bottom-up initiatives that often rely on relatively active communities but limited resources as regards time and money and by a few resource-endowed top-down approaches that aim to install open collaborative models of production, but usually lack access to the maker communities.

Expectations with regard to the future of value creation in open makerspaces are as great as they are contradictory. Open laboratories function as boundary objectives that inspire and provide projection screens for hopes and desires of many different stakeholders with conflicting

interests. As the public attention for makers grows, the movement's struggle for defining its core principles and ideological underpinnings and securing resources further intensifies. Within the affected policy fields, a potential point of reference might be the goal of socio-ecological sustainability, both in ecological terms (staying within the planetary boundaries) and social terms (creating social justice).

**Potentialities and conflicts.** The emergence of open workshops is part of broader societal transformation processes that entails the emergence of a new Do-It-Yourself culture and the general opening-up of production and innovation processes (Open Innovation). These changes disrupt the entrenched regime and bring about both uncertainties and potentialities for action. Will providing free access to technical infrastructures promulgate economic growth and sustainable development? Will decentralized production in open labs bring about green growth or support sufficiency-oriented lifestyles? Will a culture of commons-based peer production promote the exchange and free circulation of knowledge or rather create new forms of appropriation of intellectual property?

In order to reach the goals of sustainability, collective action of all societal actors and socio-technical innovations at different levels are vital. What role makerspaces will actually play in fostering sustainable development goals, such as the emergence of responsible consumption and production patterns, the future of work and education, individual empowerment and universal access to productive resources, as well as the build-up of resilient infrastructures and innovation capabilities, ultimately depends on which institutional arrangements will become dominant.

The study will point out the most important conflict lines and contradictions within the maker movement that are currently subject to negotiation. Based on the results of various stakeholder interviews and expert workshops, this study describes the main challenges that arise within open workshops and delineates the main conflicts and contradictions between different actors and stakeholders of the new maker movement:

- *Open access and inclusivity or personal fulfilment.* Openness needs to be created and involves costs. It may be in conflict with personal goals of self-fulfilment. Considerable resources need to be dedicated to making spaces, technical infrastructure and knowledge accessible to others. Otherwise a stable and long-term provision of the public service of inclusivity cannot be secured.
- *Commons-based or commercially oriented production.* Open workshops enable individuals to gain access to manufacturing technologies and facilitate an exchange of experiences and know-how. They are expected to contribute to sustainable development by creating niches where novel forms of cooperation and new approaches are tested. However, the deliberate contribution to commons may be put into question by market-oriented production activities.
- *Complete freedom of learning and experimentation or sustainability norms.* A basic principle and an important source of the creative

power of making is the unconditional individual freedom to experiment and learn by trial and error. Imposed normative rules of sustainability may be in conflict with this approach.

**Relevance of results.** The analysis of conflicts lines intends to have practical effects by informing the implementation, operation and long-term stability of makerspaces. It proposes networks and alliances between companies, collaborative production communities and political decision makers in order to enhance sustainability and innovation potentials.

## **The logics of employee-driven sustainable innovation**

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Eco-innovation has been widely recognized as the key driver for the sustainable transformation of businesses and society (Adams, Jeanrenaud, Bessant, Denyer, & Overy, 2015; Klewitz & Hansen, 2014). Recently, it has been emphasized that in order to harness their entire innovation potential, companies are well advised to integrate all employees into development processes for ecoinnovation (Buhl, Blazejewski, & Dittmer, 2016). The concept of employee-driven eco-innovation (EDEI) recognizes that eco-innovations occur not only in dedicated organizational niches such as the R&D-department but accidentally and informally emerge from job enactment and everyday practices in the workplace.

The EDEI concept emphasizes the importance of a supportive organizational context and employee empowerment for eco-innovation (Buhl et al., 2016) but so far lacks substantial empirical backing. Using qualitative data from seven companies engaging in eco-innovation processes, this paper explores how employee eco-innovation practices are embedded in, enabled and restraint by organizational contexts and how logics of innovation and sustainability impact employee practices of eco-innovation.

So far, research on the organizational context for employee eco-innovation is scarce. Regarding employee innovation, research in the EDI-framework has demonstrated the importance of leader support, employee autonomy, cooperation and innovation climate for innovation behavior (Høyrup, Hasse, Bonnafous-Boucher, Møller, & Lotz, 2012; Smith, Ulhøi, & Kesting, 2012). For employee sustainability or pro-environmental behavior, literature on OCBE (Boiral, 2009; Lamm, Tosti-Kharas, & King, 2014) focuses on the construct of perceived organizational support for the environment (POS-E), incorporating perceived organizational sustainability policies and supervisory support. While much of the literature either investigates employee innovation or pro-environmental behavior, Ramus (C. A. Ramus, 2002; C. A. Ramus, 2003) has argued that the organizational factors instrumental to encourage employee innovation in general are the same which encourage employee participation in eco-innovation processes.

In current research, the logics perspective has been shown to be useful for a holistic understanding of organizational contexts and practices and their

embeddedness in wider institutions, also regarding sustainability (De Clercq & Voronov, 2011). It provides a theoretical linkage between individual agency and practices and the structure of resources, routines and norms on the organizational and institutional level (Thornton & Ocasio, 2008). Building on work by Friedland and Alford (1991), Thornton and Ocasio (1999: 804) define logics as 'the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality.' Logics thus determine which behavior is considered adequate and legitimate in certain settings and situations (Spicer, 2006). The logics perspective integrates structural (e.g. resource distribution) as well as normative (e.g. beliefs and values) and symbolic (interpretations, meanings) dimensions.

Organizations are subject to multiple logics (Besharov & Smith, 2014; Pache & Santos, 2013; Smets, Jarzabkowski, Burke, & Spee, 2015) which might co-exist, oppose, dominate or complement each other. Regarding the logics of sustainability and innovation we might expect, for instance, that in some companies, practices, structures and understandings of innovation and sustainability are in conflict over resources (i.e. employee working time) while others might integrate sustainability and innovation logics so that employees routinely consider sustainability issues during all stages of innovation projects.

The paper delineates employee practices of eco-innovation and the embedding organizational logics. In particular, we seek to better understand whether logics of sustainability and innovation are complementary or competing in the sample organizations and how employees deal with the eventual tensions arising when practices of innovation dominate or are in conflict with legitimate demands for sustainable action. The paper draws from qualitative data on seven companies which have disclosed an interest in employee eco-innovation. Data was gathered in interviews, group discussion, document research as well as participant observation of eco-innovation workshops conducted in six of the seven case companies. Data gathering involved 'ordinary' employees as well as managers and experts (on employee engagement, innovation, corporate sustainability) in order to gain a broad insight into practices and dominant logics in each company. Data analysis is inductive and based on grounded theory principles since we were primarily interested in understanding the participants' perspectives on processes, routines, interpretations and rationalities regarding eco-innovation in their specific context.

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## Paper Session XIII

# The role of the SDGs in Sustainability Assessments

### Sustainability assessment in the social-ecological research for sustainable production and consumption between ideal and practice

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Sustainability assessment or sustainability evaluation is a major challenge in many contexts and so for every NaWi project. For the successful implementation of respective activities, a valid sustainability assessment measuring ecologic, social and economic effects is crucial, otherwise projects aiming at increasing sustainability performance of a sector, a company or households can hardly be managed purposefully. The decision what to assess, on which scale and for which reason, ought to be based on an intensive justification, balancing and bargaining process in which a number of different factors are considered.

The proposed paper aims at the exploration, reflection and comparative discussion of the experiences made in the research practice of the NaWi projects with respect to the decision making process for suitable approaches to sustainability assessment. The goal is, on the one hand, to elaborate a template for the systematization of sustainability assessment practices and to apply this template to the NaWi projects. On the other hand, the paper discusses different assessment approaches and their advantages and disadvantages.

In the NAHGAST project, for example, a sustainability assessment tool for meals has been developed and tested in five different catering settings. The assessment tool combines a selection of several sustainability indicators in the dimensions of ecology, health, social issues, and economy. Moreover, it integrates qualitative indicators (such as regionality, seasonality, etc.) as well as quantitative, impact-oriented indicators (such as carbon and material footprint), each related to estimated sustainable levels.

In the BiNKA project we developed a short self-report behavioral scale for the consumption areas of nutrition and clothes. The scale is based on the dice model of sustainable consumption behavior (Geiger, Fischer & Schrader, 2017) and considers ecological as well as socio-economic impacts in all three consumption phases: acquisition, usage and disposal. Behavioral items were chosen based on a similar mix of qualitative (regionality, seasonality) and quantitative (GHG emission, resource use) indicators employed in the NAHGAST project. Indicators for the socio-economic dimensions comprised fair working conditions, fair prices and health issues.

The TransKoll project aims at developing a process to implement a sustainability management in food SMEs and their supply chains, taking a shared-value approach in the sense of Porter & Kramer (2006). The first step in this process focusses on eliciting and prioritizing social impacts of companies in the food industry through internal stakeholder dialogues (hot spot, or materiality analysis (Whitehead 2016)). Results are used to derive respective measures, goals and indicators to transform current activities for the benefit of both the company and society. A mixed method approach including qualitative focus group discussions and hot spot analyses as well as in-depth interviews with managers, quantitative employee and supplier surveys is used to understand organizational and behavioral barriers to implementing a sustainability management.

As a result, there are indications and recommendations on the reflected decision-making process for choosing adequate approaches to sustainability assessment for researchers in social-ecological research on sustainable production and consumption.

Methodically, a two-step approach has been followed: in the first step, we mapped the employed assessment practices in all NaWi projects in stocktaking inventory. Key questions are:

- Which criteria, methods, and indicators are considered?
- What kind of object (process, enterprise, product, service) is reflected?
- Which levels (micro, meso, macro) are behind the selected procedures?

On the basis of the resulting mapping, selected case studies are examined in the second step in an in-depth study. The focus is on projects that have dealt with the sustainability assessment of individual behaviour or of products.

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## Using the SDGs for sustainability assessment of agri-food products

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**Objectives.** In September 2015 the United Nations (UN) adopted the Sustainable Development Goals (SDGs) (UN 2015). The SDGs are a holistic framework of goals for global sustainable development and have been adopted after a global participatory and political process. With the adoption of the SDGs a paradigm shift has been done: from setting targets for the further development of developing or least developed countries (Millennium Development Goals) to goals that cover all nations worldwide. To put the SDGs into action politics, companies, societies and scientists are called to contribute. For example, today an accepted assessment methodology to evaluate a product's contribution to sustainability is lacking. Therefore the aim of the present case study (Eberle&Schmid 2016) is to analyze how the SDGs can be used to assess an agri-foods product's sustainability and which indicators are adequate for this purpose. The case study is part of an ongoing research project, which develops a framework method to assess potential positive impacts of products and services (Beckmann et al. 2017).

**Methodology.** The chosen approach was to i) identify to which SDGs agri-food companies respectively their products can contribute to along the product's life cycle, ii) compile a selection of goals and sub-targets to which agri-food products could contribute to, and iii) define a set of indicators for the selected goals and sub-targets.

**Results.** The analysis of the 17 SDGs and their 169 sub-targets showed that agri-food products and companies cannot contribute to all of the targets, since not all SDGs address products or companies. For the analysis two cases have been defined in order to identify direct contributions of agri-food companies and their products to the SDGs:

Case 1(product/service itself contributes): the production process of the product resp. the offering of the service contributes directly along the life

cycle, e.g. through emissions or use of resources (including natural and human resources).

Case 2 (product/service contributes through the company's activities): the company producing the product resp. offering the service contributes, e.g. through the company's activities like anti-corruption, wages, investments etc.

All impacts that are caused by direct contributions of the product/service (cases 1 & 2) are defined as indirect contributions.

Considering the life-cycle of an agri-food product from cultivation/ fishery, animal husbandry, processing and packaging, transportation, use and end of life as well as activities of companies involved, 58 sub-targets have been identified to potentially be directly impacted. Potential direct contributions can be identified to sub-targets of 16 SDGs, except 'SDG 11: Make cities and human settlements inclusive, safe, resilient', since this case study's focus is on agri-food products. For all other SDGs agri-food products and companies can potentially contribute to the goal attainment.

In the following step, indicators were identified for each of the identified sub-targets. This resulted in a preliminary set of 62 indicators for agri-food products. However, targets may be measured by more than one indicator and an indicator may measure contributions to more than one target. In the agri-food indicator set, 23 indicators measure contributions which can be related to agri-food products themselves along their life-cycle (case 1). 39 indicators measure contributions to case 2, covering direct impacts of company activities. Social and economic topics are covered mostly by case 2 indicators, environmental aspects mainly by case 1 indicators.

**Discussion.** The SDGs address the most challenging issues and claim for the first time globally accepted goals for sustainable development, covering social, environmental, economic and governance-related issues. Therefore, they are an adequate value scale to assess also the contribution to sustainable development of products (Beckmann et al. 2017). However, not all sub-targets could be related to products and furthermore, also issues that rank – at least in European countries – high on the sustainability agenda, like e.g. animal welfare, are not addressed at all by the SDGs. These aspects will be discussed in the further development of the method. We are grateful for the project funding of the German Federal Ministry for Education and Research.

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## **Making Innovation work for Sustainable Development Goals: Sustainability orientation and assessment in innovation based on the SDG-Check**

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The innovations are crucial to address the global challenges of our society and have the potential to change production and consumption systems. In the light of clear planetary boundaries (Rockström et al., 2009, Steffen et al., 2015) and political goals such as the Sustainable Development Goals (SDGs, UN, 2015) various actors call for changes toward sustainability (e.g. Jacob et al., 2016, Jha et al., 2016). In order to exploit the sustainability potentials in an innovation process, it is necessary to define appropriate requirements that guide the innovation process and thus minimize or eliminate risks for sustainable development, including rebound effects (Buhl et al. 2017). Early phases of the innovation process are very important since there is an increased potential for adaptation and changes in the product and service design and changes in these early phases are less costly than changes in later phases. Further, with an increasing radicalness of an innovation, there is also the risk that the embeddedness of an innovation in individual, social or cultural contexts of use is not ensured (Clausen et al., 2011). The Sustainable Development Goals (SDGs), formulated by the United Nations (UN) in 2015 (UN, 2015) are universally relevant goals for a sustainable development and thus the basis for the requirements that sustainable innovations face in order to achieve this ambitious goals.

In this paper we describe a conceptual approach for sustainability orientation and assessment within innovation processes as well as the development of a tool for the sustainability orientation and assessment in early stages of innovation. The conceptual approach (Geibler et al., 2016) is based on a stage gate process (Cooper, 1990) with reference to the innovation readiness level Mankins (2009) and the Living Lab approach (Liedtke et al. 2015, Geibler et al., 2014), which enable user integration in innovation processes. The tool – the SDG check – aims to identify and integrate relevant sustainability aspects as early as possible in the innovation process. The SDG-Check has been developed based on the evaluation of the experiences and discussions with relevant stakeholders (Echternacht et al., 2016). The results and practical experiences from applying the SDG-Check as online survey tool within three different cases of innovation processes will be presented and discussed in light of the need for robust and practical sustainability assessments in transformative research and innovation processes.

The paper is based on results of applied research within the project "Living Labs in the Green Economy: Real-world Innovations for User Integration and Sustainability" (INNOLAB, [www.innolab-livinglabs.de](http://www.innolab-livinglabs.de)). Within the project the SDG Check has been applied in three innovation cases: Aiming for assistance systems in the key areas of sustainable consumption ("living", "retail", "mobility") three German Living Labs, companies, and research organizations have co-created and tested new prototypes of product service systems with specific involvement of users. The project is funded by the German Ministry of Education and Research under the framework programme "Research for Sustainable Development" (FONA) and within the funding programme „Sustainable Economy“. The grant number is 01UT1418A-D.

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## Paper Session XIV

# **The role of actors, technologies and framework conditions in transforming towards sustainability**

## **Transformative challenger and absorptive incumbents: Dissemination barriers for local social, ecological and solidarity-food economies and strategies to circumvent them**

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Under the concept of „Alternative Food Networks“ (AFN) a growing variety of local social, ecological and solidarity-oriented food enterprises is promising integrated, fair and sustainable value chains in the agrifood sector. They gain considerable public attention and are seen to hold the potential to foster some of the Sustainable Development Goals, such as improving food quality, security, sovereignty and justice, promoting healthy lives and well-being, resilient supply and sustainable innovations as well as favouring sustainable food practices in cities together with fair and climate friendly patterns of consumption, production and land use (*SDG 2, 3, 9, 11, 12, 13, 15*). Such enterprises like community supported agriculture, self-harvest farmland, food cooperatives or community gardens, to mention just a few, have been considered as social innovations (*Kirwan et al. 2013; Seyfang 2006; Grasseni et al. 2015*), which are transformative for those involved. They generate a plurality of forms of knowledge together with collective capacities and promote awareness and understanding of the links between local food and global sustainable development goals (*Smith & Seyfang 2013; White & Stirling 2013*). At the same time, critics have expressed concerns whether these initiatives will have an impact beyond protected niches and the middle class and what the role of place-based inequalities and environmental justice is within AFNs (*Jarosz 2008; Bean & Sharp 2011; Paddock 2016*).

Moreover, research into successful dissemination and growth of sustainable innovations indicates that the greatest challenges are in terms of spreading on the one hand *quantitatively* from niche milieus and markets to disseminate into mass markets, given food regimes and the everyday practices of large population groups. On the other hand, the *qualitative* dissemination in a direction coherent with sustainability goals, thus without the well-known rebound effects, is essential. Today, sustainable food practices for less and fair resource consumption actually do not fail because of missing offers or ideas, but due to insufficient demand, market acceptance and an inadequate integration in food systems, food policies and everyday food practices, rules and competencies (*Leach et al. 2012*;

*Hinrichs 2014*). It is well known that only the smallest part of all innovation processes is successful and these are namely those incremental ones which connect up easily to given (unsustainable) efficiency-oriented markets and expectations, do not require deviation from routinized practices and collective meaning and are introduced by market-proven firms.

Our research into AFNs, however, deals with radical food innovations which ask for profound changes in agrifood systems and related practices and which are fostered by new entrants, civil society groups and alternative networks. Their benefit is not easily perceived, they are often dependent from funding, voluntary commitment and corresponding learning, but rebound is less probable. It comes as no surprise that the distribution rates typical for these social, ecological and solidarity-oriented food enterprises are lower, more sluggish and complex. If however an acceptable level of demand can be reached, important incumbents step in and enforce defense strategies by the pioneers in order to prevent "greenwashing" and inappropriate dilution.

Against this background, the nascent-team has investigated in much detail what the transformative motivations and strategies of the company's founders in local social, ecological and solidarity-oriented food economies are and how they correspond to the expectations of their staff members, their users and clients. In this it became clear, that there is much more readiness for cooperation compared to the earlier environmental movement, both with the conventional agrifood sector and with various other actors and domains. At the same time, the focus is less on vertical business growth and a high identifiability of products and services but on far-reaching confidence-based partnerships and alliances, especially with actors from urban development, educational institutions and sense-making agencies from art and culture. Much importance is attached to a strategic occupation of urban space to become a kind of stage for transformative action. To raise public attention in times of changing media use, urban expectations and traditions concerning supplies of food, water and health are challenged by various events and strategies to uncover footprints and consequences of modern metabolisms. Overall, the measures intend to foster a plurality of gradual transformations, which in the eyes of our practice partners will only in the long run and in a cumulative mode result in a substantial, profound and sustainable change in society, which will not turn out to be a barely veiled continuation or reproduction of the given arrangement with its unsustainable rationalities.

Therefore, the enterprises highlight the requirement of corresponding co-evolutions that span the entire value creation process and its associated domains. They explore appropriate learning processes, cooperation modes and ways to support (cognitive, normative and moral) rule-adaptations in order to prevent their niche innovations from being changed by the dominant food regime. As they assume strong capitalist alliances between politics and food economy, they are looking for valuable strategies to offset unequal resources, to change given food understandings and expectations and to shift the current assortment of interests from below. The building of alternative economies together with powerful discourses and symbols and

the re-politicisation of food relations are considered to be the most powerful tools.

However, the absorptive capacity of incumbent actors should not be underestimated. All transformative strategies will only be successful, if they are capable of distinctively transport transformative orientations and practices, although the food industry has quickly learned to use the same symbols and narratives, as will be shown. Thus, the awareness of the urgency of charting pathways to sustainability has to be disseminated against politically accepted and partially supported attempts at capture in order to commercially exploit the transformative innovations of alternative food economies. Thus, it is part of our proposal to criticize the current abstraction of unequal power relations and the difficulty to deal with high desirability, complexity and uncertainty in much research into sustainable innovation and transformation, which masks out dominant development processes under the name of "green economy" and re-inforces counterproductive „whishful thinking" (*Murphy 2015: 317*).

### **Key variables and success factors in transformations towards a sustainable economy: evidence from 21 case studies in the fields of mobility, energy and resources**

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An increasing volume of research on sustainability transformations has been shaping our understanding of transformation processes towards ecologically and socially sustainable economies and societies in recent years. Work on socio-technical transitions (i.e. Rip, Kemp 1998; Geels 2002, 2011; Geels et al. 2016) and transition management (Rotmans et al. 2001; Kemp et al. 2007; Loorbach 2010) established important and widely used heuristics, such as the multi-level perspective (MLP) and the four phases or the "s-curve" of transition development (ibid.), as well as governance and policy approaches, incl. strategic niche management and the distinction between strategic, tactical, operational and reflexive elements of transition governance (Kemp et al. 2007; Loorbach 2010). Other authors have – inter alia – concentrated on path dependencies and lock-ins (Unruh 2000; Garud et al. 2010; Vergne, Durand 2010; Clausen, Fichter 2016) and innovation systems (Jacobsson, Bergek 2011).

Most of these contributions however tend to be of conceptual nature and/or are based on the analysis of single sectors/cases. Cross-sectoral analyses of sustainability transformations based on empirical data in a broader set of cases have only rarely been undertaken. Likewise, there exists a gap between birds-eye-view theoretical frameworks such as MLP (Geels 2011), which draw on the analysis of socio-technical systems and actor-centered, action-oriented approaches, which draw on theories from management studies, business administration and microeconomics (Doppelt 2009; Kristof 2010; Benn et al. 2014), tend to be more prominent in the business and

policy communities, but are mostly lacking the systemic, long-term orientation of the former.

This paper attempts to address this gap by presenting preliminary findings from an in-depth study[1] of 21 examples of transformation across the fields of heating, energy and buildings (1), electric mobility (2), as well as resource extraction and consumption (3). Additionally, select examples of overarching interest were included in the sample. The cases cover different spatial scales, speeds, and levels of maturity and were chosen on the basis of a fixed set of criteria, including elements like disruptive potential, complexity, diversity and ability to transform existing socio-technical regimes. While the analysis of said cases has been conducted with multiple research interests at the level of theory as well as policy in mind, the main research question pursued in this paper pertains to the identification of what it is, that makes transformation processes towards sustainability likely to succeed. In other words: What are key variables and success factors in transformations towards a sustainable economy? To what extent do they overlap or differ between scales, sectors and phases of transformation? And what are relevant take-aways for policy and theory?

Taking the actor-centered "Models of Change" framework (Kristof 2010) as a starting point and - by means of a broad review of current transformation literature - including systemic perspectives and adapting it to the study of sustainability transformations, the authors developed a set of 18 broadly defined and amply cited success factors covering strategies and ideas, actors and their qualifications, time aspects as well as various process dimensions. Together with three additional context indicators, they provide an encompassing set of variables, which are used as the core theoretical lens in the analysis of both, the individual cases, as well as the sample as a whole. Data collection consisted of an extensive review of primary and secondary literature, as well as in some cases interviews. In the ongoing analysis, qualitative and semi-quantitative research methods are being deployed and triangulated in order to increase the validity of the findings.

While the analysis of the data is still ongoing at the time of writing, preliminary findings suggest that all variables under investigation are indeed relevant to the unfolding of transformation processes towards a green economy, yet there are some factors, which are more important than others: Change-agents and their qualifications, as well as the preparation and exploitation of windows of opportunity and trigger events take the pole position, but also horizontal coordination between relevant stakeholders and framework conditions (incl. problem perception and preexisting path dependencies) were identified to be of very high relevance in almost all cases analyzed.

Likewise, there are some variables which are extremely important in some cases, yet barely relevant in others. Participation processes and co-benefits for example play a crucial role in cases where veto players and conflicts of interest play a prominent role, while in others the main challenge revolves around coordinating key stakeholders. In cases where veto players are threatening to block transformation, vertical coordination between different political levels tends to become increasingly relevant. At the same time a

combination of distraction, weakness or economic interest of incumbent actors tied to preexisting regimes on the one hand, and a change-agent able to seize the opportunity while being able to activate a network of supporters is a common pattern.

Looking at various stages and scales of transformation, different factors seem to drive development at different stages and scales of transition: while niche developments may be reliant on individual change-agents, institutionalization and support from incumbents becomes more and more relevant at later stages in the process. Likewise, local level and small-scale processes of transformation seem to rely on different drivers and success factors than larger scale transformations.

This paper expands on these findings and derives preliminary conclusions for both, policy formulation towards a green economy and transformation theory.

[1] This research was carried out as part of Evolution2Green, a broader research project studying transformation pathways towards a green economy, which is currently being carried out by adelphi, the Institute for Futures Studies and Technology Assessment (IZT) and the Borderstep Institute with financial support from the German Federal Ministry for Education and Research.

# Diffusion Dynamics of sustainable Product and Service Innovations

**Authors:** Jens Clausen, Klaus Fichter

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**Introduction.** During the last decades, many sustainable product and service innovations have been developed and tested. Most of those innovations are produced and consumed in small niches of the markets. Only about one third of those innovations is actually diffusing into the mass market and contributes to transforming the society.

While diffusion research on sustainable innovation so far has been limited to case studies with just one or a small number of cases or has been focused on individual sectors, the empirical data presented here cover a large number of nearly 150 cases from a broad variety of sustainable product and service fields. This allows for generalizations as well as relevant insights and conclusions for sustainability, environmental and innovation policies.

**Research Questions.** The article explores three questions: (1) What are key factors influencing diffusion dynamics of sustainable product and service innovations? (2) Which innovations do successfully diffuse into the mass market and what are possible reasons for this? (3) What role do path dependencies and the political price and cost framework play in the diffusion into the mass market?

**Method.** A comprehensive evaluation of the literature formed the basis for the empirical study (Fichter & Clausen, 2013). It yielded 22 potential factors influencing the diffusion trajectories of sustainable innovations in six fields of influence for which it can justifiably be assumed that they have an influence on the diffusion trajectories of sustainable product and service innovations or correlate with the dynamics of diffusion. Using the 22 potential factors as independent variables for the empirical study, we developed a coding system for each factor to assess the value of the variable between -2 and +2. The sum of all values forms the variable "diffusion dynamics". The diffusion process of 78 sustainable service innovations from the German market were analyzed according to the method. The results were quantitatively analyzed using the PSPP Software. An additional analysis integrating 69 cases of product innovations (Fichter & Clausen, 2013) was performed, enlarging the number of cases to 147. In addition, information on the market share of the innovations (each in its respective market) was gathered successfully for 130 innovations.

**Results.** The study shows that 10 of the 22 independent variables significantly contribute to the explanation of the market share the products and services reach in their respective markets. The highest impact show the path dependent variables "development of prices", "self reinforcing dynamics" and "lack of inhibiting path dependencies". Quite strong is also the impact of the supply side with the factors "completeness and availability of service", "role of the industry trade association" and "renown and reputation of suppliers". The third important factor is the user: "low need for behavior modification", "uncertainties on the part of adoptors" and

“price, costs and cost-effectiveness” are important factor with a high influence on the development of market shares.

Innovations with a considerable market share mainly (30 out of 42) stem from three sectors: internet and computing, energy efficiency and renewable energy. Established firms in 50% of the cases have done the market introduction of the innovations. About a third of innovations was introduced by start-ups, the rest of both groups simultaneously. A special impact of start-ups on fundamental innovations in the realm of services could not be shown.

There was no relationship between market share and environmental effect of the innovation but it can be shown that improvement service innovations have a significantly higher impact on environmental protection than fundamental service innovations. Nearly all service innovations are suspected to lead to potential rebound effects.

The analysis shows further, that about 70% of the innovations remain in market niches with an average market share of 5%. Only 30% of innovations make it into the mass market.

Within the niche, the main difference between unsuccessful innovations with a low and a high diffusion dynamics is found on the supply side. Forming coalitions with industry associations and renown vendors as well as getting intermediary organizations on board and organizing media coverage improves diffusion dynamics.

Innovations which make it out of the niche into the mass market are adopter friendly: they have a “low need for behavior modification” and low “uncertainties on the part of adoptors”. Additionally, “price, costs, cost-effectiveness” as well as the “price development” are of importance. It seems to be the case, that the possibility to reach mass markets is easier, if the product fits into user routines and the price framework is set by the state in way, that does not give advantage to unsustainable solutions.

### **Source**

Fichter, K. & Clausen, J. (2013). *Erfolg und Scheitern „grüner“ Innovationen*. Marburg: Metropolis.

## **Identifying and characterizing key enabling technologies for the bioeconomy**

**Authors:** Angela Gubelt<sup>1,2</sup>, Stefanie Bröring<sup>2</sup>, Jan Börner<sup>1,2</sup>

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In view of a growing world population, climate change, and looming fossil resource scarcity, sustainable, resource-efficient strategies are required to sustain modern societies. Bio-based economic change has been proposed as a key element of the required sustainable transformation. The bioeconomy

comprises all economic sectors involved in the production, processing and use of biological resources (plants, animals, microorganisms) for the production of food and feed, the provision of biomass as resources and the production of bio-based chemicals, materials and bioenergy. The bioeconomy is directly linked to 11 of the 17 Sustainable development Goals (SDGs) of the 2030 Agenda for Sustainable Development such as End hunger (SDG2), Ensure healthy lives (SDG3), Water and sanitation for all (SDG6), Energy for all (SDG7), Sustainable economic growth (SDG8 & 9), Sustainable cities (SDG11), Sustainable consumption (SDG12), Combat climate change action (SDG13), Oceans, seas and marine resources (SDG14) and Terrestrial ecosystems (SDG15). However, bioeconomic transformation is not necessarily sustainable. Commonly voiced concerns about bioeconomy include direct and indirect land use change and associated biodiversity loss or greenhouse gas emissions or health and other risks allegedly associated with some biotechnology applications. As a result there is considerable uncertainty about (1) what kind of technologies are needed to foster sustainable bioeconomic transformation and (2) what governance strategies have to be developed to minimize associated social and environmental risks. This study focuses on the first question.

We aim at identifying and characterizing high potential future technologies for the bioeconomy by developing specific indicators for key enabling technologies (KETs). Our approach is inspired by the European Commission's initiative of defining KETs for the European economy. In the European economy's context, KETs (micro- and nanoelectronics, nanotechnology, industrial biotechnology, advanced material, photonics and advanced manufacturing technologies) were seen as drivers for innovation and competitiveness with potential to enhance economic growth, provide jobs, and tackle societal and sustainability challenges. Our approach to identifying KETs for the bioeconomy relies on own conceptual work, literature research, and expert interviews. Conceptually, we expect bioeconomic transformation to materialize in the form of four complementary pathways: Substitution of fossil by bio-based resources (Type 1), Increases in primary sector productivity (Type 2), Increases in biomass use efficiency and new biomass uses (Type 3), and Bio-based value added in low volume but high value industries (Type 4). Eligible KETs (such as specific biofuel applications, bio-refineries, enzymes for the production of high value products, secondary plant metabolites and cell culture technologies) thus must be suited to enable such pathways, but have widely differing attributes in terms of technology readiness, adoptability, scalability, and implications for societal and environmental outcomes at global scale. Empirically, we rely on a multistage survey of expert interviews and literature research. Experts chosen for this study have broad insights into bioeconomy, come from different disciplines and represent academia, industry and government. A first round of expert interviews (part of an international bioeconomy expert survey), complemented by findings from literature research, will generate a first set of specific indicators and KET for the bioeconomy. The results are the basis for a second round of interviews of an additional group of experts (technology expert survey), who will be asked to assess the findings of the first round (e.g. desirability,

technological readiness, drivers, advantages, risks), again complemented by literature results, and to add further indicators and KETs. Depending on answer variations, an additional round of interviews, providing feedback from the second round, can be attached, following the methodological approach of a delphi study.

Our literature and expert-based approach is designed to identify what indicators are best suited to assess KET potential in these and other dimensions as an input to risk assessment, social cost-benefit analysis and the planning of related policies to govern innovation and knowledge transfer as well as sustainability tradeoffs, which tend to be inevitable in societal transformation processes.

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## Paper Session XV

# **International perspectives on transition to sustainability in urban areas**

## **Transition to Truly Smart Cities? Drivers and barriers of smart city transition in China context - the case of Ningbo China**

**Authors:** May Tan-Mullins, Benjamin Sovacool

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In January 2013, the Chinese government launched the first batch of 90 smart cities initiative, seeing the need to use smart technology to promote and enable eco/sustainable economy and city development in China. A series of policies and guidelines were then launched, such as the new 'Urbanisation Plan for 2014-2020' and 'Guiding advice for healthy development of smart cities', providing clearer guidelines, aid coordination and exchange of best practices. This demonstrated the Chinese central government political will to promote this initiative. However, the decentralized governance structure of China means this initiative is mainly implemented by the local provincial/ municipal governments, who are well-known for their entrepreneurial behaviour in strategically implementing central policies or adapting them innovatively to the local contexts. As a result, the outcomes of this initiative have deviated from its original intents of 'smart city' development. This paper looks at the drivers and barriers of the smart city initiative, and assess the divergences between aims, planning, policies and implementation of smart city management in China. We use a case study of Ningbo, a city located in the northeast of Zhejiang province. Ningbo is used as our main case study as it is a pilot city for key initiatives of 'smart city', 'low-carbon city', 'green city', and recently 'sponge city'. The city has also developed a comprehensive Smart City plan to be implemented from 2011 to 2015 with an investment amount totalling 40.7 billion (US\$6.36 billion).

There are three main findings in this research. The first is that there are two gaps- first gap is between centrally planned policies and provincially/ municipally implemented initiatives due to the Chinese governance structure and decentralized system in China. The second gap is between the original intents of the smart city and its interpretations by the local government officials due to the varying interests of the local stakeholders. Without reconciling these two gaps, the benefits of the smart city will not be distributed as equitably and equally among the different stakeholders. The second main finding is that the Chinese central government is the main driver of this initiative, and has strong political will to ensure its success through policy encouragement and financial incentives. However, due to the nature of the sector which demand strong industry capacity and linkages, and huge initial financial investment, present huge barriers to the success

of this initiative. The last finding is that public perception and acceptance of this development initiative play an important role in the success of the smart city project. Many of the smart initiatives such as smart citizen project, smart payment or smart transport project require the buy-in of the public. In the case of China, public's uptake of certain initiatives are more progressive compared to others due to local specifics, which this paper will further discuss.

## **Explaining China's Commitment to Sustainable Development**

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At the United Nations Sustainable Development Summit on 25 September 2015, world leaders adopted the 2030 Agenda for Sustainable Development which includes a set of 17 Sustainable Development Goals (SDGs) to end poverty, fight inequality and injustice, and tackle climate change by 2030 (UNDP 2016).

China is the second largest economy in the world and the largest emitter of greenhouse gases. With the election of Donald Trump as President of the USA in November 2016, the promotion of the sustainable development agenda faces new challenges. China has already taken several opportunities to reaffirm its continued support for the global agreements of New York and Paris.

The concept of sustainable development intertwines with many concepts and terms that are in frequent use in the P.R. China, including *ecological civilisation* (生态文明), *green development* (绿色发展) and *eco-marxism* (生态马克思主义). Academic research and debates have contributed to deepen and broaden various discourses related to sustainable development. Social media have facilitated exchange and spread green knowledge.

China has made significant contributions to advance the 2030 Agenda and the agreement on the seventeen SDGs and is about to overcome its image as a "hardliner in international negotiations" (Zhang Haibin 2013). China released its national plan for implementing the 2030 Agenda for Sustainable Development in October 2016. The plan translates each target of the SDGs into "action plans" and refers to a large number of specific SDG related programmes.

### **2. Structure of the Presentation and Research Questions**

Firstly, this presentation will explain why China has played a crucial role in international diplomacy in the context of advancing the agreement on the Agenda 2030. Secondly, the presentation will analyse the current key challenges for China in the process of transforming to a sustainable economy.

The research work is based on the analysis of policy papers, participation in several conferences in China and semi-structured interviews with academic

and practitioners in the context of research stays at Peking University and Xiamen University. Further research activities in China (and Germany) will be planned to understand potentials and barriers of the sustainability transformation process.

### **3. China's Role in Advancing the Sustainable Development Goals**

#### **3.1 China's Engagement with Global Environmental Politics**

China's commitment to engage in international environmental politics dates back to its first participation in a United Nations (UN) summit in 1972. After the P.R. China regained its seat as a permanent member of the UN Security Council, the Stockholm conference on the human environment provided an opportunity for the P.R. China to substantiate its claim for a leading role within the UN. China has been one of the first countries to ratify the conventions related to the Earth Summit in Rio de Janeiro in 1992. China's Agenda 21, the White Paper on China's Population, Environment and Development in the twenty-first century (1994) highlighted and popularised the concept of sustainable development.

China's international engagement corresponds with its national policy-making process, reflected in the Five Year Plans (Hu 2015), several laws and regulations. It established a series of environmental laws, resources management laws, administrative regulations, and several hundred environmental standards. Further laws have been established on education, health, culture and social security.

#### **3.2 China and the Millennium Development Goals**

The fact that the P.R. China has been the top performer in achieving the targets of the Millennium Development Goals has been an enabling factor for its growing support to the SDGs. The MDG's focused on poverty reduction and converged with China's national priorities in the beginning of the 21st century. China's outstanding performance also enhanced its reputation and standing within the UN.

#### **3.3 China as a Driver of South-South Dialogue and Cooperation**

South-South dialogue and cooperation was crucial in agreeing on the SDGs. China has traditionally played a leading role in South-South Cooperation, mainly in the context of the Group 77. More recently, China has become one of the BRICS countries and has greatly extended its cooperation with Africa through the Forum for Africa Cooperation (FOCAC). While the P.R. China showed sensitivity towards the reservation of some developing countries towards the integration of the MDGs into the new SDGs, it has also contributed to muster support of the developing countries for the SDGs by showing flexibility in the difficult process of global negotiations.

### **4. Key Challenges for China in the Process of Implementing the SDGs.**

#### **4.1 Trade-offs between Economic Growth, Environmental Policies and Social Welfare?**

China's biggest challenge in the context of the SDGs is to balance economic growth with ecological and social concerns, e.g. it needs to balance the

pledges for emission reduction with the potential loss of jobs in the fossil fuel industries. The number of protests in coal mines has significantly increased over the past years.

#### **4.2 Implementation at the Sub-national Level**

While China favours a top-down process of political agenda setting, it allows significant space for local experimentation. Experience gathered at the local level, e.g. in the context of the designation of low-carbon cities and low-carbon communities and the establishment of province and city level emission trading schemes, provides valuable insights for advancing policy-making in the field of sustainable development. Business and non-governmental organisations take part in the design of projects. Yet, the implementation of new laws and regulations in the field of environmental protection and social welfare requires major capacity building and training efforts in order to create the necessary structures, incentives and awareness at the sub-national level.

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## Paper Session XVI

# **Influence of techno-economic change and public policy on transition pathways**

## **The Missing Key: A Global Public Policy**

**Author:** Inge Kaul

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The world is facing a lengthening list of global challenges, from climate change and communicable diseases to excessive financial volatility, illicit trade, cyberattacks, terrorism and forced migration. Crisis follows crisis and new challenges like those of microbial resistance and water scarcity. Their conjuncture has led some to try and turn back the clock, and call for renewed protectionism; but has prompted others to look ahead, and explore ways of fostering better international cooperation—those who realize that unilateral action will not keep these challenges at bay, let alone resolve them.

But what will it take to generate better international cooperation and to demonstrate that, at least for these global challenges, it is often the best way for a country to achieve its national interests?

To answer this question, we examine the operational side of international cooperation, especially how agreed-on global goals are translated into new policy that is then executed to attain these goals. Because, as the *2030 Agenda for Sustainable Development* demonstrates,[1] there is no shortage of agreed-on—and repeatedly confirmed—global goals. It is how they are followed up and implemented that does not work so well.

The purpose of the proposed paper is to take a close look at how one segment of this operational side—multilateral development banks—addresses global, border-transcending challenges. Many of these challenges

affect us all, whether we live in rich or poor countries, powerful or fragile states. As they possess the properties of “public goods” we also refer to them as “global public goods,” or GPGs.[2]

These banks[3] have been tackling GPG-type policy issues for decades. Yet, perhaps prompted by *Agenda 2030* and the *Paris Agreement on Climate Change*,[4] they have recently upped their commitment to GPGs, in such documents as *Foreword Look* (WBG 2016d), the Communiqué of the October 2016 meeting of the Development Committee of the International Monetary Fund and the World Bank,[5] and papers jointly written by several banks, including *From Billions to Trillions* (MDBs 2015) and *Forced Displacement* (MDBs 2016).

More of the same? What about operations and impact? To help answer these questions, we cast an eye over the role of the banks in providing GPGs and ask what they can do better to bring their full potential to bear on the supply and distribution of GPGs.

This paper’s analysis will draw on a review of publicly available documents issued by the banks, and on external studies on their activities and institutional setups in policy fields tied to GPG concerns. Section 2 discusses the GPGs’ main characteristics and the governance requirements of special interest, as background for section 3 which identifies five criteria that a sound bank delivery model would need to be fit for purpose when providing GPGs. Section 4 then compares the banks’ current GPG policy practices with that delivery model. The conclusions round off with some findings and possible next steps, partly supporting reform proposals that have already been aired—and moving beyond them.

### **The conjecture to be explored**

Preliminary research on the topic to be addressed suggests that the banks’ GPG efforts fall short of what is required to allow the world to escape from its web of crises. The reason is not the oft-cited responses, “lack of time” or “shortage of resources.” The problem seems rather to be path dependency: GPG issues are addressed mainly through the conventional development approach, one that is single-country-focused and uses development-assistance tools like sovereign loans in a way that fails to resolve many of the problems inherent in collectively tackling GPGs.

The root cause of the problem lies outside the banks, however. It is in the wider system of international cooperation, which lacks a well-grounded and run theory and practice of global public policy. The paper would therefore recommend that:

- The academic community initiate research on a genuine global public policy that could point to ways and means of incentivizing and supporting accelerated progress towards more sustainable global growth and development.
- The wider international community—not just the banks—consider the creation of an international office that would undertake for GPG finance what the Development Assistance Committee of the

Organisation for Economic Co-operation and Development does for development assistance.

- All governments, in line with the internationally agreed-on principle of common but differentiated responsibility and capacity, contribute to the public part of GPG finance, charging these contributions to the budgets of the relevant technical or sector government entities, such as the environment, energy, or health.
- The banks to prepare jointly a report outlining their views and recommendations on establishing GPG provision and development assistance as two separate, yet mutually synergistic operational models, including what the implications of such re-purposing would be for their mandates, instruments and financing.

The paper will build on and extend the following first working paper on the topic: <https://www.odi.org/publications/10784-providing-global-public-goods-what-role-multilateral-development-banks>

[1] For more details, see <http://www.un.org/sustainabledevelopment/development-agenda/>.

[2] Public goods are goods (products, services, conditions) that affect many, perhaps even all people in a certain community and are, therefore, also said to be non-excludable in consumption. If they are also non-rival in consumption – meaning that one person’s consumption does not subtract anything from the good’s availability for others, then the goods are said to be pure public. Goods that possess one or both these properties only partially are categorized as impure public. Depending on the geographic reach of the goods’ public effects (benefits and/or costs), they are local, national, regional or global public goods (GPGs). For a detailed discussion on public goods, see, among others, Kaul et al. (2003); Kaul et al. (2016) and Sandler (2004).

[3] “Banks” in this paper refers only to multilateral development banks, notably the banks that are at the center of the analysis in this paper: the African Development Bank (AfDB), Asian Development Bank (AsDB), European Bank for Reconstruction and Development (EBRD), Inter-American Development Bank (IADB), and World Bank Group (WBG).

[4] For details on the *Paris Agreement*, see [http://unfccc.int/paris\\_agreement/items/9485.php/](http://unfccc.int/paris_agreement/items/9485.php/)

[5] The text of the Communiqué is available at <http://www.worldbank.org/en/news/press-release/2016/10/08/world-bank-imf-annual-meetings-2016-development-committee-communique/>

## Peak Materials Demand - Evidence on the Saturation Effect

**Author:** Raimund Bleischwitz

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Decoupling is at the core of the contemporary debate about economic growth and natural resources. Our contribution looks at material-specific demand and stock build-up trends over an extended time horizon of a century. Four materials (steel, cement, aluminium and copper) are analysed for a group of four industrialized countries (Germany, Japan, the UK and the USA) together with China, as the most pre-eminent emerging economy. The choice of these materials is justified by the fact that all economies require them in order to develop – steel and cement demand is a function of infrastructure development and urbanization; copper and aluminium are multifunctional materials for housing, energy, mobility and consumer goods. Accordingly, these materials are often included in commodity market analysis. The underlying questions are:

- Is there a saturation of consumption for materials in those developed countries?
- Is there a time gap in material consumption between developed and emerging countries, given their different stages of wealth?
- What are the development patterns of the build-up stocks?

This contribution combines the analytical strands of resource economics and material flow analysis to answer those questions. We have identified a research gap between the different methods and time series, e.g. used by UNEP IRP, making insights on development trends and advances towards SDG 12 for the year 2030 difficult.

Analysing a new set of per capita and gross domestic product indicators, our research confirms the relevance of a saturation effect with a number of specifications.

Our text finds evidence of a saturation effect at a late development stage that seems to have been overlooked in the recent debate about the decoupling of resource use and GDP. As our analysis is based on long-term time series for apparent domestic consumption, it is not biased through patterns of international trade and shifting production sites. We thus consider it an important conclusion referring to structural changes rather than dedicated efforts of becoming more resource efficient – the latter would add to such dynamics.

While the evidence is strong for the per capita demand for steel, copper and cement in the four industrialized countries analysed (the US, the UK, Japan and Germany), it is somewhat weaker for aluminium. We observe, in addition, that the saturation point starts at different income levels: relatively early for steel and cement (\$12,000 GDP/capita) and later for copper (\$20,000 GDP/capita), probably reflecting the different applications and use for purposes of a more affluent society. For China, we see early indications of saturation in the demand for steel and copper. The very high

numbers for cement also point in favour of stocks per capita coming close to saturation.

We conclude that a time gap of about 40 years is a relatively common pattern for those transition pathways, from take-off towards any saturation of demand. Another novel element of our analysis is that the build-up of stocks is a relevant feature of the use of materials over time. Stock accumulation saturates with a delay of at least 20 years compared to demand, depending on lifetimes of capital goods. Our analysis thus also underlines their relevance for decoupling processes, adding a future perspective as those stocks will also be a potential source of future supply through extended circular economy efforts.

Looking ahead, our research suggests that any extrapolation of previous trends (for example, the last five to 10 years, or regression analyses based on the last twenty years) for material consumption should *not* be regarded as a guiding rule for future market trends and investments. Emerging economies can rather be expected to decouple GDP from resource use through drivers of such saturation effect, *as well as* through resource efficiency, circular economy and low-carbon economy efforts. In particular, for steel, copper and cement in China, we would suggest future scenarios with a demand that is much flatter than extrapolations from the past 10 years. Closing the efficiency gap that seems to exist between China and the industrialized countries will further contribute to such lower demand. Future research – such as that facilitated by UNEP’s International Resource Panel, the Asian Infrastructure Investment Bank or the emerging G7 Alliance for International Resource Efficiency – should enlarge its database and develop criteria that translate such a saturation effect into foresight analysis, with clear relevance for the SDGs and their 2030 timeframe for delivery. In the same spirit, scenarios and economic modelling efforts should take the saturation effect into account. Our treatment of product groups and sectors fits well into modelling frameworks such as Input/Output Analysis and Computable General Equilibrium (CGE), but probably also for other tools.

We would like to conclude with a word of caution and a call for more comprehensive research on the issue. Innovation and technical change will continue to enable industry to apply materials to new product areas. A comprehensive perspective that captures substitution effects and systemic innovation will thus be needed. Altogether our findings should encourage more economic research on decoupling, MFA, and a saturation effect from an international perspective.

# Trafo 3.0 project side-event

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As a side-event to the SustEcon Conference, the research project "Trafo 3.0" offers four sessions on sustainable transformations – taking place Monday afternoon.

## About the Trafo 3.0 project:

(How) can societal transformation processes be initiated, supported and governed so that they are sustainable? This is the core question of the Trafo 3.0 research project conducted by Oeko-Institut, a German environmental research and policy think tank, together with various stakeholders.



Based on previous projects and existing transition literature, we conduct transdisciplinary and action-oriented research with regard to three ongoing transformation processes: sustainable production and consumption of meat, paperless publishing and reading, and the use of e-bikes for urban and regional mobility.

The overall objective of the project is the further development and field-testing of a transformation (governance) heuristic, and the drafting of an (electronic) manual to support politicians and practitioners in contributing to the initiation and governance of socio-ecological transformation processes.

For more information on the project, please visit the website [www.trafo-3-0.de](http://www.trafo-3-0.de).

The project is funded by the German Federal Ministry for Education and Research (BMBF) within the "Sustainable Economy" program; funding reference: 01UT1426.



## About this side-event:

The event is open to all conference participants and anybody else interested.

Presentations and discussions will usually be in German. However, comments in English are also possible and welcome.

While the first session will introduce and discuss the conceptual framework, the other three sessions will each give insights on a concrete transformation process. Although we recommend participating both in the conceptual as well as one of the thematic sessions, you can also visit them independently from one another.

## **Session I: Conceptual framework**

### **Governance of transformations: the Trafo 3.0 project's heuristic**

Monday, 2 - 3.30 pm, Akademischer Senatssaal

The first session introduces the conceptual framework of the Trafo 3.0 project, including our understanding of transformations (of sociotechnical systems) and a heuristic for analyzing the status quo in a system. The focus, however, lies in a newly developed heuristic for the governance of transformations – intended to serve as the foundation in a practitioners' guide for contributing to sustainability transformations. Several invitees dealing with societal change in different contexts will comment on the draft heuristic's utility from their perspective, followed by an open discussion.

Program:

- Welcome and short introduction into the Trafo 3.0 project (*Carl-Otto Gensch, Oeko-Institut*)
- Input: The Trafo 3.0 heuristic for the governance of transformations (*Dirk Arne Heyen, Oeko-Institut*)
- Interviews and discussion with practitioners: *Laura Haverkamp, Ashoka; Marie-Luise Abshagen, Forum Umwelt & Entwicklung; and Herbert Brüning, City Administration Norderstedt*
- Open discussion with audience

Interviewing and facilitation: *Franziska Wolff, Oeko-Institut*

## **Sessions II-IV: Thematic fields of application**

### **Transformation towards light electric mobility (e-bikes)**

Monday, 4 - 5.30 pm, Akademischer Senatssaal

This session discusses how electric bikes can contribute to a sustainable transformation of the transport sector. Learning from the experience of the pro-cycling grassroots initiative "Volksentscheid Fahrrad" in Berlin, a particular aim is to identify key factors for a successful transformation induced by civil society actors. What barriers do they face? What are key factors of success? Which stakeholders need to be engaged? The session aims to discuss measures for civil society as well as for political actors seeking to facilitate the transformation towards light electric mobility.

Program:

- Understanding and governing the transformation to light electric mobility using the Trafo 3.0 heuristic (*Ruth Blanck, Oeko-Institut*)
- "Volksentscheid Fahrrad" as an example for successful change induced by civil society (*Kerstin Stark, Volksentscheid Fahrrad*)
- Policy instruments to promote e-bike use (*Thomic Ruschmeyer, bsm e.V.*)

- Open discussion with audience

Facilitation: *Dirk Arne Heyen, Oeko-Institut*

### **Transformation towards sustainable meat production & consumption**

Monday, 4 - 5.30 pm, Hörsaal D

The production and consumption of meat is currently the subject of intensive and controversial discussion in Germany. On the production side, animal welfare and environmental impacts but also economic conditions are main issues. On the side of the consumer, consumption levels and related health impacts as well as willingness to pay for higher standards are main issues. This session discusses challenges and opportunities for the governance of a sector transformation in a sustainable direction.

Program:

- Understanding & governing the transformation to sustainable meat production & consumption using the Trafo 3.0 heuristic (*Dietlinde Quack, Oeko-Institut*)
- Possible pathways for a transformation with a focus on the value chain of pork (*Jürgen Herrle, Naturland Fachberatung*)
- Open discussion with audience

Facilitation: *Franziska Wolff, Oeko-Institut*

### **Transformation towards paperless publishing & reading**

Monday, 4 - 5.30 pm, Conference Room I

The ongoing transformation towards paperless publishing and reading in the book market offers opportunities as well as risks from a sustainability perspective. Based on an analysis of the current situation this session aims to facilitate a discussion on how to design more sustainable pathways in this sector. Oeko-Institut will provide some ideas, followed by comments by sector experts and practitioners. Participants of this session can engage actively in the discussion with the help of the fishbowl method.

Program:

- Understanding and governing the transformation to paperless publishing & reading using the Trafo 3.0 heuristic (*Carl-Otto Gensch, Oeko-Institut; Peter Mathews*)
- Ideas to design more sustainable pathways (*Ina Rüdener, Oeko-Institut*)
- Fishbowl with experts and interested audience members

Facilitation: *Carl-Otto Gensch, Oeko-Institut*