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## **How people perceive their future lifestyles? The results of our focus groups interviews on sustainable lifestyles**

*Midori Aoyagi, Tomohiro Tasaki, Yuko Kanamori and Aya Yoshida*

Discussions of sustainable consumption and production are deeply connected with an understanding of lifestyles: how we can evaluate current consumption patterns, which direction we are heading, and the current status of engagement with environmental and consumption behaviors. These issues relate to how we can balance our quality of life with the material flows and environmental impacts created by our consumption. Based on projections for Japanese households from 2010 to 2035 in January 2013. According to these projections, there will be no single "standard model household" that can be used to explain various governmental policies in 2030. In the next steps, we discussed possible future Japanese lifestyles. In writing these stories, we interviewed several experts whose majors are the work-life balance, labor economics, the sociology of labor, youth culture, and aging. Based on the results, we developed several story lines for our sustainable lifestyle scenarios that will be further elaborated during our expert workshops. Our expert interviews revealed the following possible future main trend of Japanese lifestyle scenarios: Those eight stories are roughly categorized in four groups, such as "Self-fulfillment, risk taking", "self-fulfillment, high ability to cope with risks", "low self-fulfillment, low ability to response risks", "not aware of risk, low self-fulfillment". Those eight story lines are considered to be Japanese lifestyle main-trend. By considering more than 160 scanning materials as "signs of changes", we build up our four possible future scenarios. Those scenarios express those societies such as health, ICT, Network, and Anti-age communities. The procedure of the expert workshop is as follows. 1) The base of our 2030 sustainable lifestyle scenario is the elaborated version of "possible future main trend of Japanese lifestyle scenarios (future issues)", which consists of 16 story lines. 2) Using "scanning materials" which is more than 160 articles from newspapers or magazine all over the world, we try to "find" "signs of change" in our lifestyles. 3) Using our eight future issues and signs, we held a expert workshops and discussed with what happens in Japanese lifestyles in 2030. 4) Using the results of the expert workshop, we wrote four story lines of "Japanese future lifestyles scenarios". In the next step, we used focus group interviews (FGI) to verify our "Japanese future lifestyles scenarios" The results of FGI are as follows. For the future issues, as 16 story lines, our participants roughly agreed our story lines, especially widening income gaps, changing role and social position of women, and NEET(young people Not in Education, Employment or Training). But, they tended not to agree most on four story lines of "Japanese future lifestyles scenarios" as those stories are written based on new technology development stories and those technologies are difficult to imagine what kind of lifestyles they would be in.

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## **Sustainability, social organizations and networks: an opportunity to interact**

*Nilton M. Arruda*

In a sustainability approach, the media is critical to build and strengthen relationships between companies and stakeholders. Strategic organizational management tool, its application goes beyond the immediate function of promoting brands, products and services and should include sustainability as the new companies' positioning in society. Such strategy implies to influence the whole production process, given the necessary coexistence of market and sustainability. The chief spokesman of this order is the new marketing communications professional. Acting in defense of the organization, it is expected communicator power of persuasion for the conscious consumer, as paradoxical as it may seem. The language's change in communication campaigns reinforces the need to improve the sustainability's concept in the public opinion. As Porter de Souza (2005), the explosion of services and the globalization of markets require businesses to offer the most reliable products. The reputation of a particular organizational brand shall depend upon its marketing approach. And manage reputation, according to Almeida (2002), is even larger task than just using the communication and marketing's tools to improve the image.

However, what we see is a still reactive treatment of the sustainability's issue in business. For Porter de Souza (2005), "the traditional tools of the marketing mix - product, price, place and promotion - must be extended the concept of sustainability, as well as the approach to business communication that should be intense with all stakeholders." In fact, the author emphasizes the importance of entrepreneurial attitude and argues that the triple bottom line model arrives definitely undertakings. The discussion inevitably goes through the form of consumption that occurs in market societies. In the past five decades, the world population grew from 2.5 billion (1950) to 6 billion (2000), with an exponential increase in consumption and, consequently, pollution and urban waste. Currently, the population consumes 30% per year over renewable natural resources than the planet can regenerate, in relation to social and environmental problems with consumer habits in big cities. Swarthy (2005) realize a bridge between production and consumption and citizens' sense of belonging from certain "tribes" influence the consumption's model referring the person's lifestyle.

In this sense, social media emerge as a great ally in order to engage the consumer, for once, his influence's power in the market. If the traditional forms of communication companies can repeat the same vices of unilateral use of message content in social networks, the discussions end up being guided by ordinary citizens' voices. This phenomenon compels organizations to seek a more empathic relationship with its audiences, and social media can increasingly restrict speech merely marketing companies.

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## **Circular economy and industrial reconstruction in China: from economy of transformation to the transformation of the economy**

*Vincent Aurez*

Circular economy in developing countries is closely linked to the need for an approach adapted to a socio-economic context which differs from that of industrialized countries. In many cases, the proportion of secondary raw materials obtained through recycling already exceeds the share of "primary" materials such as for paper and some non-ferrous metals. The production of energy is also far from being anecdotal, in common with the contribution of waste treatment to the objectives of the Kyoto Protocol.

China is of first importance in the global economy of waste which has decisive implications in development issues within the country (and others developing countries) and GHG emissions at the global level. In 2004, China surpassed the US as the world's largest waste generator. In 2030, China will likely produce twice as much municipal solid waste as the United States.

The process of waste can be studied through the structure of local interactions. The study cases, studied both at the micro- and meso- economic level, are showing specific examples of experiences of circular economy in China. The study cases in China are: Chongming island in Shanghai, Caofeidian eco-city, Ziya National Demonstrator for circular economy, Tianjin Eco-Industrial Development Area (TEDA). These study cases are then evaluated with specifically designed indicators for circular economy, showing the driving factors of their success but also the constraints that they had to deal with. It illustrates the on-going transition toward an integrative circular economy but also its potential in the future in China.

These study cases strengthen our study by showing how the implementation of circular economy practices, laws and policies have not only develop this sector in China, but participated in the establishment of new relations between companies at the local level, between companies and citizens, and between the public and the private sector. This gives us our title: "Circular economy and industrial reconstruction in China: from economy of transformation to the transformation of the economy" which not only focus on the potential of circular economy in China, but also on the consequences that a full implementation of circular economy would cause on the economic structure and territorial development.

Circular economy appears as a paradigm with an increasing leverage effect for industrial competitiveness, involving both the regulatory domain, and incentives for innovation. The economic and energy gains from circular economy in China are finally assessed, with three different scenarios until 2030.

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## **When consumer sovereignty meets good old “monopolistic competition”: The relevance of advertising in the socio-ecologic transformation? Plea for a global ad tax**

*Josef Baum*

There is a multi-faceted discussion about sustainable consumption, about its relevance and limitations. In a broader context the discussion on consumer sovereignty (Scitovsky 1962) versus the shaping of preferences by marketing and the ad industry basically is an old issue. Notably the relevance of advertisements is not often highlighted systematically in ecological economics. Mander (2012) pinpointed a "privatization of consciousness" and the imprinting of the individual beginning with children and various power relations in respect to media and advertising. Also this basically is not new, but it is worthwhile to combine it with some political ecology. In the paper a general framework shall be given for the relevance of advertisement in a socio-ecologic transformation by combining knowledge from different fields of management science, psychology, media studies, regulation economics and especially of political economy. Advertisement is most powerful by television but is gaining momentum in the internet -still more refined, see Google as "area of greatest concern" (Gannon-Lawson, 2012). The consequence is the reduction of the role of consumer demands for paradigm shifting towards sustainability.

Advertisement is essential in the globalisation of unsustainable consumer styles. The financing of media by ads is well-known - now changing substantially. What often seems to be forgotten: advertising as an important feature of good old "monopolistic competition" (J.Robinson) and oligopolisation: commercial advertising is cause AND consequence of oligopolisation with unessential product differentiation in saturated markets and constructing brand images, successfully in protection and extension of market shares and oligopolistic profits with relentless consequences against SME by establishing "entry barriers". Conclusions and practical proposals to reduce unsustainable choices: The ban of commercial advertisement could be "optimal" in many relations, e.g. also to clear market distortions. But anyway initiating steps can regulate advertisement more strictly: In the neoliberal era taxes on advertising had been abolished or reduced. But they could be relevant for public budgets. Analogously to financial transaction taxes (Tobin) the design increasingly could be supranational or on the global level. There could be exceptions for fundamental innovations and local levels, and some provision against substitution effects to indirect advertisement. There have been well-known real significant measures of regulations of advertisement: The limitation of advertisements for cigarettes. There is also some ad limitation in Vermont Stopovers can be e. g. the ban of advertising in public spaces, the control of advertising on the internet, the end the commercialization of childhood (Gannon-Lawson).

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## **Cheap Fossil Fuels or Energy Efficiency as Comparative Advantages? - Comparative Views on "Re-Industrialisation" and Energy in Europe and USA**

*Josef Baum*

Because of better performance for countries with a bigger industrial sector during the financial crisis and the dimensions of China's industrialisation and its implications there is some comeback in the discussion on industrial policy in OECD countries in relation to the importance of manufacturing and industrial activities. The starting point is a small case study on a big investment project of the biggest Austrian company Voestalpine in the USA. Three main reasons for this investment are cited: low energy prices, lower wages and lower prices for land. - The company states that wage costs in southern US-states are  $\frac{3}{4}$  of Austrian wage cost allegedly at same productivities. To examine these contentions the different levels of industrial production in the USA and different EU countries are to be identified as crucial for further direction of development (path dependency or convergence?). More important the energy intensity for different industries has to be compared and what is the development of shares of energy intensive industries. But can this approach of accumulation and "Re-industrialisation" basically work on the basis of cheap energy and lower wages? And which industrialisation? "It makes sense for the US to close its current account deficit by 're-inventing manufacturing'. But it may even be problematic for a resource-rich country like the US to base the rejuvenating of its industry on low energy costs. For resource scarce Europe this holds even more"(Aiginger). The consequence is to increase investment into innovation and education and specifically to increase energy efficiency and innovations in ultra-low carbon technology. So US cost advantage in energy could be matched by closing the technology deficit, improving skills and going for excellence in energy efficiency and clean technologies. Then the DYNAMICS would be that energy can be more expensive in Europe, if at the same time innovations in energy efficiency and innovation and education in general become cheaper and more efficient. In the long run technological progress - together with the speed of diffusion of the best technology - is the true deciding factors as regards the dynamic effect of emissions (Aiginger).

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## **Rethinking sustainability transitions from a Chinese perspective**

*Christian Binz, Heiko Gebauer, Bernhard Truffer and Yonglong Lu*

This study investigates transitions from resource intensive to carbon-neutral production and consumption patterns from a Chinese perspective. The multi-level perspective (MLP) has become the dominant analytical framework to assess such "sustainability transitions". However, the MLP was mainly developed in the context of democratic, industrialized Western economies. It thus remains debatable whether that framework has explanatory power in the context of a fast growing, late-industrializing planned economy and how its analytical dimensions and theoretical propositions would have to be adapted to increase its generalizability. This paper aims at tackling this gap based on retroductive theorizing from three case studies on solar photovoltaics, wind power and water recycling technology in China.

Based on more than 100 expert interviews in these sectors we identify three main areas that challenge taken for granted assumptions of the MLP and indicate interesting areas of future research. First, the MLP falls short of conceptualizing transitions in a fast growth context (as opposed to Western static - or even declining - economies): In all three case studies a dominant regime co-existed for a long time with an emerging radically different proto-regime. Because fast growth asked for the quick build-up of additional capacities, the selection environment imposed by the dominant regime was much weaker than is generally assumed by the MLP. Secondly, the MLP does not consider spatial interdependencies stemming from China's latecomer position in existing global innovation networks. Most of the activity in the analyzed niches and emerging proto-regimes was crucially influenced by interconnections with external knowledge sources and innovation dynamics. Finally, the analyzed ongoing transitions are all strongly conditioned by China's sino-marxist policy context. The long-term stability of China's innovation policy and governance system allowed for a more strategic and consistent strategic niche management approach than in Western economies. All three cases profited from such long-term and stable innovation support and the quickly growing interpersonal (guanxi) networks forming around emerging niche technologies.

In conclusion, there are three main areas in which the MLP could benefit from additional theorizing: 1) A structured debate is needed on the basic conditions for sustainability transitions in growing, stable and even declining macro-economic contexts. 2) It should integrate an explicit geographic perspective on the multi-scalar interaction in niche formation and upscaling processes. And finally, it should 3) embrace a discussion on how transitions unfold in political and social systems that differ from Western liberal democracies. Addressing these challenges will help to improve the generalizability of the transition framework and at the same time improve policy recommendations derived from this heuristic perspective.

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## **Household environmental pressures in The Baltic States: multi-regional input-output analyses**

*Janis Brizga, Kuishuang Feng and Klaus Hubacek*

Current unsustainable consumption and production patterns are responsible for many environmental problems. The literature distinguishes between two major distinct accounting approaches for pollution and thus for assigning responsibility: the production based approach as e.g. used by the UNFCCC for carbon emissions and the consumption based approach, the latter allocating pollution to the final consumer rather than the place of production. In this paper we used a multi-region input-output model to analyse consumption related CO<sub>2</sub>e emissions in the Baltic States - Estonia, Latvia and Lithuania. While per capita carbon footprint in the EU is about 13.3 tCO<sub>2</sub>e, in the Baltic States it was much below this level: in Estonia the footprint was 9.48 tCO<sub>2</sub>e, in Latvia 5.14 tCO<sub>2</sub>e and in Lithuania 5.99 tCO<sub>2</sub>e. The comparatively high carbon footprint in Estonia can be explained by high carbon intensity of Estonia's energy sector and relatively higher per capita GDP. In Estonia emissions between 1995 and 2009 decreased by 5%, but at the same time emissions in Latvia and Lithuania increased by 19% and 25%, respectively. The results demonstrate that housing is the consumption category with the highest CO<sub>2</sub>e emissions, responsible for 43% of emissions in Estonia, 38% in Latvia and 21% in Lithuania. Transport accounts for 18% of CO<sub>2</sub>e emissions in Estonia, 22% in Latvia and 43% in Lithuania. Food consumption is responsible for 8% of emissions in Estonia, 14% in Latvia and 13% in Lithuania. Another important consumption cluster is consumer goods accounting for 8% of emissions in Estonia, 9% in Latvia and 12% in Lithuania. The highest emissions embedded in imports in Lithuania are for fossil fuel imports (34% of all consumption related emissions). In Estonia and Latvia 15% of import related emissions come from imported construction services. But in all three countries 11% of imported emissions are from imports of food, beverages and tobacco. Due to the strong interrelation of the Baltic economies most of their embodied emissions are imported from other Baltic countries followed by embodied emissions from Russia, China, Poland. The Baltic States are at a relatively similar stage of economic development and show similar levels of environmental awareness, but there are significant differences in terms of infrastructure. For example, Estonia's energy sector is based on carbon intensive lignite, Lithuania has the most developed transportation network and highest car use in the Baltics. Policy measures to reduce consumption-based emissions includes international and domestic policies focusing on changes in household behaviour and greener production and products. Current national policy approach and at the EU level do not cover most of the consumption related emissions coming from outside the EU. To change household behaviour it is important to provide information, infrastructure, systems of provision and resources to facilitate behavioural change.

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## **Designing and using values-based indicators in formal education contexts**

*Gemma Burford and Elona Hoover*

Recognising values as the intangible, 'hidden' pillar of sustainability can help educators to inspire and empower a new generation of sustainable consumers and producers. Following an EU-funded project to develop values-based indicators of sustainability (in a holistic sense rather than a narrow environmental sense) with civil society organizations, our research group has been applying this learning to the formal education sector.

We have identified two distinct applications of values-based indicators in formal education contexts: (a) to support strategic planning and organizational development, by incorporating the indicators into sustainability assessment and/or performance management strategies; and (b) to support teaching and learning, through the design of formative self-assessment and peer assessment activities that encourage critical reflection. In this co-presented paper, we will illustrate these complementary approaches in three pilot projects:

(a) Supporting strategic planning and organizational development only: Elona Hoover will describe a project conducted in partnership with BOKU University, Vienna, to develop values-based sustainability indicators from scratch within a university. Indicators linked to twelve values have been identified and the university's Ethics Platform is working to integrate them into the BOKU sustainability assessment process, which is structured according to the AISHE Tool 2.0 (Rammel et al., 2012). A similar research process has recently been launched at the University of Brighton, UK.

(b) Both approaches together: Gemma Burford will present an ongoing project, funded by the European Union, which aims to create a toolkit of values-based indicators for use in secondary schools. The first component is a peer-facilitated educational intervention using creative methods to stimulate individual and collective reflection on, and self-assessment of, 'sustainability skills'. The second component is a values-focused evaluation conducted before and after the intervention. In addition to highlighting any effects of the intervention, this evaluation can help staff and students to identify other aspects of school life that they value, and make recommendations for improving organizational performance.

(c) Supporting teaching and learning only: Gemma Burford will report on her experiences of using values-based indicators to assess small group learning processes in a third year undergraduate geography module (Burford et al., in review). Through self-assessment and peer assessment with the indicators, students were guided to reflect on what makes a co-learning group effective, and on how well they were contributing to their own groups.

Following these three examples, we will reflect briefly on the wider implications of our work and recommendations for further research.

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## **From 'sustainable production' to 'production as sustainability': the emergence of values-focused evaluation**

*Gemma Burford and Marie K. Harder*

Discussions of sustainable production usually focus on environmental sustainability issues, such as resource use, carbon emissions (including transport), air and water pollution, waste management, and impacts on biodiversity. It is widely acknowledged, however, that 'sustainability' as a concept is not merely synonymous with environmental protection. In addition to the widely-known social and economic dimensions, as well as a fourth, less tangible dimension that has variously been described as religious-spiritual, political-institutional, or cultural-aesthetic, all of which encompass human values as a key element (Burford et al., 2013a; Dahl, 2012). In this paper, we present findings from an EU-funded international collaborative research project, involving two research groups and four civil society organizations (CSOs), to develop values-based indicators and assessment tools for CSOs promoting education for sustainable development in its holistic sense (Burford et al., 2013a, 2013b; Podger et al., 2013). The outcomes of this project far exceeded initial expectations, generating not only a set of indicators that has been found relevant in many diverse contexts, but also an emergent paradigm of values-focused evaluation. We will illustrate that beyond conventional outcome evaluation and the evaluation of intervention processes (WHAT is done), there is an intangible dimension of implementation processes (HOW things are done) (c.f. Cox et al, 2007). Within a company or social enterprise, this dimension may be concerned (for example) with questions such as whether individuals feel part of a team, and understand their responsibilities within that team; to what extent people feel an emotional connection to the wider community of life (human and non-human); how policies of equality and non-discrimination are implemented in real life; and whether people are perceived to be truthful, honest and transparent. Such outcomes, where they are present, can be viewed as indicators of sustainability in a holistic sense - focusing on the 'human results' of production efforts, rather than the material inputs and outputs or the environmental impact of the physical processes. In values-focused evaluation, a process of dialogue (intersubjective conceptualization) is used to construct a shared vocabulary of values. Through discussion and consensus-building, 'value-labels' (words and phrases referring to abstract values, such as 'trust', 'empowerment' or 'unity in diversity') can be associated with 'indicators' (behaviours, perceptions or organizational structures that might indicate the enactment of these values within the work environment). This conceptualization process can contribute to a number of positive outcomes: individual behaviour change, improved group dynamics, esteem-related outcomes and strategic change. Through a feedback loop, values-focused evaluation both engenders and is facilitated by a culture of 'production as sustainability'.

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## **Affective and values-related aspects of a non-governmental organization's impact in motivating food waste recycling in China**

*Micheil Gordon, Lin Xiyin, Blaine Johnson, Xu Dong Yin and Marie K. Harder*

'Cradle-to-cradle' waste management may be viewed as a missing link in discourses of sustainable production and consumption (SPaC). The collection and composting of food waste can, for example, connect issues of consumption directly back to sustainable production (e.g. organic agriculture), creating a 'closed loop' system.

This paper investigates how and why non-governmental organisations (NGOs) and community-based organisations (CBOs) can make useful contributions to recycling schemes. Data was collected from four urban gated residential communities when a food waste collection scheme was introduced: two had normal civic involvement and two had additional NGO involvement. Pre- and post-scheme recycling rates, contamination levels and waste composition levels were measured, which showed the NGO involvement was significantly beneficial (Gordon et al., in review). We analyse these results using an evaluative framework based on behaviour change determinants initially prioritised by public health practitioners (Michie et al., 2005).

The resulting analysis shows clearly that the NGO's attention to localising the recycling scheme to different communities favourably influenced most of the key determinants, especially capabilities belief, motivation and emotion. The NGO generated a positive feeling around recycling by encouraging people to work together and identify a common purpose and goal. In particular, a number of residents wrote directly to the NGO stating that they were very touched by the volunteers in their communities taking the time to demonstrate the recycling - standing near the bins even in cold weather - and that this had encouraged them to commit more deeply to sorting their food waste. Civic authorities and waste management companies are fundamentally unlikely to be able to inspire this type of affective response. The apparent importance of empathy and solidarity with 'suffering' volunteers has implications worldwide in pro-environmental behaviour change planning, and could also be explored in relation to wider literature on Chinese culture, philosophy and values.

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## **Mini-workshop: Reflecting together on values and values-based indicators**

*Marie K. Harder and Elona Hoover*

This interactive mini-workshop will encourage wider stakeholder engagement with concepts of values and values-based indicators in sustainable production and consumption (SPaC). This will be achieved by inviting contributions to knowledge production from the attending audience and, if possible, from a wider international audience participating in the panel as a live webinar. This session exemplifies the enactment of sustainability values: we illustrate how values of empowerment, critical thinking and, ultimately, social justice can be reinforced by challenging the dichotomy between 'experts' and 'lay people' and granting authority to previously unheard voices.

The first part of the mini-workshop will focus on identifying and conceptualising values that participants might link to SPaC. This will be achieved by completing a short survey, either (ideally) online by using a personal smartphone, tablet or laptop, or on paper. Participants will first be asked to 'brainstorm' values-related words and phrases (value-labels) that they associate with SPaC, and second, select three of these value-labels and write a few words or a short sentence about what each one means to them. Third, each participant will be asked to choose just one of their three value-labels and think of a real-life scenario in which they felt that this value had been strongly enacted (i.e. where they or another person had really been 'living' the value). Results will be collated and either displayed in real time or shared after the session, depending on the functionality of particular web platforms in local circumstances.

In the second part of the mini-workshop, participants will be asked to respond to a small number of values-based indicators that have been generated in previous studies. This will be achieved by rating each indicator on a scale from 1 (not at all relevant to SPaC) to 3 (very relevant to SPaC) and discussing some of their ratings in small groups.

Finally, there will be a short plenary discussion facilitated by Marie Harder, highlighting any interesting findings and drawing out recommendations for future research. Following the session, participants will have the opportunity to contribute to a written statement that will be submitted by the panel 'Values and SPaC' to the conference organising committee.

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## **Carbon Footprint Labelling for Sustainable Building Materials**

*Sau Soon Chen*

Over the last two decades, Malaysia has undergone a rapid pace of infrastructure development that is expected to maintain momentum through the Economic Transformation Programme (ETP) in particular the Greater KL/Klang Valley development, the five Regional Economic Corridors and housing demands associated with rapid urbanisation. At COP 15, the Prime Minister of Malaysia made a voluntary commitment of 40% greenhouse gas emission intensity reduction relative to GDP by 2020 as against 2005. One of the initiatives of the ETP is to develop and retrofit buildings to enhance efficiency. The growth in the construction sector means increased demand for building materials and services that are supplied largely by SMEs. The SWITCH-Asia project on Environmental Declaration Scheme for Construction and Building Materials aims to motivate and inculcate best practices in the production and sourcing of construction materials and products through the life cycle approach. The production of these materials can be energy and resource intensive, hence the emphasis on their carbon footprint. The formulation or design of building materials can also impact their performance in the use stage such as replacements or refurbishment and their recyclability or ultimate disposal at end-of-life. The embodied carbon of a building is generally much smaller when compared to the operational activities. However they should be given due attention with the large production volume needed to support infrastructure development in fast growing economies as well as the opportunities for improvement. It is said what cannot be measured cannot be improved. Hence the project initial outputs were protocols, tools and the support mechanism needed for profiling their carbon footprint i.e. to enable producers of building materials and products to measure, report and reduce the environmental impacts of their goods. To ensure the quantification exercise can be sustainable from the business perspective, a carbon footprint labelling scheme will be developed to boost market share for lower-carbon labelled goods. The project has developed ten product category rules based on ISO14025, ISO/TS14067, ISO21930 and BS/EN15804 for a pilot carbon footprint labeling programme covering ten product categories: wall coating; sanitary ware, plumbing pipes, ceilings, floor finishing, wall panels, masonry units, structural steel, architectural steel and architectural roofing. These products were selected based on stakeholder consultations. The project will recruit 50 companies to join the pilot that will eventually see their products carbon-labelled, and hot spots identified for improvements. The project is implemented through the partnership of a technology institute SIRIM, Federation of Malaysian Manufacturers, Building Materials Distributors Association of Malaysia, Malaysian Green Building Confederation and Carbon Trust of the UK.

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## **The impact of consumer environmental awareness on supply chain strategies under carbon labelling**

*Yonghong Cheng, Zhongkai Xiong and Yu Xiong*

Carbon labelling has become a widely used term and concept in the public debate on responsibility and abatement action against the threat of global climate change and is now a buzzword widely used across the media, the government and in the business world. In practice, carbon labelling captures the interest of businesses, consumers, and policy makers alike. Specifically, manufacturers can watch their product carbon footprint as an indicator of abatement investment for dealing with global climate change, retailer are curious about the product carbon footprint of their supply chains, and consumers are more increasingly offered low-carbon products if they are care about the environment and willing to pay a premium for the carbon-labeled products deemed to be environmentally sound. In this paper, we consider a supply chain system consisting of one manufacturer and one retailer, as well as consumers, and analyze the impact of consumer environmental awareness on product carbon footprint, firms' pricing strategies and their profits. Interestingly, we find that if the initial carbon emissions level of the product is below a certain threshold, as consumer environmental awareness increasing, the product carbon footprint will decrease so far as to zero, but the manufacturer and retailer's pricing decisions are same to the case without carbon labelling, and the manufacturer's profit will decline, whereas the retailer's profit keeps the same to the case without carbon labelling. On the contrary, if the initial carbon emissions level of the product is larger than the certain threshold and consumer environmental awareness is relatively weak, carbon labelling does not induce the manufacturers to cut down product carbon footprint to zero, and when consumer environmental awareness is very strong, the supply chain will go out of business. In addition, we validate the corresponding conclusions through numerical examples. At the same time, some strategies and suggestions about how to lower product carbon footprint and set prices for the manufacturer and retailer under carbon labelling are proposed.

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**Car Culture, Gender and Sustainability in urban China**  
**From Kingdom of Bicycles to Land of the Car: Car Culture, Gender and Sustainability in urban China**

*Hilda Roemer R. Christensen*

Cars have become a highly visible site of life and consumption in 21st century China where car ownership has turned into a material icon of belonging to the Chinese middle class and the class based value matrix (suzhi). This has created a new and hegemonic car discourse promoted by commentators, car producers, planners, politicians, media and willing consumers, with vested interests in the stunning car boom in China and assumed gains for economy, production and daily life. The aim of the paper give an account of car-culture and gender in present day China and to challenge dominant research paradigms in transport and mobility and sustainability studies where gender has been either ignored or stereotyped. It departs from theoretical and methodological considerations of gender and car culture and argues, that gender and cars are entangled in both global and local assemblages through which bold processes of current Chinese and global developments can be explored. It turns out that cars in today's China are not only subject to craze and fascination, but also to worries and contestations related to safety, air pollution and class privilege. The gendered implications of car culture make these ambiguities even more pronounced as they challenge conceptual, cultural and political ideas of gender equality, diversity and mobilities. In the paper I will focus on gender and class in the making of the new cultures of mobility and possible alternatives. Whose ideas and preferences have been met and what kind of conflicts have evolved? What are the effects of the new mobility and car cultures for gender and social (in)equalities? And how can these effects best be recorded, analyzed and changed?

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## **The role of university in shift to pro-environmental consciousness and behaviour: insights from the Lithuanian case**

*Renata Dagiliute and Genovaite Liobikiene*

Environmental education and information provision is one of the most important tools for seeking sustainable development. In the whole education system, higher education plays an important role providing platform for access of people from different branches of science, different views and perceptions and creating possibilities for more environmentally friendly, sustainable lifestyles and professional decisions.

The aim of the study was to assess the environmental consciousness (worldviews) of the students and its impact on environmentally friendly behaviour (purchasing eco-products). Study focuses on those who choose elective Environmental Science or other Nature or Physics science related subject at Vytautas Magnus University, Lithuania. Referring to survey conducted in 2011-2012 (during two semesters), there was the revised New ecological paradigm (NEP) scale (Cronbach alpha - 0.672) applied. Where were questioned 438 students, 45.8% of them from Environmental Science course students. In order to reveal the determinants of environmentally friendly behaviour the Values-Belief-Norms behavioural model was applied. The influence of demographic factors such as gender on worldviews and environmentally friendly behaviour was embraced as well.

Study reveals a relatively high environmental consciousness of the students in general. Mean of the NEP scale amounted to around 36.5 (SD 6.65). This could explain why they have chosen particular courses. Those choosing Environmental Science, Biology or Astronomy had pro-environmental views more often than those choosing Logic for analytical reasoning ( $F=7.71$ ,  $p<0.05$ ). Female students were more environmental orientated ones ( $t=2.39$ ,  $p<0.05$ ). Not always pro-environmental attitudes turn into corresponding behaviour, but in our case students with more expressed pro-environmental worldviews have been purchasing eco-products on more regular bases ( $F=3.315$ ,  $p<0.05$ ). While in the case of several possible factors, interest in environmental issues was most influential ( $B=0.325$ ,  $F=24.52$ ,  $p<0.05$ ).

Special courses or topics on environmental issues are of importance in curriculum, especially trying to reach environment not committed students as results reveal. Environmental and sustainability policies of university should also be taking into account and promoted in general. Both bottoms - up and top-down pro environmental initiatives exist in university, hence, not always consistent approach is being applied and intentions are being "lock-in". Possibilities to express views and attitudes ("unlock") play a crucial role in this case as behaviour might be determined by many other factors, not only attitudes.

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## **The Ethics of Hope: Values as Positive Drivers for a Sustainable Future**

*Arthur L. Dahl*

With science providing largely negative, even apocalyptic, messages about the state of the planet, and the economy heading rapidly in the wrong direction, we are not motivating action, but turning off the youth. They see what is wrong, but lack alternatives to propose. With their capacity for networking and access to knowledge, they can be the drivers for societal transformation, rather than just revolution. To shorten and reduce the human impact of the inevitable transition ahead, we need to provide an ethically-based positive vision of the possible sustainable future, and a narrative on how to get there. Sustainability values can be the drivers for change. They can be founded on the multiple dimensions of human well-being, but also need to include the individual transformation from the egotistical pursuit of self-interest based on a materialistic concept of human life and purpose, to an altruistic orientation of service to others, with the happiness that comes from a virtuous life. This transformation is at the heart of all the great religions, from which traditional spiritual practices and knowledge can be drawn. This should become an essential part of education for sustainability. By getting the values right, the potential is created to evolve many diverse social and economic solutions for a sustainable low-carbon society.

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## **A political economy analysis of the Chinese climate policy implementation at local level**

*Yixin Dai and Hubert Schmitz*

In response to climate change, government, especially local government plays essential rule in designing and implementing climate policies to fix the market failure generated from the negative externality. Government intervention in China is also smoothed by the so-called "local government entrepreneurship" phenomenon, in which local government is purposely promoting certain policies to maximize local benefit measured mainly through economic improvements. Local government entrepreneurship is normally found to be effective and efficient in implementing most policies in China.

Policies in response to climate change, referred as "climate change policy", include energy policy, climate policy, industrial policy, science and technology policy, and financial policy among others. Climate change policies do not naturally lead to local economic improvement. For example, strict environmental standard may increase the manufacturing cost and reduce the benefit. This makes the direct push from government less powerful in policy implementation. On the one hand, local governments may have less motivation in certain climate change policy implementations due to their lack of visible, short-term, economic benefit; On the other hand, more active stakeholders involved in the climate change policy implementation with conflicting interests.

To deal with the implementation complexity, this paper tries to form a comprehensive framework to understand who, with what interests, drives/obstructs climate change policies implementation in China.

This study chooses solar electricity application policy, "the Golden-Sun Project" as the example to explain the gap between designed policy and the policy implementation. First hand data come from firm interviews and local government interviews, while policy document contents serve as second hand data. Following Yin (1996), this paper explores on single case to form the theoretical model.

Many different types of stakeholders are considered in this research, including local government, business and civil society with different priorities: climate change mitigation, energy security, competitiveness, or job creation. There are competing narratives of individual interests during the process of policy implementation. Through qualitative analysis via context coding, this paper finds multiple pathways of climate change policy implementation at local level in China. Preliminary results show that policy adoption process and implementation process are separated at local level. Implementation is not only initiated by the government; rather, it could be initiated by different stakeholders according to their own interests. Key elements (i.e. stakeholders), key actions (i.e. resource allocation) and key environment (i.e. market adoption) form different implementation paths reflecting the influential power of different stakeholders.

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**From Top Down to Bottom Up: Investigating the potential of market mechanisms to effectively direct China along a sustainable growth trajectory through a shift in production and consumption patterns.**

*Sabine Dauth*

Academic analysis has predominantly treated China's approach to climate governance as a fixed entity dominated by state led top-down regulation.

China, however, is in transition. Chinese authorities have identified market based mechanisms such as emissions trading and carbon tax as effective and cost efficient pollution reduction measures to address air pollution and the climate-development dilemma. By putting a price on carbon the establishment of economic instruments will directly impact consumers as well as providers of energy intensive goods and services alike.

This paper attempts to move away from a black box view to reveal a multitude of actors and networks. It seeks to establish the extent to which civil society could influence the direction of climate politics through market instruments bottom-up with their diverging interests and conflicting agendas.

By investigating the impact of these actors on the allocation of benefits and burdens as well as risks and opportunities associated with economic climate instruments, the paper intends to shed light on the potential of market mechanisms to shift the behaviour of providers and consumers of energy intensive goods and services towards more sustainable production and consumption patterns. Research will draw on experiences in developed countries as well as other emerging markets. The paper will conclude with recommendations for the design of market instruments within the unique and complex setting of China's political economy.

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## **Smart Intelligent Low Carbon Eco Knowledge Cities; making sense of a family of concepts promoting sustainable modernization of urban areas**

*Martin de Jong, Simon Joss and Margot Weijnen*

In the past 20 years metropolitan areas around the world have been seen to take a variety of initiatives towards modernization in an effort to create better social, ecological and/or economic development opportunities for the future. These initiatives have been coined in different terms, most commonly as 'intelligent cities', 'smart cities', 'knowledge cities', 'eco cities', 'low carbon cities' and 'resilient cities'. Although these terms are often used interchangeably by public policy makers, the academic literature has tried to make distinction between the various concepts of urban modernization and their normative perspectives, as the focus of their actual implementation in practice appears to differ markedly. Even if modernization efforts towards a more knowledge intensive economy may enable economic growth measured as GDP or GDP per capita to be paired with a decrease in material and energy resource intensity of that economy, that does not imply that 'knowledge cities' and 'eco cities' development efforts are likely to have similar outcomes. This paper aims to re-examine the plethora of city modernization terms in the academic literature to clarify their explicit and implicit normative-conceptual perspectives and identify contested perspectives. Besides the academic contribution of this work, it will provide policy makers with clarity on the implications of their choice between different city modernization concepts and the pitfalls of their implementation. Underlying the concepts of intelligent city and smart city is the notion of the city as an organism with a brain and metabolism, in which massive implementation of information infrastructure will help to increase the metabolic efficiency while at the same time transforming interaction patterns between infrastructure and consumers and between citizens into information- or knowledge driven relations. The knowledge city emphasizes the social side of knowledge infrastructure more and aims to enrich human capital and encourage the emergence of an open and a cosmopolitan civil society. The terms eco-city and low carbon city obviously originate from a more environmental view of urban development, albeit with large differences in emphasis on ecological quality, livability and reduction of energy use. While eco-cities have stronger overtones in architecture, urban design and urban planning and allow for a more fluid and wider interpretation of policy implications, low carbon cities take GHG emissions as the key indicator for improvement in the performance of the built environment and thus focus more on the energy household.

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## **Institutional challenges and barriers for the implementation of sustainable urbanization in China**

*Martin de Jong and Li Yu*

Perhaps more than anywhere else in the world, in China the concepts of eco city low carbon city and low carbon eco city have caught attention from policy-makers. In previous studies published in journals such as *Journal of Urban technology*, *Journal of Cleaner Production* and others, much attention has been paid to policy ambitions, the actual implementation of policy plans, complications emerging during the implementation process and the disappointing gap between initial intentions and the emerging realities of the new built environment. In our view, this can be the result of three possible scenarios, or combinations thereof:

1. In some cases, the eco-city or low carbon city becomes more expensive than initially planned for and the developer encounters serious financial difficulties. This can be because construction costs were underestimated, or even ignored in planning stage or because the attractiveness to new green businesses was overestimated, leading to higher costs or lower benefits than anticipated. In short, there is economic underperformance. This has been the case in various projects where the developer(s) went bankrupt, such as Tangshan-Caofeidian (Hexun News, Available at <http://news.hexun.com/2013-10-08/158542517.html> [accessed: October 14 2013])
2. The eco-city or low carbon city is realized and a comparative economic success, but along the way much of its ecological attraction or gain is lost, because ambitions were given up along the way or performance on environmental standards was not appropriately measured, monitored and controlled. The result is a regular somewhat garden-like suburb with high carbon emissions. This is ecological underperformance as it can be found in Tianjin-Binhai.
3. The eco-city or low carbon city is realized, but its social appeal is limited (Yu, 2012, "Critical Analysis of Chinese Eco-cities Development", *Urban Planning International*, 27(3), 93-101 ). It does not have the cosmopolitan and international feel that was intended, it is not really innovative but more middle of the road. The low carbon city has not become a smart city or a knowledge city. We could call this type social underperformance.

In this article, we will be exploring the institutional background for these urban sustainability projects in China, why policy-makers, developers, infrastructure builders, architects and environmental regulators work in the way they do and how the combined institutional forces (financial, regulatory, career and other incentives provided to various actors) often make their behavior rational in terms of their own policy goals, but why combined they make the realization of truly sustainable next to impossible.

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## **Households' Livelihood Vulnerability to Climate Variability and Change: Adverse Effects and Adaptation Strategies in Southern Ethiopia. A Case Study of Sodo Woreda**

*Zelalem N. Dendir*

The impact of global climate change is mainly felt by societies from regional to local scales. Droughts or intensive precipitation events, for instance, can have dramatic effects on agricultural production and thus on the household livelihood base. Ethiopia is one of the most vulnerable countries to the impacts of climate change since the economy is largely dependent on climate-sensitive natural resources and adaptive capacity is very low. Climatic studies mostly focused at global and national levels but only very limited studies carried out at local and household levels. Robust assessments of adverse effects and adequate adaptation measures are thus urgently needed. Therefore, this study was conducted to identify adverse effects, factors which make farmers vulnerable to adverse effects of climate variability and change and to find out the coping and adaptation strategies that households practice to withstand the situation. In order to achieve these objectives, a survey was conducted to collect primary data from sampled respondents. Supplementary, secondary data were collected from published and unpublished sources. The data were analyzed using qualitative and quantitative techniques. Ample evidence showed that climate change has impacted agricultural productivity, livestock, ecosystem, and biodiversity which has been frequently imposing challenges on their livelihood and consequently affecting the natural, financial, and social resources on which communities depend. Thus, many people are still waiting for aid particularly food aid. Furthermore, droughts and floods have been experienced leading to loss of many resources. In connection to this, it is understood from the study that many sources of income generating activities for the sustenance of people's livelihood have been severely affected due to climate change. In addition, communities mentioned other, oftentimes mutually-reinforcing, social and environmental issues that have implications for their vulnerability. These underlying drivers of vulnerability includes environmental degradation, population pressure & gender disparity. Sale of household asset, borrowing cash, reducing frequency and amount of meal, selling of firewood, and food aid, were found to be more frequently practiced coping strategies by farmers. Finally, giving priority to female headed households in interventions, introduction of water harvesting technologies, promotion of on-farm and off- farm diversification, opening credit institutions, and organizing the farmers under associations and work in close collaboration with intervening agencies recommended by different stakeholders as sustainable interventions to climate variability and change related adverse impacts.

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## **Focal organisations and sustainable consumption and production systems: the case of China's dairy industry**

*Leonie Dendler, Paul Dewick and Shiyi Chen*

With its fundamental transformation over the last decades in both production and consumption, the dairy industry is a prime example of China's rapidly changing consumption and production systems (CPS). Portrayed mainly as a means to improve the 'quality' of Chinese dairy products, there have been particular efforts to achieve greater consolidation and concentration in the historically fragmented Chinese dairy production and distribution chain. However, in depth studies of the implications of those industrial transformations from a sustainable consumption and production perspective are missing so far.

Through secondary literature review, documentary analysis and in depth elite interviews with experts from across the Chinese dairy CPS, this paper seeks to address this gap. Drawing upon new institutional theory as well as work on supply chain governance (e.g. Gereffi et al. 2005), we focus on exploring the role of 'focal organisations' in shaping the direction and pace of change toward a more sustainable CPS. We understand focal organisations as those whose behaviour can lever innovation and sustainable practices across CPS by virtue of their "innovation power" (van Bommel 2011) and "unique position" (Huber 2008).

We explore how a series of governmental interventions stimulated the emergence of increased 'focal' power of manufacturers and lead to significant change in the Chinese dairy production and distribution system. These changes include vertical and horizontal integrations, implementations of central production complexes and zones, increased technology and knowledge exchange, changes in contractual arrangements and licensing as well as various other supply chain management measures, such as standardisation, monitoring and certification. However, despite these transformations, quality concerns still remain, especially from a safety perspective. What's more, the unintended consequence of a current focus on food safety appears to be the marginalisation of environmental concerns and conflict with other normative sustainable development goals such as poverty reduction and equality. We contrast the emerging situation in China with that of the UK dairy CPS and identify relevant avenues for mutual learning. In addition, our paper makes a theoretical contribution to the ongoing discourse about the role of focal organisations in stimulating innovation and institutional change to support sustainable consumption and production in different geographical and socio-political contexts.

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## **Institutionalisation of organic labelling in the People's Republic of China**

*Leonie Dendler and Paul Dewick*

Over the last decade, the People's Republic of China has become not only the world's second largest economy and home to more than one fifth of the world population, but also the second largest contributor to world carbon emissions facing increasing pressure on already insufficient natural resources. To address some of these problems and facilitate more sustainable consumption and production, multiple Chinese product labelling schemes have been implemented. The effectiveness of these schemes has been limited however, in their acceptance by Western markets as well as meeting their aim to target a rising Chinese consumer class. Previous studies in Western contexts suggest that the (outcome effective) institutionalisation of product labelling schemes is driven by a dynamic construction of legitimacy between various actors from across the consumption and production system (CPS). Yet in depth studies of the causalities behind the institutionalisation of Chinese product labelling schemes are rare, even more so work that would shed light on causalities across different institutional contexts within China. This paper seeks to address these gaps through an in depth study of the institutionalisation of the Chinese organic labelling scheme in two contrasting CPS - potato and dairy. From a theoretical perspective, the work is framed by new institutional thinking as well as concepts of legitimacy from the governance and organisational studies literature. Empirically, each case study draws upon secondary review of academic and other relevant documents; discourse and content analysis of a major Chinese newspaper; and in depth interviews with experts from across the dairy and potato CPS in China. Based on this work, we show how in the increasingly concentrated dairy PDS powerful initiatives amongst key manufacturers coupled with strong health associations related to dairy consumption and a prominent discourse around the safety of dairy products has resulted in the increased diffusion of the Chinese organic label. In contrast, the Chinese potato CPS, with a much more fragmented PDS and couched within a less favourable normative, discursive as well as natural environmental setting, has seen less strong diffusion dynamics in recent years. These findings illustrate how key legitimacy actors and other drivers of product labelling institutionalisation processes can differ substantially across different product groups making not only an important contribution to the new institutional and governance literature but also helping certification and labelling practitioners to make crucial strategic adjustments.

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## **Toward Guidelines for Best Practices Replication Process in Urban Neighborhoods**

*Franck Dubois*

Facing Climatic Change and the depletion of natural resources, consideration should be given to an anthropologic change able to preserve our planet while reconciling social progress and economic performance. Our "resource-hungry lifestyle" daily consumption models are at the core of the situation. Therefore, how to mobilize citizens around eco-responsible conducts? The common approach is to build on co-construction, change management and public policies. Our project teams are currently working on a results restitution process to inhabitants and representatives in the urban area of Fontaine d' Ouche and its surroundings within the Dijon conurbation in Burgundy. From empirical models to applied public policy, an omnipresent accompaniment process of actors is necessary with inhabitants, public services, associations and retailers in a neighborhood, a town or even for a whole city.

The aim of this article is to provide an overview of actual functional criterion and parameters used in demonstrator showcases, planning models, tools and alternative trend scenarios of eco-responsible conducts and residential development in metropolitan areas. Which elements are mutualisable or need a popularized overview? Thousand experiments around the world are waiting for a cross-boundary transfer. But we are limited in a maximum population size to conceive a comprehensive physical planning tool. How to make the maximum amount of inhabitants able to participate and communicate with guide lines, schedules, workshop and engineering tools?

When context sustains participation, we usually need to limit learner numbers to a classroom, a school perimeter or a neighborhood unit to design, build and test dialogical devices in order to co-produce a community to help and causes the socio-ecological transition. The present proceeding would like to analyze collaborative experiments criticism in order to consider a comparison of the population on to different scale maps, for example between France and People's Republic of China.

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## **Understanding governance structures and their influence in enabling resource efficiency and collaborative consumption**

*Chandra Kripa K. Dwarakanath*

Analysis of empirical evidence on collaborative consumption (CC) point to three distinctive drivers behind the practice- financial, ethical and necessity. They can be related to three actors- businesses, organised civil societies and national/ supra-national bodies respectively. This paper will aim to examine practical examples and debate on which of these three actors can deliver a better CC model, in terms of longevity of intervention and impact.

Drivers to collaborative consumption and living within limits: Financial: Businesses take interest in being primary consumers or intermediaries in the CC model only when there is clear financial benefit. This is true at the successful industrial symbiosis case of the National Industrial Symbiosis Programme (Green Futures Magazine, 2012) in the UK, where NISP facilitates information exchange on material availability between interested parties. In the case of peer-peer sharing, models that offer greater business opportunities are typically pursued by companies (World Economic Forum, 2011). Thus profitability is the main driver and businesses remain key actor in these models.

Ethical: One of the weak signals from emerging consumer trends comes from people who are looking for a 'more meaningful life' and attempt to live within limits (Mattar, (World Economic Forum, 2011). They manifest in different ways, such as sharing bicycles or exchanging used products through internet. Taking this a step further are local currency examples used to trade local produce. The main driver behind this shift from the consumerist society may be ethical and the actors are individuals and organised civil societies (in developed countries).

Necessity: Examples from history and from the future indicate the need to live within limits can be driven by the government. In Cuba, during the oil crisis, government intervention required their citizens to invest time in urban gardens and become self-sufficient; reverse migration to rural areas was encouraged ( (Robins et al, 2010)- resulting in positive outcomes. For the future is the intervention by the European Economic and Social Committee with a Public Hearing on CC in 2013. It aims to avert a resource crisis and may enable CC through the regulatory route. The driver in both cases being necessity (to avert/ respond to a crisis) and chief actors being the government/ supra-national body; although there is very little in common between the examples from a macro-economic perspective.

Research theme: With three distinctive strands of actors and structures operating with one aim i.e., living within limits, the focus of this study will be to examine the link between governance, markets and regulation and their likely impact in promoting CC. The geographic focus is Europe, but to explore self-sufficiency models case of Cuba is included.

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## **When consumption becomes political. Understanding politicized consumer participation in new democracies**

*Fabian Echegaray*

Political consumerism as the use of consumer choice among brands and products to support ethical or socio-environmental goals has increasingly been recognized as part of a citizen engagement repertoire among scholars from social sciences (Micheletti et al. 2003; Stolle et al. 2005). However, the vast majority of the publicly available evidence comes from developed societies in fairly equal and mature democracies with nearly zero knowledge about developing nations (Cotte and Trudel 2009; Balsinger 2013).

Lifestyle politics (Bennett 1998), post-materialism (Inglehart 1997), a sense of individual self-responsibilization (Micheletti et al 2003), and mistrust in traditional political institutions (Beck 1997) have been brought forward as explanations for political consumerism, although partially supported by data (Baek 2010; Newman and Bartels 2010; Neilson 2010; Barbosa et al. 2013). Given that most theorizations on the subject reflect thinking about social trends relevant to the context of the developed world, suspicions arise about their applicability to unequal societies undergoing a time of democracy consolidation. Standard interpretations of boycotting and buycotting for corporate provision of public goods may be overlooking the influence of consumer mobilization by corporate movements like CSR for steering politicized market behaviors.

Using recent survey data from Brazil (collected from an urban representative sample of 403 adults), this article empirically examines five hypotheses about the motivations for political consumerism, related to the impact of lifestyles differences, the role of post-materialist values, the effect of sub-politics theory, the risks for the quality of democracy, and the influence of beliefs about corporate social responsibility (CSR).

Results indicate that Brazilian political consumers embrace democratic politics and rely on a CSR policy framework for societal change, challenging the predominancy of a value-driven, sub-politics motivated interpretation.

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## **Consumers reactions to product obsolescence in emerging markets. The case of Brazil**

*Fabian Echegaray*

Product obsolescence in the household appliances and electronics segments represents a major challenge for building sustainable development. Since the term was popularised by Vance Packard (1960) over half century ago to refer to the deliberate curtailment of product life span, the volume of e-waste have grown exponentially amplifying its social, economic and environmental effects. In the case of emerging markets, the combination of widespread social mobility and purchase power gains by lower classes together with poor waste management infrastructure and poor regulation of corporate performance aggravates results. Product obsolescence leading to a fast cycle of product replacement may be interpreted as a positive market mechanism that stimulates demand and lifts businesses thus performing as a catalyzer for product innovation and overall economic growth. Conversely, a shortened product life span raises negative consequences for society (eg, consumism, reduced disposable income for new goods or services), the environment (eg, pollution and higher pressure over natural resources), manufacturers (eg, increasing customer dissatisfaction and disloyalty), and authorities (eg, waste disposal management). Despite these important consequences, little research has been conducted on the topic, with released information restricted to a handful of scholar and government-sponsored studies in few developed societies (Cooper 2004; 2005; Gultinan 2008). In emerging countries this lack of publicly available information for consumers is further aggravated by the lack of volunteered corporate initiatives indicating the average lifespan of products. This paper aims to illustrate consumers' perceptions of appliances and electronics product life spans and to understand consumers' reactions to product obsolescence in an emerging country: Brazil. It reflects a research partnership between a market research agency and IDEC (the leading consumers' advocacy organization in Brazil) in order to improve educational campaigns, enlighten the debate on the subject, and provide information for future policy initiatives. Studying Brazil is relevant given its emblematic standing as the most resounding contemporary case of social mobility and consumerism in the Western hemisphere, with nearly 50 million leaving poverty to middle class status during the late 2000s (World Bank 2012). Consequences of such drive include the highest per capita e-waste rate among developing nations (average 0,5 kgs/year, cf. PNUMA 2010). On the other hand, the nation hosts one of the most pro-active business alliances in the realm of corporate sustainability (Visser-Tolhurst 2010) and sustainability mobilized third sectors in the developing world (Leeuwen 2006), and upholds one of the most progressive legislation on solid waste management in the pack of emerging societies (PNRS 2010), although weakly enforced (Visser-Tolhurst 2010).

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## **Pathways towards sustainable maize production and consumption in China: prospects, politics and practice**

*Adrian V Ely, Yiching Song and Sam Geall*

Food and agriculture are fundamental to human development. However, through their impacts on biodiversity, greenhouse gases, nitrogen and phosphorous cycles and the use of freshwater, current forms of agricultural production threaten to undermine opportunities for development into the future. At the same time, changing consumption patterns (especially increased intake of animal protein) are putting ever more pressure on agri-environment systems. China provides a stark and globally significant illustration of these trends. The manufacture and use of synthetic nitrogen fertilizer is currently estimated to account for some 9- 15% of China's total greenhouse gas (GHG) emissions, as well as contributing to additional environmental and social problems. However, China's rapidly growing innovation capabilities and dynamic pattern of development offer a unique opportunity for system innovation towards more sustainable and resilient agri-food systems. This paper discusses the technological, political and socio-cultural factors central to such system changes, with a focus on maize as a core case study.

Beyond export restrictions, China's national policies around agriculture and food security focus primarily on building technological capabilities in agri-science and technology for intensification. The focus on R&D-intensive, IP-driven approaches also links to the 'indigenous innovation' growth strategy that developed since the Hu-Wen administration. However, new transgenic products such as phytase maize (which claim environmental benefits) are yet to be approved for cultivation, despite meeting legally-defined biosafety requirements.

Alongside the focus on agricultural biotechnology, there is also concurrent interest in upgrading low external input maize agriculture in China through improved management practices and supply chain innovation to deliver high quality products serving wealthier urban and overseas markets. Agro-ecological and participatory research approaches have simultaneously been shown to provide multiple benefits in terms of livelihoods, environmental sustainability and - through maintaining genetic diversity - resilience. This alternative form of 'disruptive innovation' provides a more bottom-up, emergent model of sustainable socio-technical transition.

Drawing on social science research carried out over the past decade, and preliminary work on a newly-funded (2013-2016) project, the paper will explore the potential for the strategies above to enable wider transitions to more sustainable maize consumption and production systems in different parts of China. We will especially focus on the political context of these transitions, and the changes in practices amongst farmers (maize and livestock), supply chains and consumers envisaged in transitions towards more sustainable future agriculture systems.

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## **Sustainable fisheries and seafood in China**

*Michael Fabinyi and Neng Liu*

With the massive expansion of the Chinese economy over the last thirty years, China's role in fisheries production, trade and consumption has become increasingly prominent. How China and the world adapts to these trends will be a major social and environmental issue in the years to come. This essay examines the policy and governance context of China's role in global fisheries, focusing on the factors that influence whether and to what extent processes of 'ecological modernization' are taking place. We focus on a number of key themes, including recent policy developments as articulated in government documents, the role of environmental non-government organisations, and scientific and technological developments in the aquaculture industry. We also highlight the role of important drivers of policy that lie outside the immediate fishery sector, such as the overarching importance of economic development, poverty reduction, food safety and food security to China.

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## **Network Environ Perspective for Virtual Water Cycle in Social-Economic System**

*Delin Fang and Bin Chen*

Stemming from the increasing population and urbanization, environmental resources are highly utilized as inputs material and resources for economic production and consumption, however, they are often undervalued as little costs associated with their consumption, especially for water resource. Virtual water can reflect the water consumed during the whole production process, providing an effective tool towards determining how best to use the scarce water available. Cities are considered as the major contributor to water shortage problem, where water is highly embedded in the overall urban metabolism. In this study, based on a virtual water flux model in urban social-economic system, we utilized Network Environ Analysis (NEA) to figure out the mutual interactions and control situation within the urban virtual water trade between different economic sectors. This system model enables to distinguish between direct and indirect consumption, probes into interrelationships in virtual water trade from mechanistic aspect, and further reveals the dominate water consumer. It provides the feasibility of designing an economic and environmental policy oriented towards sustainable water management.

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## **Promote Sustainable Consumption Governance in China and its Policy- Supporting Contents. Based on T21 Modelling**

*Ying Feng*

Sustainable lifestyle and sustainable consumption has long been neglected yet is exactly the vital sector of the realization of "saving-energy and emission reduction" national target, and further the greening of China and the world. Pitifully we have put so much attention of Clean-production and the production end, yet less emphasis on sustainable Consumption in China and consumption-end, especially how to promote sustainable consumption in China. This paper analyzes on why current sustainable consumption situation is weak in China, above which summarize how China should take a major strategic transformation of Green Consumption. In the third part, this paper uses T21 Model(Threshold 21, Chinese Sustainable Development Modelling) which was originally developed by Millennium Institute(MI) of USA and revised by ISTIC to do scenarios analysis and conclude some major in sustainable consumption. In the last part, this paper puts up Chinese policy-suggestions on making a sustainable consumption strategy, framework and policy-setting in the years ahead.

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## **From manufacturing industry to strategic renewable energy sector: Solar PV in China**

*Doris Fischer*

In the past, China has been praised as leading in solar PV. For most of the time, though, this praise of China's role regarding solar PV only held true with regard to the manufacturing industry. Manufacturing of cells, modules and panels indeed grew fast in the last decade and much faster after 2009. However, most manufacturing output was not used for solar power generation within China. Instead more than 95 per cent of PV cells, modules and panels were exported. Only in reaction to weak international markets following the global financial crisis and to the disputes with the US and with Europe regarding cell and module prices did the Chinese government start to experiment with larger scale deployment of solar PV technology in China. Experimentation has so far been a thorny process as the existing benchmarks for solar policies in Western countries were either deemed too expensive or incompatible with the Chinese energy sector. Hence the experimentation with different approaches to solar energy technology deployment tried to develop a Chinese way of bridging manufacturing industry needs, state energy policy strategies, infrastructure problems, cost issues and vested interests. This paper will look into this process of experimentation from a policy learning and politics perspective. It links up to the literature regarding transitions to a low carbon economy by highlighting the importance of underlying policy processes. It also links up to the ongoing discussion within social science research on China regarding the specific importance of policy experimentation for explaining economic development and political stability in China. Specifically the paper addresses the following questions: What were the driving factors and who were the driving actors behind different types of policy experimentation regarding solar PV deployment? To what extent did different experiments feed into a policy learning curve in China? Has this process of experimentation resulted in policy innovations that are useful and relevant for other countries? The paper will be based on earlier publications of the author and additional research into the solar PV deployment policy framework that is emerging as a result of the political leadership change in China since 2012/2013.

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## **Electric vehicle market development in China - Consumption and business models**

*Doris Fischer and Sabrina Weithmann*

Electric vehicles have been propagated in Germany since the 1970s and have received rising governmental and public attention in recent years. Electric vehicle development in China emerged with the 863 program (1986) for high technologies and has received more substantial support since the 10th Five Year Plan. However, in both countries support programs of the past had only limited effect in terms of actual market penetration. While past papers on EV development in China and Germany have concentrated on efforts to enhance the technology (range, safety, charging time or charging infrastructure) more recently both China and Germany have started experiments to accelerate EV sales and market penetration that eventually should support mass market development. With this move towards sales promotion, the need to reach and attract the consumer becomes important.

This paper will examine selected cases of experiments for electric market development in China. We will look into subsidies, business models and incentives schemes used and will evaluate these against insights from research on consumerism and marketing in China. The findings of this research are compared to equivalent business models for EVs in Germany. Specific questions addressed by the paper are: How do consumer structure and preferences for EVs differ between both markets? Do the EV business models employed match with relevant insight on consumerism and marketing in both countries? What are the assumed preferences of consumers inherent in the business models? What can be inferred from the examples for EV deployment strategies in China and Germany? Can the experiences with experiments contribute to improved cooperation between actors of both markets? This paper will be based on earlier research of the authors on EV technology development and innovation in China and Europe and a current project dedicated to electric vehicle consumer market in China.

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**Digital Participation for an eco-responsive consumption**  
**Framework of our research program : « Transition Towns, the case of Fontaine d' Ouche »,**  
**MOVIDA Program**

*Olivier Galibert and Cyril C Masselot*

In May 2011, has been published on the website of the Ministry of Environment, Sustainable Development, Transport and Logistics of France (MEDDTL), a call for funding research projects in order to understand the levers of sustainable consumption. This program, named MOVIDA, aims to assist the government policy in accompanying consumerist changes provoked by taking into account the ecological imperative. We decided to study the consumption practices of an area of the city of Dijon in Burgundy (France), mixing condo in big buildings, residential areas of individual houses, green spaces. In this inter-disciplinary research program which also gathers psychosociologists, economists, geographers, one of the research issue is to consider the role of communications tools 2.0, particularly in mobilizing and assisting inhabitants towards sustainable consumption practices. Our project has been laureate of this funding program and we began the scientific work since the first of January 2012.

The Web 2.0 in order to involve inhabitants in the eco-consumption path? Our research on Web 2.0 tools is part of a participatory and co-constructive approach. It aims to involve all stakeholders in the creation and dissemination of eco-citizens consumption practices in the field of mobility, leisure (sport and culture) and food. The social utility of the project is to support the implementation of concrete initiative as known as « transition experiences ». For Rob Hopkins, "[...] transition experiences represent a new evolutionary approach to sustainability for a community [...]. Although the peak oil and climate change is undoubtedly enormous challenges they carry with them the possibility of an economic, cultural and social innovation. We will see a blossoming of local businesses, local solutions and skills and an explosion of creativity and cunning." Obviously, we cannot predict the development of these micro-level initiatives in the territories. The solutions expected by Hopkins displayed the predominance of micro-level actions. It is the accumulation of small and spontaneous experiments which must be generalized to enhance social innovation through the socio-ecological transition rules. This is a global change from a "top-down" to a "Bottom up" governance. How a social network as Facebook could be a good communication platform to initiate, stimulate or help this transitional experimentation of sustainable consumption? Do the inhabitants have enough skills in using the Web 2.0? What kind of community management is required to succeed in this task of environmental education? All these questions deal with the participation issue : What kind of communication devices and services are the best to enhance participation of the inhabitants? What are the forms and norms of this participation?

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## **A study on carbon lock-in in housing**

***Ran Gao, Zhen Zhang and Hongmin Chen***

In today's China, energy conservation in the areas of life is being ignored. Many people are optimistic that behavior change can effectively reduce carbon emission in everyday life. This paper argues that if there is carbon lock-in in the areas of life the contribution of behavior change is very limited. In order to explore the effect of carbon lock-in in everyday life, this paper focuses on the relationship between the size of house and energy using. To vividly illustrate the effect of carbon lock-in in housing, this paper compares two typical size of housing, that is, 30m<sup>2</sup> per capita and 200m<sup>2</sup> per capita and finds that the electrical equipments are different. More energy-consuming equipments are stuffed in larger houses. Once those devices are acquired the effect of emission reduction from behavior change is almost negligible. Therefore, to avoid being locked in by bigger houses is a question worthy of study. In essence, it is a how to provide Chinese a new style of life which is both comfort and carbon saving.

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## **A discourse-institutional perspective of micro-generation in the UK**

*Audley T. Genus*

The paper considers problems and possibilities connected with governing and realising the "transition to sustainability". Conceptually its focus is on neo-institutional analysis and critical discourse analysis and the development of a discourse-institutional perspective. The first strand of the paper outlines the limitations of and potential insights into the governance of sustainability transitions that may be derived from adopting an approach based on a more thoroughgoing appreciation and application of work in sociology on neo-institutional theory. The second strand of the paper concerns discourse, recognising the role of text, discursive practice and social structures in framing the possibilities considered available and legitimate for governance. The two strands are brought together in a discourse-institutionalist framework, an approach that is illustrated by a case study of microgeneration in the UK. The paper's conclusion makes suggestions regarding the conduct of future research employing the proposed approach, and for furthering our understanding of issues connected with the governance of sustainability transitions.

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## **Psycho-social determinants of organic apparel consumption in China**

*Yan Han*

**Purpose** - The present study aims at exploring psychological determinants of intention to purchase sustainable apparel within the framework of the Theory of Planned Behavior (TPB). **Design/methodology/approach** - A convenience sample of 784 university students studying in three major cities (Beijing, Shanghai, and Dalian) of China completed the anonymous surveys. The final questionnaire was composed of two sections: the first section contained items designed to assess the major constructs (Attitude, Subjective Norm, Perceived Behavioral Control, and Intention) in the TPB model, and the second section contained questions for demographic information. **Findings** - All antecedents included in this study were significantly related to intention of sustainable apparel purchasing. Among them, the most important predictor of Intention to purchase sustainable apparel was individuals' Attitude towards buying sustainable apparel, followed by Perceived Behaviour Control and Subjective Norm. The TPB was proved to be a reliable predictive model of intention to purchase sustainable apparel in the Chinese context. **Research limitations/implications** - The university-student sample used in the present study weakens the generalization of the results. Further, no actual measure of behavior was obtained for this study. Future research might focus on the sustainable apparel market segment rather than the student or the general population. Also, future research may pay more attention to the actual behaviors of sustainable apparel consumption instead of focusing narrowly on intention. **Originality/value** - Few studies have investigated psychological determinants of intentions to purchase sustainable apparel within the framework of the TPB in the Chinese context. Findings from this study give readers an understanding of the magnitude and significance of relationships between antecedents and intention in the sustainable apparel consumption domain. These results lead to suggestions for policy makers, marketers and stakeholders involved in the sustainable apparel market.

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## **Carbon emissions of dual-channel closed-loop supply chain with consumers' free-riding and governmental intervention**

*Rongyao He and Yu Xiong*

The importance of closed-loop supply chain has been widely recognized in literatures and practice. However, the impact of channel structure characteristics, especially the dual-channel, on the closed-loop supply chain and life cycle carbon emissions of a product is seldom been discussed. Specifically, in a dual-channel supply chain that includes a traditional retailer and an online e-tailer, free-riding behavior of consumers often exists. Those consumers enjoy the service provided by the traditional retailer but make final purchase with a lower price at the e-tailer who does not provide any service. The lower price is mainly due to the e-tailer's lower operational cost and consumers do not need to pay any sales tax when shopping online. In response, traditional retailers are strongly lobbying the government to end tax-free online shopping. This behavior not only alters the production, recovery, consumer use and landfill emissions of the product, but also the logistics carbon emissions from traditional and online channel, which are mainly emissions of consumers' traveling and express delivery emissions from trains, trucks and airplanes. This research discusses the impact of this free-riding phenomenon on firms' decisions in the dual-channel closed-loop supply chain, governmental subsidy that promotes remanufacturing activity and tax on e-tailers that removes consumers' free-riding, as well as the environmental change, and social welfare.

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## **The sustainable society and the good city**

***Fabio Hernandez Palacio***

In an age of an urbanised world, where the majority of people live in cities, the question of how cities are built to face social demands is crucial. There is a growing concern about how to adapt cities to functional and economic changes, social changes, climate change, and to a world where resources could become scarce; in short, how to achieve sustainable cities. At the same time, wealth and welfare have increased with urbanisation; in consequence there is a growing demand for urban environments that fulfil people's expectations regarding quality of life. According to several studies, a compact urban form has a positive influence on key aspects attached to sustainability, for instance mobility patterns and energy performance. Hence, the compact city has been widely adopted as the paradigm of sustainable city. Although the implementation of higher urban densities appears as a barrier because of social acceptability, market constrains and technical questions, urban densities have been increasing in many cities. This success of urban densification seems to be related to the implementation of planning strategies and to demographic changes, such as the decrease of family size and the increase of old population. Higher densities have several benefits from the perspective of urban efficiency but there are also challenges with regard to urban quality and social acceptability. This paper explores those barriers and brings together several aspects related to the idea of urban quality and sustainable city that are compatible and can create synergies that enable the transition toward sustainable societies. Urban quality of life and sustainable city can be highly attuned concepts.

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## **The drivers, nature and business value of eco-innovations in Chinese firms**

*Peter S. Hofman, Jingzi Zhou and Shijin Zhou*

Based on a survey of 220 Chinese firms from three major industries (electronics, textiles and automotive) we investigate the major factors that influence the development of eco-innovations. We assess external pressures that trigger eco-innovative behaviour ranging from regulatory to normative and mimetic pressures. We also incorporate internal capabilities as an explanatory factor and combine with the influence of network collaboration. As we have identified firms with eco-innovative behaviour we use the nature of eco-innovation as dependent variable in our model. We distinguish between different types of eco-innovations, ranging from adjusted purchased state of the art technology within firms to fully in-house developed eco-innovations. We also distinguish between eco-innovations with limited environmental effects and more radical eco-innovations with a very significant reduction in environmental impacts. Our results show that while regulatory pressures positively impacts eco-innovations in firms they tend to generate mostly incremental innovations while normative pressures are associated with more fundamental eco-innovations with more significant reduction in environmental impacts. Network relations with a variety of actors tend to reinforce these effects.

In the survey we also included items that indicate how firms are able to capture value from the eco-innovations. This includes effects more internal to the firms such as reduced costs and improved health and safety conditions for employees and those related to the product and reputation of the firm. Firms reported increased quality, product differentiation and enhanced reputation as various ways that the eco-innovations bring value to the firm. Firms also report that the eco-innovations enhance learning processes for further design of more eco-friendly products. The sample included firms from various regions including coastal provinces such as Zhejiang and Guangdong and central provinces such as Anhui, Hubei and Sichuan. Ownership of firms varied from private to state-owned and included a number of joint-ventures with foreign firms.

Overall we develop a model that presents key variables that explain why certain firms develop more fundamental eco-innovations with significant reduction in environmental impacts. We also explain how Chinese firms are able to derive value from eco-innovations. The research contributes to our understanding of key factors that drive eco-innovation and the nature of the value that can be captured from these innovations. The research increases understanding of eco-innovative behaviour in Chinese firms and especially the factors that will move firms towards developing more significant eco-innovations relative to the often utilized strategy in Chinese firms of purchasing state of the art technology and making minor modifications to these.

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## **Values and motivations of people acting to mitigate climate change**

*Rachel A. Howell*

It is increasingly recognised that values play an important part in motivating sustainable consumption, and it has been suggested that it is necessary to promote biospheric (eco-centric) values in order to promote pro-environmental behaviour (de Groot and Steg 2010; Thompson and Barton 1994). However, a small-scale mixed-methods study by Howell (2013) found that concern about the environment per se was not the main motivator of action for people who have adopted lower-carbon lifestyles, and that the interviewees tended to score altruistic values significantly higher than biospheric ones on a survey instrument.

This paper presents a study that builds on that work, reporting the results of a survey of 355 people who are taking action to mitigate climate change through adopting lower-carbon behaviours (e.g. reducing flying) and technologies (e.g. home insulation) and/or campaigning about climate change. The survey sought to understand the values, motivations and formative influences/experiences of respondents, using a mix of open and closed questions. As with the previous, smaller-scale study, the research reveals that although biospheric values and concerns are in evidence among the sample respondents, other values and motivations are also very important.

The evidence suggests that action to mitigate climate change should be regarded as a different kind of activism from more traditional environmental activism such as conservation. 'Pro-environmental behaviour' undertaken to mitigate climate change is often 'pro-social behaviour' since values of justice and fairness are strongly in evidence as motivators of such action. Perhaps climate change should not be regarded as an 'environmental issue' and should be reframed to appeal to other values.

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## **The Downstream Effects of Swedish Efficiency: Swedish Consumers, Chinese Producers and the Policy Implications of Consumption-Based Emissions Accounting**

*Cindy Isenhour and Kuishuang Fen*

Technological innovation has long been presented as a "win-win" strategy for the climate, resulting in both reduced emissions and economic growth. Yet significant research has shown that efficiency gains are being rapidly outpaced by growing levels of production and consumption, resulting in a net increase in global emissions. Further, consumption-based environmental indicators suggest that many efficiency improvements claimed by environmentally progressive and wealthy nations have come at the expense of increased emissions elsewhere. This paper draws on a multiregional input/output analysis and multi-sited ethnographic case study of Sino-Swedish climate cooperation to illustrate the processes that produce displaced emissions and to explore contemporary debates about the appropriate policy response. We argue that although the logical implications of these analyses point to the need to reduce total consumption, the political precariousness of these ideas have thus far limited Swedish policy to the reinvention of consumer awareness campaigns and the international extension of ecological efficiency efforts of questionable efficacy.

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## **Sustainable Consumption Practices in the United Arab Emirates**

*Shilpa Iyanna*

The United Arab Emirates (UAE) long term 2012-2021 national initiatives to build a green economy has been listed by the International Labor Organization (ILO) among national initiatives adopted by twenty one countries to promote environmental sustainability. UAE's "Green Economy for Sustainable Development (2012-21), aims to position the country as a center for the export and re-export of green products and technologies through programs and policies in the areas of energy, agriculture, investment, sustainable transport and construction" (ILC, 2013). Briefly, some of the initiatives are as follows: Tabreed: Tabreed which means "cooling" in Arabic is a district cooling industry that was established in 1999. In the UAE, during the peak summer months, air-conditioning typically accounts for 70% of energy consumption. By utilizing approximately 50% less energy, district cooling helps reduce costs to owners and governments alike, while also decreasing carbon dioxide emissions. Today, Tabreed delivers its energy-efficient, economical, and environmentally-friendlier cooling solutions to many of the region's landmark projects, including the Sheikh Zayed Grand Mosque, Ferrari World, Dubai Metro, Etihad Towers, World Trade Centre Abu Dhabi, Aldar's HQ to name a few. Masdar: Abu Dhabi Future Energy Company, is a strategic government initiative established in 2006 with a mandate to advance renewable energy through education, R&D, investment and commercialization. Masdar comprises three business units--including Masdar Capital, Masdar Clean Energy and Masdar City--and is complemented by Masdar Institute, an independent, research-driven graduate university. Estidama: "Estidama" the Arabic word for sustainability, is the sustainability initiative of the Abu Dhabi Urban Planning Council (UPC). The purpose of Estidama is to create a new sustainability framework that will direct the current course of development while allowing adaptation as new understanding evolves. Currently Estidama is focused on the rapidly changing built environment. In addition to policies and initiatives implemented by the government, businesses in the UAE too are strongly encouraged to implement sustainable business practices. In October 2013, 11 organizations were honored for their corporate social responsibility (CSR) and sustainability efforts (GulfNews, October 2013). The Sustainable Consumption Roundtable report published in the UK (2006) suggests that consumers (i.e. people), business and the government each occupy a corner in the "Triangle of Change". As consumers do we really know how the personal choices we make with regard to what we buy; how much we buy etc., impact environmental sustainability? My main research interests are in the fields of consumer behavior and customer value. I hope to make a contribution by researching various aspects of sustainable consumer behavior in the UAE context.

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## **Everyday Sustainable Behaviour Practices of Individuals in the United Arab Emirates**

*Shilpa Iyanna*

After being ranked as having one of the highest per capita Ecological Footprints in the world in the 2006 Living Planet Report, the UAE became the third country, after Switzerland and Japan, to embark on in-depth research into its footprint (EWS-WWF). However, government policies and regulatory frameworks to reduce UAE's the Ecological Footprint are not enough. Consumers have a key role to play as well because, "the consumption undertaken by private households accounts for a large proportion of the economy's environmental impact" (Peattie 2001:197). Thus the aim of this paper is to examine the everyday individual practices focused on green consumption, recycling, energy saving and water conservation. A questionnaire with 25 items relating to everyday sustainable behavior (Barr and Gilg 2006; Thøgersen and Olander 2002) measured according to frequency (never-always) was examined using factor analysis. The paper provides insight into how actions that help the environment are followed in everyday life. The results will offer policy makers insight into how effective their efforts have been on everyday practices of individuals. Considering the dearth of research in this area in the UAE, this study could provide academics with future research opportunities that explore motivations, attitudes and values of consumers in the region.

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## Connecting Actors to Sustainable Product Innovation in Vietnam

*Shauna Jin, Sarah Suib, Marcel Crul and Han Brezet*

There is a two-fold sustainable design and production challenge facing Vietnamese SMEs. On the global market, Vietnam can no longer continue to export commodity goods, semi-finished products, or cut-make-trim products as labor, material, and production costs continue to rise. This is compounded by shrinking export markets due to global financial crisis, as well as demand for stricter environmental regulations and transparency by governments and consumers.

In the domestic market, there is opportunity to expand to new markets linked to the quickly growing middle class in Vietnam. Moving from commodity production to sustainable product innovation, especially focusing on the local market, can help Vietnamese SMEs stay competitive both on export and domestic markets, providing both short-term and long-term benefits.

In general, marketing, differentiation, design and innovation activities are not encouraged among local SMEs. Although findings from literature suggest that marketing and differentiation, rather than technology, are the key competitive advantages for SMEs; here, design can be viewed as a leverage point for adding value.

Other Southeast Asian countries have invested in developing design institutes and education to improve their industries competitiveness. Similarly, Vietnam must follow suit to nurture and develop sustainable design knowledge and awareness among local SMEs. However the nascent design discipline in Vietnam shows designers they still lack connection to the real context of local product development.

The aim of this paper is to describe current challenges in new product development (NPD) for local industries and identify opportunity areas to support the necessary knowledge and experience needed to induce the transition to sustainable design and production in Vietnam.

To accomplish this, field research was conducted in Vietnam from 2010 to 2012 within the EU funded, SWITCH Asia, SPIN Project focusing on product development sector in Vietnam. Inputs were collected from the perspective of different stakeholders including local designers, companies, and support organizations both local and international.

Interviews were performed to describe the current situation within Vietnam's product development sector especially on barriers face by local SMEs and designers in NPD. While design intervention were devised and implemented through workshops involving local stakeholders with the objective to expose and shared knowledge on sustainable product innovation.

Currently, there are still many barriers to implement sustainable product innovation in Vietnam on all fronts. Some external barriers facing SMEs include lack of market access, distribution infrastructure, rampant copy-culture, market access and low consumer awareness.

Design education is needed. The industry can gain understanding of what the role of design can play inside and outside their organization. The workshops directly and indirectly cultivate SMEs' understanding.

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## **Economic and Environmental Convergence on the Global and Regional Scale**

*Romualdas Juknys, Genovaite Liobikiene and Renata Dagiliute*

In order to leave more space for the economic growth in developing countries, one of the core elements of global sustainability is a radical reduction in the use of resources and related environmental impacts in developed countries. However, instead of a classical both-sided convergence, current convergence trends are mostly one sided, which means that we usually deal with a catch-up process. From the point of sustainability, two aspects of the catch-up process are very important - whether developing countries and regions are able to catch-up with developed ones, and whether the economic catch-up growth in developing countries can be based on more sustainable patterns of production and consumption in order to reach the same level of prosperity as in developed countries with a much lower use of resources and much lower emissions. The analysis of the annual GDP per capita growth rate in developing regions has revealed a positive trend - a comparatively fast decrease in the number of the least developed countries which have not yet started catching-up with developed ones. Even Sub-Saharan region, though heavily, has also started catching-up with developed countries since the beginning of the last decade, and it is considered, despite internal and external interference, to be a sustainable trend. A rather remarkable relative decoupling of the environmental impact from economic growth is characteristic of the most developing countries, however, the level of decoupling is not sufficient to reach sustainability of their development. The catch-up growth in the use of resources and emissions in developing regions, in the best case equals the catch-up growth in production and consumption, whereas in the emerged fast growing economies, the use of resources and emissions of greenhouse gases approaches the level of developed countries much faster than production. China, as a very important player on the regional and global scale, simultaneously with 21% of GDP per capita of OECD countries on average, has reached almost 40% of their energy use, and almost 70% of CO<sub>2</sub> emissions. The analysis based on double decoupling approach has shown that energy intensity measured as amount of consumed energy per unit of GDP, in China is almost two times higher than OECD level, witnessing the necessity of a faster technological transformation. At the same time, carbon intensity, measured as an amount of emitted CO<sub>2</sub> per unit of consumed energy, also almost twice exceeds OECD level and indicates a necessity to shift to more environmentally friendly energy resources. As the lion's share of ecological footprint in developed and emerged economies comes from the burning of fossil fuel (carbon footprint), a radical de-fossilization of their economies would allow to markedly reduce the ecological footprint of developed countries and to free space for developing regions, as well as to sustain the economic growth in developing regions with a much milder environmental impact.

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## **O.U.R.S Cities + Energy - Operationalizing User-driven Resilience through Sustainability transition in Cities (and Energy)**

*Harn Wei Kua*

In tackling climate change, transformations of urban systems/services are now considered as top priorities. As an emerging field of research, climate change resilience has taken many approaches, including linking resilience to transition theories. Nonetheless, due to their novelty, instilling resilience in urban development is still challenged by a lack of an operationalizing framework that considers resilience in the light of sustainability transitions. In mitigating and adapting to climate change (which contributes to resilience), one cannot ignore transitions in household energy consumption, which accounts for around 13% and 9% of the total electricity and gas consumption of a country respectively. Although many studies strived to understand and modify energy consumption habit, there is still a general lack of rigorous methodologies for successful user intervention, especially those based on knowledge in how different compounding social or behavioral factors influence energy consumption. An international comparative study that examines the effectiveness of similar strategies and thus reveals lessons for more effective policymaking is critical but lacking. Proposed by an international group of researchers from Spain, Colombia, South Africa, Saint Lucia, Saudi Arabia and Singapore, O.U.R.S Cities aims to fill the gaps identified above, by fulfilling the following objectives: 1) Create a blog and website that act as a platform to engage different stakeholders, including the public and academic communities to contribute ideas on developing resilience-themed concepts or projects. 2) Foster online discussions on transitions in household energy usage behavior. Earlier versions of energy intervention projects (namely the ECO-living Program in 2010) have been implemented successfully in Singapore, in which student volunteers had been engaged as "energy ambassadors" and various scientifically designed methods to encourage households to save energy were implemented and their effects measured. One of the groups reduced consumptions by about 15.8%, thus resulting in a carbon reduction cost of around USD 44 per ton of CO<sub>2</sub> avoided. Ideas from the online discussions and these earlier projects will be used to design new energy intervention projects (called O.U.R.S Energy) in the 6 countries, where representative communities with a range of social background will be selected for these comparative studies. 3) Organize video-conferencing lectures and webinars, in which different countries' co-investigators share the progress of their respective projects with an international audience. These will be incorporated into my seminar class, so that students can obtain ideas and feedback for actual energy conservation outreach projects that they will execute on campus, together with the Office of Environmental Sustainability. Hence, O.U.R.S Cities+Energy can contribute to participatory and experiential education on promoting climate change resilience.

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## **A Dynamic, Integrated Stakeholder Framework for Coherent Sustainability Policymaking from an Industrial Ecological, Sociological and Behavioral Science Perspective**

*Harn Wei Kua*

While stakeholder theories are widely discussed in the management literature, they have been relatively less commonly utilized in public policy, especially in the area of climate change or sustainable development. Applying management-based theories directly to public policy may be problematic. For example, the normative aspect of the model by Donaldson and Preston (1995) takes into account legitimate interests of stakeholders, but, especially in public policy, it is well known that stakeholders are likely not to behave according to their voiced interests. Hence, to reflect the complex nature of public policy engagement of stakeholder, new insights are required. This paper has 3 main objectives: 1) Propose a dynamic theoretical framework for identifying and engaging stakeholders in the process of policymaking for climate change mitigation/adaptation. 2) Incorporate behavioral science and sociology into the process of public policymaking, as a way of determining the roles of different stakeholders. 3) Illustrate the use of this framework in the promotion of green building materials and household energy conservation.

A review of different policymaking models was conducted. I argued that policy goals can be interpreted in terms of a set of desired behavioral traits of stakeholders. Next, the industrial ecological concept of life cycle (LC) thinking was applied to identify the different LC stages of a product or process, which leads to one knowing the sustainability bottom line-specific (i.e. economic, environmental and social bottom lines) stakeholders affiliated to these LC stages in different geographical context (e.g. local or federal/national). My concept of Creative Governance was proposed to rethink the ways that these identified stakeholders are traditionally linked, so that they can collectively propose creative solutions to address "old" problems. That said, we need to first examine their cognitive factors that are related to their capacity, capability, opportunity, willingness, reaction to any incentive and responsibility to change their behavior to match the abovementioned desired traits. "Enabling policy components" (EPCs) can then be proposed to address these factors. To ensure that EPCs lead to the realization of the overall policy goals, a Coherently Integrated Policymaking model was proposed as a mean of iteratively monitoring and fine-tuning the process of stakeholder engagement and thus subsequent nature of the EPCs, to ensure that any unintended conflicts of sustainability goals is minimized or even eradicated. This framework is applied to analyze an ongoing policy promoting the use of green building materials in Singapore.

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## **Integrated policies to improve the Singapore Concrete Utilization Index - an attributional and consequential life cycle evaluation of possible effects of substituting concrete with bricks**

*Harn Wei Kua*

With the goal to promote more sustainable building materials while reducing their life cycle impacts (including embodied energy), the Singapore Building and Construction Authority implemented the Concrete Utilization Index (CUI) to promote the substitution of concrete products with alternate buildings materials. This has been incorporated into the current BCA Green Mark Scheme and is becoming more and more popular in the industry. Recently, more firms are looking at using bricks as replacement for concrete. So far, there is no study on what the net consequences and resultant environmental impacts of such a replacement may be. Such a study is important to ensure that this policy will lead to improved environmental sustainability. This paper has 3 main objectives: 1) Using an attributional life cycle perspective, compare the life cycle environmental impacts of bricks to that of concrete relative to several environmental indicators; 2) From a consequential life cycle perspective, consider a number of likely scenarios describing changes in the flows of concrete and bricks into Singapore, as a result of bricks substituting concrete, and then evaluate the net environmental impacts of these scenarios. 3) Propose integrated policy strategies to improve the CUI so that it results in net reduction of adverse environmental impacts as much as possible. From the attributional perspective, it was found that such material substitution brings about a net increase in all the environmental impacts (acidification, eutrophication, human toxicity and global warming potential (GWP)) considered. Embodied energy will also increase. However, from a consequential perspective and using 9 different possible scenarios of consequences of material substitution, we found that such a material substitution will result in a reduction in the GWP but this reduction is small. Finally, if domestic changes in demands for concrete and bricks triggered a change in the imports of these materials, we derived a mathematical relation that enables us to know how much the import of concrete constituents must decrease in order to nullify the increased GWP resulted from the increase in import of bricks. To further ensure that the CUI leads to better environmental performance, integrated policies related to brick kiln technology and financing mechanism innovations were proposed.

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**Approaches to a systemic shift to global dematerialisation - drivers and challenges:  
Korean Soil and the City Case**

*Soyoung Lee and Eric Zusman*

In recent years, people from diverse backgrounds have realized that consumption patterns need to undergo a radical transformation to avoid a socio-ecological crisis. In recent years, researchers have also synthesized an equally diverse literature to illuminate the multi-stage, multi-level process required to transition to more sustainable consumption patterns. At the risk of oversimplification, work on "sustainability transitions" suggests that the critical first step in this transition involves creating a "niche" or space where new technologies emerge, paving the way for broader landscape and regime changes. Work on sustainability transitions have nonetheless focused chiefly on cases in Europe at the national level. Furthermore, most featured transitions have a decidedly technological bent with less attention to social learning processes that are critical to the formation and expansion of niche. This article will integrate core insights from social learning into sustainability transitions research to understand these drivers and enablers of this social space in Asia. The Soil and the City program was established to offer residents of Seoul a viable alternative to modern Seoul's growth-centred development paradigm. The program was designed to respect the organic relations between consumption and production, urban and rural, human and nature. It also focused on the importance of soil to eradicate poverty and ecological degradation while combining a supportive social-cultural environment with a low-impact lifestyle. It goes beyond from simple recycling or energy saving activities into creating a culture of sustainable community living by providing for programmes of experimentation and pilot projects, exchange of experiences, training and competence building and so on. Just as importantly, the case traces the creation of a niche not to technological innovation but the progressive idea. Further, it illustrates how actors work to augment the impacts of innovative ideas through active citizen engagement and collective participation strategically facilitated to create "communities of practice" where action-reflection approach and user-driven innovation enable "experiential learning" as a precursor to transformative social change. Finally, it demonstrates a platform where diverse discussion and negotiations take place implementing practical governance composed of bottom-up multi-stage multi-level with actors' full participation from NGOs, citizens of various backgrounds - universities, civic groups, the artists and media producers (worked for social justice) to policy makers, borough municipal officers, firms and business. In sum, it suggests that social learning is a critical driver of sustainability transitions, especially in rapidly urbanizing contexts. It also raises questions about the possible refinements to work on sustainability transitions at the city level.

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## **Low carbon transition through plant-based solutions scaling-up potentials for the plant-based movement**

*Tamas Lestar*

Research Question. There is an almost unanimous agreement among researcher and scientific bodies about the need in human history for a dietary change. It is also universally argued that the topic of the desired system change need to be approached from diverse aspects such as industrial energy use, urban traffic, housing, individual behaviour, and many more. Grass roots movements can also have a lasting impact toward a low carbon society, especially when their values and practices begin to be shared by a broadening range of society. We see this happening in the local food and the organic food systems, which originally emerged from community endeavours that later permeated into the wider society. In our paper we examine the scaling-up potentials of what we call the plant-based movement. The plant-based movement is not one particular, institutionalized community (niche), but rather a culture and philosophy entirely or partially embraced by different kinds of movements. The followers or supporters of these movements are encouraged to retrain from the consumption and production of meat items, which in itself brings about a considerable reduction of CO<sub>2</sub> emissions in their households. But the plant-based culture may have other alternative solutions for Earth's global problems. Our question is whether or not the movement can offer its solutions in a way (and if yes, how?) that can result in a significant contribution to a system-wide innovation.

Research Design. We use numbers based on calculations to show how greenhouse gas emissions would be altered by certain proportions of population switching to a plant-based diet (and/or stock free agriculture). By doing this we show why it is necessary to examine various grassroots movements and related policies in terms of the global agenda of low carbon transition. Using transition theories, behavioural theories and the - socially extended - Multi Level Perspective as our framework, we endeavour to gain insights about community-based initiatives for their potential spread into the "landscape" level of society. In their several papers on the Transition Towns Movement Seyfang et al (2009; 2010) draw invaluable conclusions about the development and possible future and impact of the bottom-up movement. By following a comparative research design we apply these findings as secondary data to the narratives gathered from our target populations, that is, followers (or opponents) of the plant-based solutions. Our narratives are collected from the Facebook Page of the UK-based, 70-year-old Vegan Society (some 150.000 followers), managerial interviews and online surveys. We use both qualitative and quantitative data in our endeavour to understand the transitioning potentials of the plant-based movement.

Conclusions. We conclude by informing community leaders and policy efforts. Then recommendations follow.

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## **Growing Alternative Food Networks in Urban China**

*Jingsong Li*

The food supply systems in China are in transition. Recent food scandals have attracted much attention of urban consumers in China. Consumers become reflexive on the globalized industrial food supply system, and at the same time become concerned about the food they could access and their daily consumption patterns. There is a turn to local food through alternative food networks (AFNs). The key feature of AFNs is the spatial proximity between farmers and consumers. There is a basic assumption that trust and social connection characterize AFNs, distinguishing local food systems from the 'global food system'. AFNs may cover different forms of agriculture and producer-consumer relationships, such as farmers markets, community supported agriculture and a commitment to sustainable food production and consumption. They emerge from certain political, cultural and historical processes, and were developed out of the interactions between rural restructuring and urbanization. This research focuses on the creation, operation and evolution of AFNs in urban China, drawing on empirical work on food purchases in two cities, Shanghai and Hangzhou. Through interviewing consumers' daily food purchasing on different market sites, we categorize their food origins - location of production, place of access - types and distances of food markets, and food labels - characteristics for value-adding, such as 'green food', 'organic food', 'Geographical Indications', 'Intangible Cultural Heritage', and etc. The Lifestyle Social Practices Model is adopted to analyze how existing 'system of provision' enables and/or constrains consumers' daily food consumption when creating and operating AFNs. This research also tries to answer, to what extent such AFNs can satisfy urban consumers' needs, and what the institutional bases and barriers are for AFNs within the Chinese context.

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## **Industrial energy and environmental efficiency in China: Analysis based on 36 major cities with undesirable outputs.**

*Mo-Jie Li*

China's rapid pace of industrialization has been followed by a huge demand for energy. Industry, as the biggest energy consumption sector in China, draws much attention in terms of energy and environmental efficiency. In China, industries cluster in major cities and the industrialization level of those cities is even higher than the provinces accordingly. Therefore, compared with provincial DMUs utilization, evaluation based on major cities could perform better in satisfying homogeneity assumption. In this paper we use nonparametric Slack-based Model (SBM) to evaluate the 36 major cities' industrial energy and environmental efficiency during 2006-2010. Both desirable output (industrial add-value) and undesirable outputs (3 kinds of industrial wastes) are considered in this approach, meanwhile, we set energy consumption, fixed assets, and labor force as the inputs. The result shows that: 1) Haikou, Shenzhen, Hohhot, Baoding, and Qingdao have top 5 of industrial energy and environmental efficiency in this study, while the first-tier cities of Beijing, Shanghai, and Guangzhou, cannot catch up with the average efficiency level, thus, we suggest the rest of the cities should not follow the same industrial development path of the first-tier cities. 2) On average, the improvement of all the selected cities' efficiency during our research timeframe proves that the China's industrial policy is effective, but the effect of the policy is various among the different regions, for the northeastern cities' efficiency had a sharp growth which is more efficient than the eastern cities. 3) 24 cities which account for more than 66% of the total have a lower-than-average efficiency, indicating that the industrial developments of regions are still lopsided; however, it is not recommended to expand its scale of production because insufficient outputs rather than inputs are the key issues.

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## **Urbanization, Rural-urban Disparity and the Variation in Consumption: Hypotheses and Empirical Test**

*Tongping LI, Sheng Cheng and Jia Ding Wang*

The relationship between urbanization, rural-urban disparity and the variation in consumption has been explored, the hypotheses of three linkage effects have been put forward in this paper. Consumption variation indicated as rural-urban Enger coefficients, household consumption level, rural-urban household expenditure per capita, the total retail value of social consumer goods per capita. Based on the Chinese data and its provincial level during 1978-2012, we are to make empirical test these hypotheses included as follows. Firstly, the more the rural-urban disparity is, the faster the urbanization goes, Vice versa. Secondly, there was a nonlinear relationship between the rural-urban disparity and the urbanization, the gap will be widened with the rising level of urbanization, when the level reached a special step, the gap will be narrowed with the increasing level of urbanization. Finally, the total consumption and consumption level will be improved, whereas the consumption ratio decreased with the ongoing urbanization rapidly.

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## **Urban modeling and transition towards sustainability: A case study in industrial city of Jinchang, NW China**

*Ying Li, Bob Beeton, Anthony Halog and Thomas Sigler*

Rapid urbanization associated with intensive resource and energy consumption, waste generation and environmental deterioration around the world calls attention to the transition towards more sustainable modes of urban development. Although cities have made great contributions in economic welfare, improvement of living conditions and social progress, the emergence of cities has generated significant challenges to ecological systems which potentially threaten human health and survival. There are numerous well-documented examples from big cities in China, as well as newly emerging cases in small to medium sized cities.

Among different types of cities, industrial cities are the ones where local residents and ecological systems have been most significantly impacted by rapid economic growth. Taking the natural resource-based industrial city of Jinchang as case study, this research focuses on the urban transition towards sustainability in Jinchang city and uses the results to make wider implications for other Chinese industrial cities. Based on the hypothesis that urban sustainability can be achieved by optimising material use and waste emission through improving policy making, this research adopts the approach of urban metabolism through material flow analysis of inputs and outputs to explore the complex systemic changes in the urban system. The results from the modelling are followed by an evaluation of urban system sustainability to provide basic information for condition assessment and to guide urban transition from researching to policy making.

The analysis of material flows in Jinchang city between 1995 and 2010 shows that the material inputs and outputs are highly correlated accompanying with both high material use and high waste emission. The material inputs of Jinchang city is dominated by industrial minerals, metals and energy consumption reflecting Jinchang city's high dependency on non-ferrous metallurgy industries. Industrial solid waste, SO<sub>2</sub> emission and dust are the predominant factors affecting Jinchang's environment and sustainability. Technological progress plays a key role in diminishing the unsustainable aspects of material flows, however, the growth in population and social wealth reduce the contribution of technological progress. A significant reduction in air pollution indicates that the long-term urban sustainability can be achieved with multistage decoupling of economic development from material use and waste emission.

This research verifies that the application of urban metabolism can clarify pathways to urban sustainability. The urban transition towards sustainability requires good governance, policy and planning, as well as the participants of local enterprises and residents. The rapidly growing cities in developing countries have the potential to be significant actors in the transitions to global sustainability with necessary environmental improvements for China as a whole.

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## **Consumers in Chinese Representative Cities Willing to Pay for Premium Priced Green Productions**

*Yan Li and Yi Lu*

The difference between the premium for green products relative to non-green ones and consumers' willing to pay for them directly affects the progression of green consumption. The study surveyed consumers from four representative cities in China through questionnaires, and employed a multivariate logistic model to study the consumer behavior of green products based on the data collected. The study finds that Chinese consumers already are conscious of green consumption, and their reservation price for green products is influenced by age, location, income, sources of information, and a host of other factors. At present, nearly half of the consumers are willing to pay an extra of no more than 5% for green products, which is lower than the premium for green products relative to non-green ones. Ways including multiple marketing methods, trade-in services, and green branding can effectively raise consumers' reservation price for green products.

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## **Building eco-friendly and resource-efficient edible bamboo shoot value chain in China**

*Yanxia Li and Yiping Lou*

The presentation will introduce the newly launched EU-funded SWITCH-Asia project relating to bamboo shoots as sustainable food resource: the project "Greening food production and consumption: Transforming the highly-polluting and resource-consuming edible bamboo shoot industry into a sustainable value chain in China", which aims to improve economic benefits for 300 bamboo shoot-producing SMEs through the adoption of eco-friendly food processing technologies and policy formulation and governance. Finally, the project aims to contribute to sustainable livelihoods, environmental protection and food safety in China and across the globe. The project attempts to promote edible bamboo shoots as ecological food by working with farmers, SME producers, processors and retailers in Sichuan province and Zhejiang province in China, to improve product quality and safety, reduce environmental impacts in production and raise consumer awareness for sustainable consumption. The project will also help to strengthen the capacity building of provincial associates on SCP policy enforcement and to facilitate SMEs and bamboo industry partnership building. Furthermore, the project will develop methodology to quantify greenhouse gas emission reductions from shifting rice cultivation to growing bamboo.

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## Simulation and forecast of the influence of electric bicycle transition on PM2.5 in China

*Xiao Lin and Peter E. Wells*

In recent years, the increasing PM2.5 has led to a serious pollution and is severely detrimental to public health in China. Considering a great concern from the government and public (H Pui, Chen and Zuo, 2014), it is urgent to introduce alternative transport fuels and vehicles for reducing PM2.5.

Due to the merit of zero-emission (Hawkins et al., 2012), electric vehicles (EVs) seems to be promising for reducing PM2.5. However, the widespread adoption of EVs is currently confronting various barriers (Offer et al, 2010). In this case, electric bicycles (e-bikes), which has already dramatically developed and reached 120 million in China, is considered to be a more practical solution (Wei and Benjamin, 2012). E-bikes possess the advantages of high accessibility, high flexibility, high efficiency and low operation cost to allow for personal mobility (Weinert, Ma, and Cherry, 2007). However, it is still not clear how the transition process to e-bikes influences PM2.5 reduction quantitatively, which is crucial for policy making and transport management.

Therefore, the present paper seeks to establish a multivariate model to simulate tailpipe emission (TE) in order to achieve PM2.5 reduction. In this model, the governing equation is as follows,  $T=f(NCVs, CVsE, CVsTD, NBus, BusE, BusTD, NCVs-EBs, NBus-EBs, EBsTD)$  where T is the total TE, NCVs the total number of conventional vehicles (CVs), CVsE gram of TE per Km of CVs, CVsTD the travel distance (Km) per conventional vehicle, NBus the total number of buses, BusE gram of TE per Km of Buses, BusTD the travel distance per bus, NCVs-EBs the number of Electric Bicycles that shift from conventional vehicles, NBus-EBs the number of Electric Bicycles that shift from buses, EBsTD the travel distance per e-bike. The model reveals quantitatively how TE varies with the independent variables, making it possible to forecast and reduce tailpipe emission by controlling the independent variables.

Furthermore, influential factors are identified for each independent variable in the model. For NCVs and NEVs, they are purchase cost, purchase tax, running cost, cost subsidy, ticket price, and route design. For CVsE and BusE, they are oil refining, oil products transportation, vehicle emission standard, and use phase energy consumption. For NCVs-EBs and NBus-EBs, they are travel time, accessibility, weather, battery life and charging points. Based on the model and identified influential factors, the present paper develops various potential policy packages and scenarios in order to accelerate the pace of achieving tailpipe emission reduction target. Finally, it is concluded that PM2.5 reduction targets achievements are closely related to customer vehicle choice behaviour, electricity source, and across a wide range of policy mechanisms.

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## **System innovation in the food system - solving the input sustainability gap**

*Lassi Linnanen, Anna Kuokkanen, Mirja Mikkilä, Helena Kahiluoto and Miia Kuisma*

Planetary cycles of nitrogen and phosphorus, essential macronutrients in agriculture, have transgressed their planetary boundaries; implying irreversible changes in earth mechanisms might threaten operating space for humanity. Furthermore, nutrient runoff causes serious pollution problems in the catchment waters e.g. the Yellow Sea, The Gulf of Mexico, the Baltic Sea, and the Great Barrier Reef.

The increase of anthropogenic nutrient fluxes is due to increase in use of mineral fertilizers, which production is heavily reliant on finite resources, phosphate and fossil energy. Wasteful and linear way of applying mineral fertilizers leaves room for increasing nutrient efficiency throughout the food chain. However, relatively little attention has been given to the idea that nutrient recycling could be an overarching principle to create alternative and more sustainable food system.

Current food system has several of factors inhibiting sustainability transitions. 1) Technologically, the system is locked-into into specialization of territories and production systems, reduction in the number of cultivated species and growing reliance on external. 2) Institutionally, the food system is locked-into maximization of productivity per animal per hectare per labor unit as a guiding principle. 3) Research and development is locked-into privatization of public good, better aligned with genetic engineering than agro-ecological innovation. 4) Politically, agriculture is locked-into dualistic accounts of productivist and environmental discourses. Yet there is evidence that two accounts do not have to be contradictory and exclusive. 5) Socially, farmers are squeezed in from subsidy requirements they need to comply with and from food industry that has bargaining power over producer prices.

There are a number of strategies to achieve more efficient flow of nutrients in the food system. It is important to note that nutrient recycling regime should not aim at full compliance with organic agriculture, despite adopting main principles from organic and local food chain ideologies. Upstream, provision of fertilizing services could link up actors from biogas production, energy sector and industry. Organic waste streams could be processed into suitable fertilizers. Secondary nutrients could also be harvested from sea in the form of secondary fish, algae and shells and refined into feedstock. Farmers would get more entrepreneurial space in the form of ecosystem stewardship e.g. protection of waterways. Downstream, food processors and retailers could create more intelligent supply chains, in attempt to minimize food waste, which would also be used for feedstock or processing of fertilizing services. Nutrient-efficient diet would promote more sustainable and locality and seasonality-friendly diet.

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## **Sustainable consumption in China: A conceptual framework and research agenda**

*Wenling Liu, Gert Spaargaren and Peter Oosterveer*

Since the 1992 Rio Earth Summit consumption has emerged globally as an important policy issue for sustainable development. Promoting sustainable consumption can be approached from different points of view, ranging from a focus on the production and sale of more sustainable products to an emphasis on changing consumer behaviors and lifestyles. Various theories and approaches have been introduced in the debate on how to address sustainable consumption. In this study, we first discuss different theoretical perspectives on sustainable consumption, particularly developed in the fields of economics, socio-psychology and environmental sociology. We argue that neither an 'individualist' nor a system- or structural perspective alone is sufficient for understanding and analyzing the transition towards sustainable consumption. Therefore, we propose an integrated analytical framework that combines human agency and social structure. Based on this integrated perspective, we summarize and review current research on Chinese sustainable consumption in particular on the three consumption fields of food, housing and mobility. It is found that introducing sustainable technology for more efficient production is commonly taken as the focal point for promoting sustainable consumption in each of these three sectors in China. Despite a rising interest in consumers' perceptions of products' sustainability in recent years, there is hardly any attention paid to consumers' behavioral change or to a more integrated transition to sustainable consumption. 'Individualist' perspectives have to a large extent dominated also Chinese consumption research. However, rather than only looking at individual consumption behavior and its motivation, more integrated approaches are needed. This paper therefore proposes a research agenda to look into a transition process towards sustainable consumption in China by emphasizing the link between the provision of sustainable products and the diverse sustainable consumption practices, hereby applying a group perspective.

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## **Enhancing Eco-friendly, Pro-poor Bamboo Production Supply Chains in Sichuan Province of China**

*Yiping Lou, Hanmei Yang and Yanxia Li*

The presentation will summarize the experiences of the SWITCH-Asia project relating to the use of bamboo as sustainable building resource: the project "Sustainable Revival of Livelihoods in Post-disaster Sichuan: Enhancing Eco-friendly, Pro-poor Bamboo Production Supply Chains to Support Reconstruction Effort". The project promoted the use of bamboo to substitute timber or other non-renewable building materials, such as concrete and steel and helps bamboo SMEs to improve their productivity and environmental impact. The project also helps to strengthen bamboo farmers' cooperatives for their resource management and marketing. The project operated in the Sichuan region of China. In addition, bamboo also offered an accessible and affordable option for post-disaster housing in the 2008 Sichuan earthquake, and bamboo structures have proven especially resilient to earthquakes because of their strength and flexibility. Furthermore, the projects developed bamboo building code for earthquake resistance construction.

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## **Ecological network analysis for the carbon metabolism of a typical industrial park**

*Yi Lu and Bin Chen*

Global climate change has been a hot topic in affecting on human-environmental sustainable development all around the world. It announces a developing contradiction between the high speed socioeconomic transition and the eco-friendly prospect. As the symbol of socioeconomic and technical level, industrial parks are among the notable donators for national direct/indirect carbon emissions due to the high density industrial-economic organizational activities. This paper aims to answer three questions: 1) how carbon recycle within industrial parks with specific metabolic structure; 2) how to define the low-carbon industrial parks, and by which standard can we confirm whether a given industrial park is low-carbon or not; 3) how to design or improve the low-carbon park performance. Thus a general network model for the carbon metabolism is established for the industrial park based on ecological network analysis. Then BDA, a typical industrial park in Beijing, was taken as a case study by constructing a carbon network model with 7 compartments and 16 main flows. We tried to identify the comprehensive carbon metabolic processes, quantify the ecological flows, and assess the system relations and control properties among diverse compartments. Network utility analysis, control analysis, structure analysis and comprehensive system analysis were conducted for these targets, where new indices including system structure index (SSI) and network sustainability index (NSI) were also proposed.

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## **Optimization of industrial structure under the energy and environmental constraints: A case study in Beijing**

*Zhifu Mi and Yi-Ming Wei*

Energy supply has been one of the main constraints to the economic development. The environmental problems resulting from energy consumption, especially CO<sub>2</sub> emissions have aroused wide public concern. So, it is necessary to develop energy-saving industries. This article uses the Input-Output model to establish a multi-objective optimization model comprehensively considering energy consumption and industrial output. Based on this model, we take Beijing as a case to analyze the adjustment of industrial structure under the energy and environmental constraints, aiming at proposing for developing an energy-saving industry. The results show that industrial structure adjustment has great potential of energy conservation. As for Beijing, it can save 23.66 million tons of standard coal equivalent through industrial structure adjustment in 2015.

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## **Environmental impacts from consumption in Europe - a life-cycle consumption-production systems perspective**

*Lars F. Mortensen and Almut Reichel*

The paper provides an analysis of the lifecycle environmental impacts from consumption in Europe - focusing on the areas of food, clothing and electrical and electronic goods. It places the challenge of sustainable consumption and production in a green economy perspective, where product policies and waste minimisation/prevention approaches feature centrally, and the global environmental dimension of European economic activities more broadly are addressed. This is relevant for a green economy because consumption and production activities in Europe are fuelled by imports (and exports) of resources, goods and services. Environmental pressures related to these therefore largely impact the environment outside of Europe via trade, they are indirectly 'embedded' in the imported (and exported) goods and are thus outside direct control of European environmental policies. In addition, both benefits and negative social and economic impacts associated with the imports also occur outside of Europe. These impacts will thus influence indirectly the wellbeing and health of the population in the producing countries. Focus is on three consumption areas characterised by high shares of trade and significant lifecycle environmental impacts: Food, clothing and electrical and electronic goods. Since European production and consumption in these areas relies heavily on imported goods and resources, the associated impacts (both positive and negative) are dispersed across global supply chains. For each of these areas, the paper summarises the trends in European consumption, their environmental and other impacts and review the governance mechanisms and opportunities to alleviate these impacts -- both within Europe's borders and elsewhere. Finally, the paper provides systemic reflections on the trends and opportunities, exposing the complexity of and the need for a long-term transitions perspective on the governance and responsibility challenge. How can society meet future sustainability visions and live well, while mitigating the environmental and social harms? How can Europeans influence globalised consumption-production systems when the main mechanisms for governance -- government policy and enforcement -- primarily operate within state or regional boundaries? Which consumption patterns can be globalised within the boundaries of the planet? What are the potentials and limitations of different options for changing production and consumption systems? How can the transition be organised and what is the role of governance and of business models and civil society activities?

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## **Towards Sustainable Consumption of Automobility**

*Paul A. Nieuwenhuis*

The car is without doubt the consumer product with the greatest environmental impact. Much of the debate surrounding this impact, and what can be done to mitigate it, suffers from a near-exclusive focus on technology. Yet many technologies that would reduce this impact are already available. In reality the barriers to progress are elsewhere. Similarly, the debates surrounding sustainable automobility almost exclusively regard the car as a transport mode. However, this is only one of its functions; the functionality of the car extends well beyond its transport role into cultural, social, psychological and institutional realms. Cars are used for self-expression - much like clothing - for social interaction, for pleasure and enjoyment, and as a core cultural artifact in many societies. Without addressing these other aspects, automobility is unlikely ever to become sustainable.

Much of the environmental impact of the automobile may be attributed to overproduction prompted by the current dominant mass production system. At the same time, overconsumption prompted by our inability to develop longer term relationships with most of our objects, including 'consumer durables', is interwoven with this overproduction. Both then need to be addressed together in order to create economic and business models that allow significantly reduced levels of production and consumption, while still satisfying the need to consume automobility in some form.

The problem of addressing these areas is that they are inevitably less concrete and considerably more complex than the current focus on technology and transport would suggest, instead taking us into much broader areas of sustainable consumption and production and, more generally, into the very essence of our relationships as humans with the objects we make, use and discard, as well as the other entities with which we share our planet, be they animal, vegetable, or mineral.

In order to address this complex set of issues, this contribution will draw on a higher level analysis of the automobility system, combining a deep insight into the car industry with aspects of design, consumption and more recent thinking about our relationship with the objects around us, drawing on the work of thinkers such as Morton (2010, 2013), Bogost (2012) and the lesser known work by Spyker (2007). The basic notion being that if we gain a better understanding of our place on this planet and how this relates to the place of other entities on this planet, we may also gain a better understanding of our relationship with our objects and how we can enhance such relationships in the interest of more durable relationships, thereby reducing the need for their premature replacement.

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## **Environmental Quality Analysis of the Urban Ecology of Kuala Lumpur City, Malaysia**

***Khairulmaini B. Osman Salleh and Fauza Ab Ghaffar***

This paper discusses the state of Urban Ecology for the Federal Territory of Kuala Lumpur City, Malaysia. Urban Ecology is an emerging field of study that examines the structure and content of urban ecosystems in a City or Urban area. The state of Urban Ecosystems describes the Environmental Health or Environmental Quality of a City or an Urban Area. The structure of an urban ecosystem can be defined as the combined representation of the diverse landuse types that defines a City or an Urban Area. General Landuse mapping studies classify and map what are the landuse types that dominate a unit area of land. This is considered a static approach and centers on what is where in space. However in the present study a functional approach is adopted where landuse types are associated with their role on determining the state or quality of the immediate environment. In the present study the state of the immediate environment are examined at two levels of complexity - a lower level where the environment is divided into the 4 main subsystems of Air, Water, Land and Ecology, and a higher level which examines the environment as a Unit System comprising of the 4 main subsystems. The Landuse Categories are reclassified so as to exhibit a Functional character. 6 Major Functional categories were identified. The categories are (1) Mixed Tree Vegetation, (2) Mixed Shrub Vegetation, (3) Agriculture Vegetation, (4) Water Bodies, (5) Exposed Bare Areas and (6) Built - Up Areas. Each Landuse Category is examined in terms of its influence on the Quality of each Subsystems of the Environmental Complex. The Study Area chosen was the Federal Territory of Kuala Lumpur. A total of 280, 1 km X 1 km cells were identified for the Federal Territory of Kuala Lumpur. The acreage for each Landuse categories of each cell was measured using an instrument called planimeter or area measurer on 2008 landuse maps of the FTKL. The landuse category and acreage were then cross checked in the field. Landuse acreage was measured in km<sup>2</sup>. Each landuse category was critically evaluated in terms of its influence on environmental quality. A scale index of 0 to 10 was determined to describe the state of environmental quality and its relationship to the landuse category. 0 describe the non-present of the landuse category in the cell, 1 to 2 very low, 3 to 4 low, 5 to 6 moderate, 7 to 8 high and 9 to 10 very high. However, based on past studies it is well understood that landuse categories that describe some form of vegetation dominance and also water bodies the environmental quality is positive whereas for built-up areas and open bare areas the state of the environment quality is negative. A factor score was determined for each landuse category. The factor score is highest if the landuse category influences environmental quality many folds. The factor score times the scale index of a landuse category will yield the weighted environmental quality index of the landuse category.

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## **The Social Construction of Nature: The Seoul Green Trust and the Making of a City-Forest**

*Buhm Soon Park and Youjung Shin*

In 2005, the construction of a forest in the middle area of Seoul City started under the leadership of Mayor Lee Myung-Bak. "A magnificent forest where deer and roe deer are romping around" was the oft-stated image of this new green space, and the measures were indeed taken to materialize this idea when considering types of tree, soil, artifacts, and animals for the so-called "Seoul Forest." This paper juxtaposes the process of constructing a man-made nature with that of forming a network of expertise to mobilize public support, contest the city government's proposals, and spearhead political negotiations. It pays particular attention to the Seoul Green Trust, an NGO that played a central role in getting citizens involved from the outset. As a positive civic group, the Seoul Green Trust acted as an honest negotiator among various interest groups and local residents. The analysis of this organization's activities will provide not only a bottom-up picture of urban renewal but also an in-depth understanding of the ways in which expert knowledge of urban renewal--sustainability, criteria, and frameworks--was introduced, modified, and implemented.

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**The Stock Market Response to (the disclosure of) Environmental Incidents in China? Fan  
Empirical Research of 149 Events From Jan., 2003 to Mar., 2012**

*Liu Qian*

This paper takes 149 sample environmental events between 2003 and March 2012, using event study method to analyze whether environmental events are associated with an abnormal volatility of stock returns. The results show that, China Stock Markets is not Green-Efficient as a whole, and environmental events cannot be the significant negative signal for stock prices. While the CAR of industrial waste pollution, chemical industry and state-owned enterprise are more significant than their counterparts. Further test suggest that environmental events have significantly negative effect in stock prices after 2008. The regression of cross-sectional data reveals that major and serious accidents show sharp impact on the stock prices than minor ones, while Investors are not sensitive to accident and enterprise type. Therewith, we suggest improving responsibility tracking system and information disclosure system to increase enterprises' environment default costs, meanwhile cultivate rational investment philosophy.

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## **Comparative Analysis of GHG Emission and Air Pollution Reduction in Shenyang and Shanghai**

*Wen Qiao*

Climate change has become the most significant environmental and development challenge of humanity in the 21st century. It is the core task of global sustainable development for now and for quite a long time in the future. China, one of the major emitters of greenhouse gases (GHGs) in the world, is also facing the serious problem of climate change. The concomitant issue of environmental pollution is also a serious problem for the development. The rapid growth of urbanization, degradation of the environment, GHG and pollution emissions are becoming the most critical factors to affect climate and environmental changes in China. In order to mitigate climate change and environmental pollution actively, Chinese government claims that the level of carbon intensity per unit of GDP will be reduced by 40%-45 % in 2020 comparing with the level in 2005 and therefore, policies have been made and a series of actions to reduce carbon emissions and improve environmental quality have been taken as well.

As we face the double pressures of GHG emissions and environmental pollution, the study which focuses on the co-benefits of GHG and pollution reduction is becoming important. And the study will explore the benefits of cutting GHG emissions and environmental pollution by using the economic, social and environmental theories.

The industrial sector makes the significant contributions to both the environmental pollution and GHG emissions in China. The paper selects the Baoshan District in Shanghai and Tiexi District in Shenyang as the two cases studies of typical industrial zones for the assessment. A contrastive analysis is taken on the co-benefits of GHG emissions and air pollution reduction in the industry sector. The analysis shows the dynamic relations among the levels of co-benefits in the two districts due to the intervention of the national and local regulations and policies through the established indicator system. Finally, the policy recommends are given based on the results of the variation analysis to the co-benefit implementation in two different cities. In order to achieve effectively co-benefits of cutting GHG emissions and pollution in China, the study shows that the local conditions, short-term and long-term objectives, spatial and temporal differences should be given same weights in the process of relevant policies.

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## **Transformative pathways of global certifying partnerships: A foresight study in the field of sustainable agricultural commodities**

*Greetje Schouten and Pieter Glasbergen*

Over the past few decades, private governance arrangements, particularly industry consortia and partnerships between businesses and NGOs, became vital in the search for a more sustainable future. Using certification and product labeling as regulatory tools, many of these arrangements have become focal points in terms of sustainability standard-setting, enforcement, and monitoring compliance.

In this paper we address the changes in the governance of agricultural commodities through the introduction of global private certifying partnerships. These arrangements often originate in the -consuming- North, while they address production in the South. Although participation is voluntary, they aim to change the conditions of production and market access. This form of governance is particularly contested regarding this change capacity for a variety of reasons. E.g., certification schemes tend to favor large-scale producers who are well organized over smallholder farmers. Also, tensions may arise between private schemes and public responsibilities.

These points reflect the uncertainties regarding the transformative capacities of global certifying partnerships. We seem to be in a development phase in which different pathways to a more sustainable agriculture are possible. Each of these pathways has its specific transformative capacity, understood as the ability to bring about substantial sustainability changes at the production level in a development context. In this paper we use a foresight approach to reflect on these pathways, answering the question: what are possible future developments and how should they be valued in terms of transformative capacity of global certifying partnerships?

A foresight approach does not have the intention to predict future developments, but rather to imagine what scenarios are plausible. It aims to generate insights regarding the dynamics of change, future challenges and options, to suggest potential intervention points.

Based on an analysis of current dynamics in our focal field we observe that three alternative scenarios are plausible. The first scenario, leaving it to the market, anticipates an increasingly accelerated institutionalization of private governance arrangements. The second scenario, taking public responsibilities, anticipates that (national) governments (re-)take their role as central actors. The third scenario, institutionalizing meta-governance, anticipates harmonization by private and/or public actors. Each of these 'futures' has implications and creates dilemmas when reviewed in terms of transforming agricultural production and consumption in a sustainable way. A further analysis of the factors that drive the transformative capacity in this field reveals the contingencies that need to be taken into account when deliberating the transformative capacity of global certifying partnerships.

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## **Study on the path of low-carbon urbanization**

*Jing-jing Shan*

In the process of large-scale and rapid urbanization, China is now faced with a big issue, which is how to transit from the past development mode featured with high energy consumption, high emission, high pollution and low efficiency to the new one featured with low-carbon, high efficiency and green, especially during the dynamic period of dramatic change. Based on clarifying the concept of low-carbon urbanization, this article analyzes various dilemma it is faced with. Then combined with the actual situation, this article puts forward specific path from the perspective of industrial transformation, urban planning and construction, lifestyle, social management and technology innovation in order to promote the development of low-carbon urbanization.

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## **Asymmetric Relationship between Urbanization and Industrialization in China**

*Cheng Sheng*

China's urbanization and industrialization are basic synchronization, which not only increases the consumption of resources and ecological pressure, but also introduces carbon emission rising sharply. However, with the advance of urbanization, the public infrastructure efficiency will improve continuously, which also reduce energy consumption and carbon emission. The paper revealed the non-linear relations between urbanization and carbon emission based on the data survey from World Bank. Firstly, we researched the stationary features and long term equilibrium relationship with the time series of urbanization and carbon emission. Secondly, considering the possible structure change in the two time series, threshold vector error model and Markov-change model had be constructed to find the non-linear relations between the two time series. Then, some conclusion are as following. (1) There are two regimes exist in the relationship between urbanization and carbon emission, and the relationship are differences significantly in the two regimes. (2)The structure threshold in the relationship occurs in 1993 and 2000. (3)The change probability is very small, therefore, the advance of urbanization is unlikely to reduce carbon emission, and carbon emission increasing speed is more fast the urbanization when it reaches the threshold.

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## **Is Fukushima eco-ing? The risk politics of radiation**

*HaeRan Shin and Masahiro Ono*

This study looks at how risk communication has taken place among various actors and who have led the agenda-setting regarding the Fukushima disaster in 2011. It also looks how risk coalition has been formed to pursue pro-nuclear energy policies. Since the Fukushima disaster, there have been substantial debates on the level of harms of the meltdown of the nuclear reactors and the safety of nuclear power plants in the future. The involved actors include Japanese national government, the Fukushima local government, the US Center for Strategic and International Studies (CSIS), the United States government, and media. Most of radiation levels in the nuclear crisis have fallen in the scientific grey area, so scientists in different disciplines have suggested different solutions. Because there are practical issues that are affected by the risk perception such as compensation, food safety, residential safety, and decontamination plan, the communication among different groups is needed. Through archival analysis on the media, governmental reports, and experts' writing, this paper specifically explores how the risk perception on Fukushima and the city's eco-ing strategy has been negotiated. We argue that, first, that the risk politics involves the risk communication between a national growth discourse and a reflexive-environmental one. The emergence of new social media played an important role in the knowledge mobility between experts from different disciplines, between non-academics and academics, between governmental and non-governmental actors. Second, the risk coalition was formed based on the obligation to resolve the problem while the involved actors had conflicting interests. The power hierarchy among those actors and major political issues influenced the risk politics of radiation.

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## **Songdo and Incheon Free Economic Zone: Two Visions, Two Scales, One Model - The Ubiquitous ecocity**

*Sofia T. Shwayri*

Songdo International Business District (IBD) has, in the last few years, become a ubiquitous ecocity. Under development since early 2000, Songdo became part of a larger planned development, Incheon Free Economic Zone (IFEZ), in August 2013, along with the two cities of Yeongjong and Cheongna. IFEZ is the first economic zone to be named following the government's decision to establish six such zones, part of a transition to a service economy and a policy to encourage foreign investment. Songdo's master plan was drawn up by Kohn Pederson Fox, an international New York based architectural firm, whose vision was to create a sustainable urban environment through mixed-used development and open/green spaces. The urban development vision for IFEZ was set by the authority in 2004 and centered around three principle elements; an eco-friendly city, a ubiquitous city and a high-tech transportation city.

Despite Songdo being mainly privately led, mostly foreign and IFEZ initiated and locally driven, espousing different scales of sustainability and thus models to be exported, this paper argues the visions of Kohn Pederson Fox and IFEZ are in response to global demands and local needs that have resulted in the creation of a model for the ubiquitous ecocity. This paper focuses on the uncovering of the constituent parts of this model by examining each vision and the underlying knowledge circuits in the broader socio-spatial and political context as a way to understand how scale is being reworked by the authority, evidenced by its interchangeable use of the IFEZ-Songdo model in its attempt to promote it.

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## **Waste Transitions: the role of Framing Activities and Linguistic Power**

*Angie Silva and Paul Mercieca*

Sustainable urban development relies heavily on our ability to manage waste and material flows. With mounting consumption levels, high turnover products and an inability to maximise on materials already in the system, against a backdrop of depleting natural resources and major ecological disruptions to our oceans, fauna and atmosphere; evidently our wasteful consumerist society is causing a major waste crisis. Waste reduction is developing as a key sustainable transition, deeply embedded and tightly interwoven with the ideologies of sustainable production and consumption. Pursuits towards a 'Sound Material Society' in Japan or a 'Zero Waste' city in San Francisco are a few waste transition innovations to have emerged in the last decade. The spatiality of waste reduction governance, from manufacturing to consumption and eventual disposal, is complex, spanning across multiple geographies and involving many diverse actors; necessitating frameworks that transcend beyond geographical jurisdictions. This paper will draw attention to key waste transitions around the world, assessing the role linguistic power and framing activities has played in waste minimisation initiatives and policy development. The paper argues that linguistic framing provides insight into how agents connect and engage across physical boundaries through shared use of language and visions, constructing linguistic power. The paper concludes that linguistic power significantly influences the waste discourse that then impact societal perceptions and technological innovations, influencing waste transition trajectories and pathways.

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## **Energy consumption and resource metabolism of community based on input-output analysis**

*Dan Song and Bin Chen*

As the major source of greenhouse gas (GHG) emission, cities have been facing a huge pressure of energy conservation and emission reduction for decades. Community is the main carrier of urban housing, public facilities, transportation and other properties of city's land use. Low carbon community construction has been considered as an important pathway of carbon mitigation in the context of rapid urbanization. Thus it's necessary to trace energy conservation back to its' specific production processes and the indirect energy requirement in accessing the energy consumption level of a community. As previous studies mainly focused on direct energy consumption and ignored the embodied emissions produced by families and public spaces, this paper intended to present a comprehensive analysis on the resource pressure during the operation period of a community. In addition, input-output based life cycle analysis (IO-LCA) was used to analyze the environmental impact of material and energy resources relationships of a community from the metabolism perspective. The result showed that emissions from supply chain emissions embodied in the consumption of goods cannot be ignored for the optimization of resource allocation and further promotion of community.

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**Nationally Specific Regime of Policy Learning and Academics as Agents of Policy Mobility:  
With a Case Study on Environmental Agenda within Smart City Policy in China**

*Jung Won Sonn*

By analysing academic input in the Smart City agenda in Chinese economic and urban planning, this paper contributes to policy transfer literature in geography by shedding light on the geographically distinctive "regime of learning." Recently geographical approaches to policy transfer have shown that policy transfer is not simply a replication of successful policy. Rather, it is the reformulation of existing policy within a geographically specific institutional context of the hosting polity. We argue that the reconfiguration of the transferred policy is not directly dictated by the politico-economic structure of the society. Rather, it is mediated by what we call, regime of learning. Understanding the diversity of ways in which such regimes work will provide a micro-geographical foundation to the current mobile policy literature. For this purpose, we examine the role academics play within the regime of learning because active academic participation in policy process is one of the main characteristics of the Chinese regime of policy learning. In China, an academic is like the head of a small policy consulting firm, with postdoctoral fellows and postgraduate students working for him or her. An important part of the academic's job is to import policy ideas from overseas. Two important aspects are behind this active participation of academics: 1) The fast policy aspect - Because the speed of policy process is extremely fast, bureaucrats simply cannot cope. Hence, policy construction is passed on to academics who are widely knowledgeable about foreign context due to their overseas Ph.D. studies or their past experience in policy consultancy. 2) Legitimacy aspect - Due to a long history of political intransparency, people's trust of the government is still low. As such, the government has to use the names of someone else in presentation of new policy. Academics are supposed to be neutral and less corrupt. In-depth interviews with some of the key academics in related areas and documentary analysis are the main methods for this research.

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## **IIMOTHEP Data Platform for Sustainable Lifestyles and Energy Consumption Practices**

*Eddie Soulier and Wenhua T. Zhu*

Human activities at the global scale have a significant impact on energy consumption. This leads to unsustainable use of natural resources (mainly fossil) and an ever-increasing production of waste. Urban areas, where the majority of the world population lives, have to deal with many environmental problems particularly in emerging countries. The deployment of intelligent infrastructure such as Smart Grid, aims to address these challenges by optimizing the production, distribution and consumption of electrical energy in particular in urban areas, to manage both energy and the data streams in order to support new services and consumption patterns. Nevertheless, when it comes to use these massive data streams generated by daily activities of human and non-humans actors, which are directly or indirectly related to energy, Smart Grids alone, reach their limits. Indeed, they are not able to capture, analyze and visualize effectively the flow of information to help actors in these urban areas to better understand how they can influence their behaviors and lifestyles to meet the challenges of sustainability. This paper aims to explore how to facilitate the decision-making process for users about their sustainable practices and lifestyles to optimize the daily production and consumption of energy and meet the challenges of energy access and ecological transition. The introduction will first present the context, key concepts, research question, the current gaps in this problematic and a review of the literature on key terms and main theories. We focus in the following section on the theoretical approach (Assemblage Theory, Simplicial Complex, Activity Stream) as well as the tools and technologies that allow us to identify, analyze and promote sustainable practices of users in Smart Cities using intelligent networks such Smart Grids. For this last point, we use a simulation tool (3DExperienCity from Dassault System), with Virtual City Virtual Models called Virtual Shanghai Model (VSM) which give us the opportunity to integrate sustainable practices in a 3D environment and follow their transformations and interactions in virtual environment. Finally, this paper concludes with an overview of further investigation, perspectives and some reflections.

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## **Beyond CSR: Corporate Sustainability and the Corporate Human Development Index**

*Joachim H. H. Spangenberg*

Despite efforts to standardise CSR reporting, so far there is more diversity than clarity and transparency in CSR reports. Furthermore, the rankings available judge the quality of the reports, not the performance of companies. The paper tries to structure corporate CSR performance assessment by borrowing from two macro level concepts: the 'prism of sustainability' and the Human Development Index HDI. It derives some hints not only how environmental sustainability could be defined at the corporate level, but also regarding the institutional and economic sustainability of a company. Regarding reporting on corporate social sustainability we suggest developing a CHDI, by projecting the criteria and categories of the UNDP HDI to the company level. To enhance transparency and credibility, the index is defined based on data probably accessible to external agents, but certainly to staff members and their representatives (such as works councils). Confidence building through transparency of reporting is an important condition for collaboration between different sectors of society, which in turn is a condition for sustainable development. Indicator based corporate sustainability reporting can contribute to this end.

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## **The Good Life or the Better Life? Taking the Sustainable Consumption Lens Seriously**

*Joachim H. H. Spangenberg and Sylvia Lorek*

Under the currently hegemonial political and cultural paradigm of (economic) growth, a vision prevails promising unlimited satisfaction of all human wants, either soon or in a slightly more distant future. The majority of proponents for sustainable development as well as for sustainable consumption promote a strategy which sounds similar but in fact is something completely different: 'the better life'. Since the days of Brundtland and carried on in the most cited definition of sustainable consumption from the Oslo Symposium 1994 this 'better life' is continuously carried forward like a mantra. Without any doubt the 'better life' is necessary for those suffering in poverty. Promising 'the better life' however ongoing to the members of the consumer society - and even worse in the name of sustainability - seems quite contradictory. While 'the good life' indicates elements of stability as well as of contentedness the search for the 'better life' necessarily included repine. There is always something more and different to strive for. Sustainable consumption has been - and still is - the voluntary renunciation of consumption possibilities - an ascetic attitude suitable for niche life styles but not attractive to the public at large, to the mainstream focussed on and believing in ever increasing consumption. We see two elements as predominant for the ongoing push of 'the better life'. First are indeed the power structures in society and especially media which constantly tell us that 'happiness is around the corner' if we only buy this or that new product. Proponents strictly stay in the more and growth philosophy which they only like to fill with more sustainable alternatives. The second reason is that even those who in general see the advantages of 'the good life' do not manage so far to really sell the concept. It is more under the suspicion of suffering than true richness. The paper respectively the thesis developed from it intends to kick off discussion how the vision of a 'good life' could look like and how to make it appealing. The first element of how consumer can derive more satisfaction from less goods is through the efficient provision of access to flows of goods and services, probably often collectively owned (individually, by cooperatives, or public authorities). The second element is carefully screening which products and services are real satisfiers of human needs. Many of them may not be commodities or commercial services at all. The third element would be a change in consumer attitude towards consuming better but less. Institutions enabling purchasing higher quality consumer goods which save money in the medium term would be needed to reduce consumption while improving service availability. Loans and savings, cooperative banks etc. should begin to think about such grant schemes, while public institutions could begin by honouring career advances by better, not larger cars, offices etc.

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## **Increasing product novelty in the handicraft industry in Vietnam through incorporating heritage values and collaboration**

*Sarah Suib, Jotte de Koning, Marcel Crul and Han Brezet*

Vietnam has one of the largest handicraft industries with a significant impact on their overall economy. As a result of the commercialization of ethnic craft the handicraft industries in emerging countries are undergoing rapid developments. Within the complex and organic system, competition is high especially among countries such as Vietnam, India, Indonesia and China. Handicraft producers used to compete with high quantity production focusing on low-end markets with small profit margins. The producers are unable to respond to market demands with novel products and product differentiation is low due to limited design capacity. As a result copycat culture is a common practice and this reduces an already small margin for local producers, which affects the local handicraft community who traditionally are at the end of the supply chain.

This paper aims to describe a solution to increase product novelty within the handicraft industry and how it can be beneficial for the context of Vietnam. Two case studies from the Vietnamese terra cotta and bamboo sector are used for empirical data. Thanh Hà is a craft village with a long tradition of pottery made from local terra cotta clay. Duc Phong Co. Ltd is a company that focuses on the efficient use of local Lung bamboo in their products to empower the local handicraft community. For both case studies observational and ethnographic research were conducted. Based on the results, creative sessions and a collaborative design process were developed and executed with selected stakeholders (handicraft producers, local community and external support organizations).

The results show that collaborative innovation and heritage values are crucial inputs during the new product development (NPD) process as a means to increase product novelty. This strategic approach can be a catalyst to build collaborative design space between local and external stakeholders and between designers and non-designers. Collaborative design space ensures the input of design capacity and the input of heritage knowledge during the NPD process by local and non-local stakeholders which is crucial to increasing product novelty.

Since the handicraft industry is closely bound to the local community and their cultural tradition, local stakeholders and their heritage knowledge were identified as a critical input during NPD. Findings suggest that heritage values increase product uniqueness when it is consciously and structurally used as source of inspiration. The proposed strategic approach focuses on using heritage knowledge, traditional skills of the handicraft community as well as efficient use of current local resources. Not only because it directly influences product novelty but also because it intrinsically builds social cohesion among local community. Empowering the local community to use local knowledge and local resources contributes to their economy and creates a sustainable cycle within the growing handicraft industry.

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## **The rebound effect in household air-conditioner consumption behavior**

*Xin Sun*

With the improvement of energy efficiency of household air-conditioner, energy-saving air-conditioner is becoming more and more popular with the Chinese household. It means that there would be a reduction in energy use and carbon footprint of air-conditioner to achieve the same air conditioning effect as before. But due to the existence of "rebound effect", the expected reduction would haven't been fully implemented, and even possible have the opposite effect. This paper examines whether the increase in energy efficiency of household air-conditioner cause additional utilization of it, and therefore cause more carbon footprint of it. Firstly, this paper analyzed the carbon footprint of Chinese household air-conditioner by SimaPro software version 7.1 with Chinese database RCEES, based on the international standard of the PAS 2050. Secondly, we got the data of air-conditioner energy efficiency level, electricity consumption and usage behavior in Chinese household by questionnaires survey in 400 households. The results shows that the rebound effect of Chinese household air-conditioner , in the perspective of carbon footprint, is about 30%. These results have to be taken into account when making long-term energy planning for a more sustainable household consumption behavior.

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## **Is there a stable value basis for organic food consumption in China?**

*John Thøgersen and Yanfeng Zhou*

A large and growing share of climate gases and other critical emissions is directly related to private consumption, and even more are indirectly related (European Environment Agency (EEA), 2012, The World Bank, 2012). This has led to an increasing realization that future growth in consumption must respect planetary boundaries and be sustainable (Commission of the European Communities, 2008, WBCSD, 2008) or "green" (OECD, 2011). The success of such a "green growth" strategy depends on citizen-consumers choosing sustainable product and service alternatives, when offered. It is generally expected that most of the consumption growth in the coming decades will be in developing and especially in emerging economies (e.g., EIA, 2013). However, there is a lack of research on whether consumers in emerging economies value best-practice "green" consumption solutions. In this paper, we contribute to filling this knowledge gap by studying the value basis of Chinese consumers' adoption of a well-researched "green" type of food products, viz. organic food. The objective is to investigate whether a solid and stable value base exists in China for buying organic food, a western invention. In Western Europe, the purchase of organic food is primarily rooted in what Schwartz termed Universalism values (Thøgersen, 2011). Preliminary studies have found that Universalism also motivates behavior in China, but also that the value foundation for buying organic food is both broader and weaker than in Western Europe (Thøgersen et al., 2013). We study the stability of the value foundation for buying organic food in China by means of two surveys with ordinary Chinese consumers collected outside supermarkets selling organic food in Guangzhou, China, in 2009 and 2012. Contrary to what we expected, we find that the purchase of organic food in Guangzhou, China, had a weaker value foundation in 2012 compared to 2009. In 2009, the strength and breadth of the value foundation for buying organic food depended on the length of the consumer's experience with this behavior, being broader and stronger for consumers that had bought organic food for more than three months than for consumers with no or less experience. However, in 2012 experience made little difference and the value foundation for both more and less experienced consumers was similar to what we found for consumers with no or only short experience in 2009. We discuss the implications of this finding for the development of a sustainable consumption pattern in China and specifically for consumers adopting "green" solutions invented in the west, sometimes referred to as "leap frogging" (OECD, 2011).

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## **Systems Change in the Manufacturing Sector: Innovation and Access to Technologies for Sustainable Development**

*Vanessa J. Timmer and Kira Matus*

The sustainability of the industrial economic model of production and consumption is increasingly coming into question. There is growing concern about the negative environmental and social consequences of the 'take-make-dispose' linear pattern of resource consumption and waste production, along with the increasing complexity, long-term consequences and global spread of supply chains. It is also clear that increasing innovation and access to technology for greater sustainability and equity in the manufacturing sector requires a systemic perspective. This paper applies a conceptual framework of the innovation process to the manufacturing sector to explore how existing institutional arrangements, particularly those involving transnational actors, can be strengthened to improve the impact of innovation on sustainable development between and across generations. Innovation processes have become increasingly transnational in nature, with the intensified cross-border movement of knowledge and ideas, capital, goods, services, and people that characterizes globalization. Consequently, it is necessary to develop a better understanding of this emergent "global innovation system" in order to diagnose its weaknesses and identify ways to strengthen it. Our analysis began by identifying the key actors and institutions that form an innovation system in the manufacturing sector. This paper draws on a study across five sectors with potentially critical roles in enhancing sustainable development (food, water, energy, health, and manufacturing), including reviews of the literature and twenty new case studies, in order to explore manufacturing innovations through the lens of a scalable and generalizable model of an innovation system. The model relates seven stages of the innovation process: the invention of a technology, how it is selected, produced, initially adopted, put into widespread use, adapted, and eventually retired. Using the model, we develop an initial analysis of common barriers that can impede progress in each stage according to key technology characteristics. We then examine the available mechanisms to overcome such barriers within the production and consumption system, and the key functions that transnational actors and institutions can perform.

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## **Do EcoVillages actually reduce ecological footprints? Defining Elements of a Monitoring Protocol**

***Vanessa J. Timmer, William E. Rees, Jennie Moore, Allison Witter, Karen Litfin, Emmanuel Prinet, Dagmar Timmer and Alastair Moore***

Excess material throughput (resource consumption and waste generation) is a major proximate cause of ecological unsustainability. In industrialized countries, an 80% reduction in per capita ecological footprint is required in order to reduce pressure on global resources. Grassroots experiments in sustainable lifestyles and green consumerism that aim to address this problem are emerging globally, including transition towns, Ecovillages, Lifestyles of Health and Sustainability (LOHAS) practices, and freecycle networks; however, it is unknown whether these experiments actually result in reduced per capita ecological footprints, or if they are even monitoring properly for such reductions. In this paper, case study analysis is utilized to explore one particular type of sustainable lifestyle experiment - the Ecovillage - and whether reductions in material throughput are actually being monitored. Important elements of a monitoring protocol are suggested for improving assessment of the consumption and waste production levels of Ecovillages and other sustainable lifestyle experiments, and the monitoring practices of five Ecovillage case studies are assessed according to this suggested protocol. Key challenges to reducing as well as evaluating the material throughput of Ecovillages are highlighted. Recommendations are offered for improved monitoring to facilitate scaling up those initiatives that exhibit promising results.

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**South Africa Environment sector science-policy interface approach: sustainable consumption and production as one of the national green economy focus areas**

*Mapula Tshangela*

This paper contributes to the theories of policy management and sustainable development throughout the policy cycle: agenda setting, formulation, decision making, implementation and monitoring & evaluation. The paper presents the analysis and description of the approach adopted on the formulation and implementation of the South Africa environment sector research, development & evidence framework. The environment sector framework promotes timely close interface between researchers and policy makers to ensure the promotion of joint scoping and joint interpretation of research output to inform policy making. The sector framework was developed through intergovernmental, research institutions and multi-stakeholders contribution thus its argument to enhanced policy implementation success rate. South Africa has committed to pursue and explore opportunities in the green economy in the context of sustainable development and poverty alleviation- "towards resource efficient, low carbon and pro-employment growth path". In its national green economy priorities, sustainable consumption and production is identified as one of the nine focus areas. Using the sector framework approach, the paper examines the prioritisation and implementation of sustainable consumption and production science-policy interface. Areas such as policy research prioritisation, research commissioning and ultimate outputs for feeding into policy making processes are considered. The successes and challenges from the paper [focusing on sustainable consumption and production] are useful for practical implementation lessons of the environment sector research, development & evidence framework approach for other sustainable development themes. A further contribution of the paper is in the way research evidence is used [uptake] in policy making throughout the policy cycle theory.

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## **E-Mobility Transition in China as Political Process**

*David P. Tyfield and Dennis Zuev*

One of the greatest challenges regarding contemporary research into socio-technical transition concerns the possibility of 'sustainable transport'. Transportation, which accounts for at least one quarter of global greenhouse gas emissions, is key to efforts to mitigate 'climate change'. But with the particularly 'locked-in' and entrenched socio-technical system of 'automobility' at the core of contemporary mobility, it is also arguably a uniquely challenging case for low-carbon transition. In this respect, perhaps the most significant single development is the recent transformation of mobility within contemporary China. In little more than 3 decades, China has gone from a society dominated by bicycles and beasts of burden to the largest car market in the world, and with prospects for massive further growth. Yet as automobility continues to expand rapidly across this vast and uniquely populous country, emergence of an alternative socio-technical system of urban mobility is a matter of exceptional importance, both to China and the rest of the world. Conversely, China is also engaged in an experiment regarding electric vehicles that is receiving globally unique levels of governmental and corporate support; yet with, at best, stuttering impact.

The talk will ask in particular how thinking about low-carbon transition in the entirely different socio-economic, political and cultural context of China forces a confrontation with some key challenges for contemporary theories of low-carbon innovation and system transition. This highlights how analysing the future of the 'car' in China also provides a window into inter-related issues of political economy, innovation from below, adventurous consumption and novel mobilities, all of which matter profoundly in analysis of the prospects of system transition. In particular, the seemingly poor prospects for imminent Chinese low-carbon leadership (despite the significant state backing) in electric vehicles is contrasted with the case of the potentially 'disruptive innovation' of electric bikes. Considering the possible deprivatisation of mobility as well as the transformation of cars from primarily mechanical to digital machines also leads to discussion of the cultural and political challenges to low-carbon post-car mobility in China. Using evidence from interviews in spring 2013 in Beijing and Shanghai with major players in Chinese urban mobility and continuing research in a new 30-month ESRC project (2013-16), the paper thus examines what are the potential political and social implications of Chinese disruptive innovation in low-carbon mobilities, regarding the possible construction of new powerful coalitions and subjectivities, and thence, the prospects for low-carbon system transition.

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## **Implementation challenges of urban resource perspectives**

*Ellen M. van Bueren*

As major consumers and polluters, cities are considered as source and key to many sustainability problems. Resource perspectives as urban metabolism, cradle to cradle and circular economy are based on the analysis of flows. Controlling, reducing and reusing these flows will contribute to the realization of urban sustainability. Resource perspectives are becoming increasingly popular amongst scientists and local politicians (Monstadt, 2009). They seem to offer the vocabulary and methods to realize political ambitions with regards to sustainable cities, often called smart, eco, low carbon, green, healthy etc. This paper will explore two cases in which actors have used resource potential mapping as an instrument to achieve regional sustainability ambitions. Both cases are situated in the Netherlands and have been studied in respectively 2012 and 2013. The first case is about energy potential mapping in the region Holland Rijnland. The second case is about the potential mapping in the Amsterdam Airport region, in which resource flows as water, energy and waste have been mapped. Resource potential mapping aims to geographically identify options for reducing resource use, increasing the use of renewables, and improving resource efficiency. The geographical dimension of this perspective makes it a highly relevant perspective for urban design. However, the case study shows that actors in a city, including local policy makers and city administrations have more difficulty with recognizing the value of the perspective and with making use of the suggestions for improvement offered by the perspective. Following Allen and Rapoport (2012), the cases show that resource potential mapping is a method that seems to ignore the institutional context in which the by the method identified potentials have to be exploited. After analyzing the reasons for this ignorance, the paper makes several suggestions for filling in this omission based on public policy perspectives (e.g. Klijn and Koppenjan, 2004), perspectives which take the institutional setting in which policies are formulated and implemented as point of departure for any government intervention. The paper concludes with a reflection on the value and use of resource perspectives for local sustainability policies.

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## **From Consumerism to Wellbeing: Towards a Cultural Transition?**

*Philip Vergragt and Halina S. Brown*

Since the end of WWII the USA has transformed itself into a consumer society, where the national economy depends to a large extent on private consumption and consumerism as a dominant lifestyle. The consumer society emerged through concerted efforts of the manufacturing sector, government policies, and organized labor. The ecological cost of this transformation has been high. Despite growing evidence that since the mid-1970s the consumer society has not delivered greater societal or individual well-being, it is a very stable complex system, grounded in: socio-technical regimes, cultural attitudes and prevalent lifestyle choices, and dominant economic institutions and structures. Technological advances can probably not, by themselves, compensate for the ecological impacts of mass consumption; fundamental shifts need to take place in how people satisfy their needs and wants through material and energy consumption. This paper starts with a review of the history and impacts of the consumer society from the perspective of the large body of knowledge about human subjective wellbeing. It arrives at the hypothesis that that a collective reframing of people's ideas of wellbeing as less fixated on materialism and high intensity leisure activities is necessary. It then considers how such a change might take place through bottom-up social forces, focusing on the link between consumption and wellbeing. We propose that the technologically connected, educated, confident and open-to-change millennial generation might lead the way in that transition. By way of a timely confluence of several factors, Millennials are poised to redefine the good life in twenty-first century America. Although this life would be materially scaled down, it would be richer in other ways: more interdependence and reciprocity with people, and a stronger sense of a community. Additionally, the emerging New Economy movement, guided by the vision of economic democracy, equity, localism, and collaborative business models, may converge with this cultural transition, possibly creating synergies between the two movements.

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## **High-emitting households in the UK**

*Xinfang Wang*

Climate change is a global problem that will affect every country and each individual. International negotiations have agreed to 'hold the increase in global temperature below 2 degree Celsius' (Copenhagen Accord, 2009). To meet the objective on an equitable basis, many emission reduction pathways assume that the industrialised nations reduce their emissions immediately while the poorer, non-industrialised nations increase their emissions at a reduced rate, peaking in next decade. Similar discrepancies in terms of wealth, wellbeing and emissions also exist at an intra-national level. Policies for addressing climate change have been economy wide; little attention has been paid to 'tailoring' policies towards the particular high-emitting groups (HEGs) within society, which may provide for a more effective, efficient and equitable delivery of a low carbon society. To illustrate this, the paper investigates the types of activities undertaken and related emissions profiles across the HEGs and other households within the UK. Basing on the consumption-based accounting, household emissions are estimated by linking their expenditure and corresponding emission intensities. The distributions of total UK household emissions, as well as emissions from housing, transport, consumables and private services are presented by Lorenz curves. Through separating the HEGs from general households in the UK, the key reasons causing the significant different levels of carbon emissions between the HEGs and other households are further identified. Several important socioeconomic factors including household income, household owned cars, house size, household size, socioeconomic class and age of household reference person are explored on their influence of household emissions through linear regression and clustering analyses. Results show that emissions from home energy are more related to house size. And among the HEGs, households prefer more driving and less use of other transport tools if household size increases. Besides, the HEGs are mainly consisted by two typical clusters of households. One cluster of HEGs contains mainly middle-aged high-income households who are fulltime employed; the other cluster mainly includes old pensioned or unoccupied households who receive low disposable income. The old pensioned households are more significant for the emissions from housing, comparing to emissions from transport, consumables or private services. The results further support the standpoint of treating the HEGs differently from general households as an implication for climate policies. Areas for future research are identified, including the technology and behaviour change options for carbon mitigation from the HEGs, the distributional impacts of climate policy, and the rebound effects. Conclusions are drawn on the existing and potential policy options for reducing carbon emissions from the HEGs in short-to-medium term and in keeping with a range of UK emissions objectives.

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## **Forecasting CO2 Mitigation and Policy Options for China's Key Sectors in 2010-2030**

*Zongguo Wen, Xuan Zhang, Jining Chen, Qilu Tan and Xueying Zhang*

The technological status of 7 key industries in 3 sectors (energy, industry and consumption) was analyzed using bottom-up modeling. Using 2010 as a baseline, it predicts 3 sectors' GHG direct emissions trends, turning points, reduction potentials and costs in 2 policy scenarios and 3 technology scenarios in the years 2015, 2020 and 2030. The scenarios analysis shows that the industry sector might reach its emission peak between 2015 and 2020, which leaves the largest emissions reduction potential for the consumption sector. GHG emissions in the consumption sector will increase through 2030 without reaching a turning point. In the Social Low Control Middle (SL-CM) scenario, CO2 reduction technological potentials of industry and consumption sectors will reach 0.84 billion tons CO2-eq by 2020, in which production makes up 13% of reductions, transportation (48%), and construction (39%). In the 2030 SL-CM scenario, the CO2 reduction potentials rise to 1.6 billion tons CO2-eq, in which production makes up 8%, transportation (44%) and construction (48%). With the rapid industrialization and urbanization, government should pay more attention to a low carbon consumption policy rather than a traditional CO2 control policy for the industry sector.

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## **A critical review of cyclic thinking and the Industrial Ecology metaphor**

***Ronald Wennersten***

Cyclic thinking has come up as a way to solve many of the problems around resource efficiency in our societies and it can be said to be a central concept of hope for ecological modernization. Often these concepts are developed in order to change what is said to be a more linear thinking of resource use today in our industrialized society. Examples of concepts used are eco-cycle models, closed loop systems, circular economy, and circular urban systems. In these concepts there is often some kind of metaphor used for the relation to eco systems in nature like with in the field of Industrial Ecology. But is that metaphor and thinking productive and is it correct? Let us take a closer look at what is called "Zero waste", which is a philosophy that encourages the redesign of resource life cycles so that all products are reused or recycled. No trash is sent to landfills and incinerators. The process recommended is one similar to the way that resources are reused in nature. This is quite a common idea that natural ecosystems are closed loops and that they produce no waste. But is this true? It is sometimes almost a mystical theory about nature that it has a built in intention not to produce waste. The idea is basically false but it depends a little how you draw the system boundaries in time and space. The earth is an open system regarding energy but a closed system when it comes to material. This means that materials are in continues movement on shorter and longer time scales on earth. Eco systems on local levels are open systems when it comes to energy and are often also open when it comes to material flows. Earlier in the earth's development, material flows were open so large amounts of substances were deposited as "waste". Examples of such processes are of great importance to human today, as the free oxygen in the air, fossil fuels, phosphate from wildlife sediments in nutrient-rich sea to fertilizers, limestone layers of dead organisms used in cement. In that, material flows were not confined to closed cycles, resources were allocated for our use today. Life has over millions of years evolved into an increasingly complex network of relative stability. Stability is also something that is argued for when it comes to developing urban systems in analogy with ecological systems. However ecological systems may have multiple, or no, stable state(s). Our impacts can alter the state of ecosystems in an irreversible way. This point suggests that resilience in the evolutionary sense is a more appropriate criterion of persistence of ecological systems than stability or equilibrium. The conclusion is that the analogy with ecosystems about closing the loops is basically not correct and maybe less fruitful to build the further development of Industrial Ecology on. Instead we will in this paper argue that the principles of entropy can be applied for both material and energy in order to find ways to build more resource efficient cities in analogy with eco-systems.

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## **Smart cities revisited: The European "Green Digital Charter" and the governance of urban low-carbon transitions**

*Marc Wolfram*

This paper discusses the emergence, governance and implementation of the "Green Digital Charter" (GDC) in Europe with a view to changing requirements and approaches for achieving urban low-carbon transitions. The GDC has been initiated in 2009 by Eurocities, the network of major cities in Europe. It aims to foster the usage of ICT in urban areas for reducing energy consumption and carbon emissions, so far counting on 41 member cities from across Europe. The starting point of the discussion needs to be taken in the discourse promoting the development of "smart cities" - a concept now coming of age, but still highly virulent globally, informing mainstream policies that address ICT usage in cities. Section 1 thus briefly reviews the ontological basis, normative orientations and implementation approaches that "smart city" policies widely share, despite their inherent conceptual fuzziness. It equally synthesizes pertinent criticisms, recognizing that "smart city" policies in practice tend to pursue a rather narrow agenda of urban action with questionable sustainability impacts. Section 2 then uses transition theory to identify key requirements for enabling and triggering radical socio-technical system innovations in cities, thereby questioning the capability of "smart city" policies to actually deliver in terms of low-carbon transitions. Here, attention is paid to the role of visions and foresight for cognitive and normative change, to shifts in governance arrangements involving diverse newcomers, to grassroots and synergetic experiments linked to co-evolution, as well as to social learning through enhanced reflexivity practices. Against this backdrop, section 3 analyzes the emergence and implementation of the GDC, as well as principal achievements so far. Initially conceived as a visionary statement that cities commit to voluntarily, the GDC has evolved conceptually and institutionally towards a multi-level governance framework, a practitioner network and a platform for knowledge transfer. Furthermore, an international strand of activity targeting the exchange with cities in China has been added in 2011. In conclusion section 4 recognizes that, compared to its mostly local policy predecessors addressing "smart city" development, the GDC appears to combine a number of characteristics that better align with requirements for socio-technical transitions and their dynamics. However, it is also constrained by the "smart city" legacy and related path dependencies regarding e.g. prevalent discursive frames, actor coalitions and local implementation approaches. These findings are finally interpreted to formulate policy recommendations addressing different levels of government, as well as to identify relevant issues for future research.

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## **(De-)Politicising Technologies in Addressing Environmental Challenges in Rajasthan, India**

*Sam Wong*

Climate change creates a sense of urgency that requires immediate actions to respond. In light of this, technological innovations are considered offering quick-fix solutions to environmental changes. This paper draws on various environmental challenges, such as drought and land degradation, in Rajasthan, India as a case study. It examines how the process of implementing technologies to address the environmental challenges is so de-politicised that poor people ultimately bear disproportionately high costs in tackling changing climate.

With the assistance of my Indian research partners, I made visits to three villages in Rajasthan. We conducted semi-structured interviews with different stakeholders and examined the impact of various (sustainable) technologies on their livelihoods and the ecosystems. Our trip covered a wide range of water- and energy-related technologies, from indigenous methods, such as rain-water harvesting, to cutting-edged innovations, such as reverse osmosis plants (ie. turning grey-water to drinking water by breaking down the membranes of water molecules).

Three main arguments are made in this paper. Firstly, people's preferences for livelihoods can be incompatible with the technological design. Secondly, the unintended consequences of water and energy interventions bring uncertainty to policy-making which affects the long-term economic development and ecological sustainability. Thirdly, changing governance structures in challenging caste and gender inequalities requires strong leadership and favourable social conditions.

This paper calls for a critical examination of the complex linkages between human motivations, individual livelihoods, governance structures, power dynamics and physical environment in the process. It concludes by re-conceptualising the 'technology-development' nexus and offering insights into building a 'people-centred' sustainable technological intervention framework.

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## **Several important problems of sustainable production about coal resources**

*Xiangyang Xu and Dingfei Jie*

Coal is the main sources of energy in China, total coal production and consumption in China has accounted for more than two-thirds of the total national energy production and consumption. The energy structure of China determined that the solution to Chinese energy problem must give priority to coal. But long-term and overloaded exploitation of coal resource brings a lot of environmental problems. The escalating environmental crisis is generating widespread demands for a sustainable mineral industry. How to reduce the environmental problems brought by coal mining to a great extent and improve the ecological compensation mechanism in coal mining, is the key to realize sustainable production of coal resource. This paper absorbed lessons from existing research results at home and abroad. Combining with field survey data a series of environmental problems caused by mining, processing, storage, transportation and combustion of coal has been analyzed, through the method of literature review, including methane emission, air pollution, shortage of water resources, land depressions and so on. This paper also pointed out the urgency and necessity in ecological reconstruction work. On the basis of considering the intergenerational equity, it analyzed the methods and efforts in ecological reconstruction taken by the coal industry, and put forward countermeasures of coal industry ecological reconstruction in future. It also provided theoretical basis and policy suggestions to improve the ecological reconstruction work, including mining area land reclamation and restoring the ecological environment, and guarantee the sustainable production of coal. Thus ensured the coordination and development of social economy and environment protection, and eventually achieved the purpose of harmony between man and nature.

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## **Consumers' Trust in Alternative Food Provision Schemes: The case of Zhongguancun District in Beijing**

*Lei Zhang, Yunan Xu, Peter Oosterveer and Arthur P.J. Mol*

Recent years have seen accelerated urban-rural integration in China, which is featured with increasing intensity of rural-urban environment flows and uneven distribution of environmental pollution and damage ('environment bads') and the benefits from environmental protection ('environment goods') among different populations. This fact plays behind social instability, distrust between the urban and rural populations, and disharmony of society. Among these environment flows, agro-food flow is a typical one, in which environmental deterioration in the rural area and the food safety issues are intertwined. Thus, it is important to analyze and understand the social networks that have shaped the agro-food flow.

From the perspective of consumers, who are important participants in the networks along the agro-food flow, this paper analyses their trust in the food safety in emerging alternative agro-food provision schemes in contrast with traditional schemes, with an attempt to unveil the trust mechanism and the affecting factors in different schemes.

To this end, Beijing is chosen as a typical case to study these alternative agro-food provision schemes. Questionnaire survey was adopted to study the trust of consumers towards different schemes. The results show that one-in-one SFSCs is the most trusted scheme, which is followed by traditional mode, cooperative SFSCs, direct SFSCs and expanded SFSCs. The factors that affect the trust of consumers towards food safety is studied through Structural Equation Modeling (SEM). The results show that consumers trust in food safety is positively correlated with their trust in guaranty means in different schemes, so is consumer trust in food safety and the trust in information disclosure. It also shows that the consumers trust in guaranty means, information disclosing, links of the supply chain are positively correlated with their trust in the supervision.

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## **Implementing Sustainable Consumption in Civil Society of Urban China & Sustainable Procurement in Urban Administrations in China**

*Mingshun Zhang and Yichen Wang*

First, it will provide general information about the updated development of sustainable public procurement practices in China's public administrations and Sustainable Consumption in the target areas of the two SWITCH-Asia projects: Supp-China and SC- Urban China. Secondly, it will provide specific information through case studies on SC in Beijing and Tianjin. In total, the presentation will introduce four SC best practices in Beijing and Tianjin that have been created and are supported within the context of the SC-China project with focus on how retailers are working with communities for consumers SC awareness raising, Furthermore, the presentation will discuss how retailers are cooperating directly with production base/producers (SMEs producers) for increasing the supply of green products. In addition, the methods on how retailers are building their own monitoring capacities and how the retailers are cooperating with consumer associations is introduced. Third, the presentation will provide quantitative impacts of the two Switch Asia projects. For instance, in the SuppUrb project, life cycle costing analyses were employed to calculate energy savings, reduction of water use and the resulting monetary savings for public administrations. Finally, existing activities on SC policy framing. Presentation of consumer survey results among citizens of Beijing and Tianjin and projects results of public procurement trends in China.

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## **A study on the ecotourism of terrace field based on tourism industrialization**

*Wei Zhang*

Since the conception of ecotourism is proposed in the 1983, it has attracted an extensive attention all over the world. Nowadays, ecotourism developed so rapidly that it has become an emerging model of tourism industry. Based on a perfect combination of natural resource and human landscape, terrace field is an ideal place to develop ecotourism. However, today there are some serious problems occurred in developing ecotourism in terrace field in China. One of the main issues is that there are an increasing number of the young generations who tend to leave the terrace to work in the city. As a result, there will be a decrease number of people who are willing to cultivate in the terrace, and the landscape might be ruined in the future. Once the terrace falls into disuse, there will be no more tourist attraction. Therefore, it is important to search for a solution for this serious issue in order to keep the sustainable development of ecotourism in the terrace field. To solve the problem, it is very important to find out its cause. According to the investigation have been done so far, the reason could be summarized into the following aspects. First of all, local farmers of terrace could not get much benefit from the tourism as they could just receive a few amount of revenue from tourism. In addition, the cultivation of rice does not bring a remarkable profit to them. As a matter of fact, the main cause for this situation is the unawareness of the importance of the local people to keep tourism resource. To solve this problem, this paper argues that bringing benefits to the owner from the terrace could be an efficient way to conserve the tourism resource and also to boost sustainable development of tourism as a key driving force. Due to the reason above, an ecotourism industrialization of terrace field is proposed by the article in order to raise the local farmers' revenue. According to the characteristic of terrace, the main relative products are divided into 2 kinds: tourism products and agricultural products. As to the tourist products, there two main types of products which include landscape sightseeing and experiencing tourism; on the other hand, agricultural products includes rice and its byproducts. On this basis, ecotourism industrial pattern are aimed at setting up a connecting chain between those two kinds, which could raise the total revenue from branding and scale of production. In this article, we take Honghe Hani Rice Terrace as a study base to deeply explores the structure of ecotourism industrial pattern, which may serve as a model for other terrace field in the world.

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## **Bi-dimensional Matrix Model to extract best practices for sustainable urbanization**

*Xiaoling Zhang*

Urbanization is a dramatic change taking place globally, with over half of the world population living in cities. Large cities are the engines of economy which may bring about a high environmental impact. Many good sustainable practices have been carried out under different contexts determined by aspects such as social, economic, political, cultural development and geographical conditions, which makes it difficult to effectively share experiences obtained in these practices. It is therefore considered imperative to establish mechanisms for sharing these experiences to mirror and help transfer the good results already obtained to other cities. The aim of the bi-dimensional matrix model for sustainable urbanization is to analyse environmental, social and economic issues in quadrant terms at different stages from a new life cycle perspective of urban and rural environment. It proposes a roadmap towards sustainable urbanization, facilitating to generate effective mining and sharing of sustainable urbanization experiences that will support the decision making process in selecting strategies and solutions. This contribution aims to stimulate innovative methods that are able to cope with the challenging urbanization problems in an integrative manner adapted to the fluctuating urban demand patterns.

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## **Assessment on the Effectiveness of Co-benefits Approach in the Industrial Sector of China**

*Jiajia Zheng*

The unprecedented pace of modernization and urbanization in China has caused serious environmental problems. China has actually become the biggest greenhouse gases (GHG) emitter on earth, with its cities suffering bitterly from the worsening air quality, and yet this fastest growing economy in world is still in great need of resources and materials.

Studies show that the co-benefits of climate change mitigation and environmental protection can be achieved simultaneously and the approach of co-benefits could serve as a novel and effective solution to achieve urban sustainability. The fact has been proved that climate change policies could help reducing air pollution to a large extent. Furthermore, other benefits such as energy conservation, economy escalation and public health improvement, etc., could also be obtained through implementing the policies.

Being aware of the inherent correlation between GHG emission reduction and pollution reduction, it would help policy-makers to adopt more energy-efficient and cost-saving initiatives to achieve sustainable goals of urban development, especially for less-developed countries like China. The co-benefits approach, as a systematic strategy which integrates both climate change mitigation measures and environment improvement measures, calls for more attention on policy design and enforcement.

Thus it is of vital importance to build an assessment system to measure the effectiveness of co-benefits approach. The alteration of the relevant indicators reflects how well a co-benefits intervention (policy/plan/project) is designed and implemented.

The industrial sector accounts for the most significant proportion of energy use amount among all the economic sectors in China, thus contributes the most to GHG emission. In addition, the industrial sector produces the majority of environmental pollutants, such as SO<sub>2</sub>, PM, COD, heavy metals and wastes.

In this paper, national policies on energy conservation and environment improvement within the industrial sector are explored and good practices under the co-benefits approach are also assessed. A set of GHG and environmental indicators is established and applied in the case studies in which Shenyang and Shanghai are selected for analysis. Under the umbrella of national policies, the two cities have also issued their local regulations in the industrial sector. The data related to different indicators are analyzed and compared within the period when the policies are implemented. The study finds that the current policies have resulted in co-benefits in the industrial sector to various extents in two cities.

Gaps and barriers are also examined and corresponding recommendations are made to both national and local policy-makers. The awareness of co-benefits and the soundness of policy enforcement are critical to implement co-benefits approach effectively.

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## **The Triangle: Factory Farming in the U.S., China and Brazil**

*Wanqing Zhou*

The consumption-driven expansion of intensive animal farming is gaining global attention, due to its impacts on climate, environment, public health and farmers' livelihoods. However, current attention is far from adequate. Today, a "triangle of factory farming" has emerged, linking the world's three biggest players in the meat industry: the United States (U.S.), China and Brazil. This essay analyzes the dynamics shaping the triangle, compares the driving forces behind animal-farming intensification in these countries, and tries to provide sustainability solutions based on their challenges and interests, with a special focus on "delegitimization".

**Dynamic Triangle.** The U.S. is one of the world's largest producers and exporters of meat, with most of its livestock products coming from intensive animal farms, still under expansion. China, in order to meet its growing appetite for meat and other animal products, has become the world's largest importer of soybeans and top meat producer in recent years. The growth is linked to the country's deliberate adoption of industrialized farming practices, inspired by the U.S. model. China is also increasing the import of meat and live animals from countries including the U.S. and Brazil. Brazil is also adopting the U.S. model, as it becomes the world's largest meat exporter. Cattle ranching, soybean cultivation and industrialized animal farming are encroaching invaluable ecosystems such as the Amazon and the Cerrado.

**Driving Forces.** In the U.S., factory farming grew from the industrial revolution. Vertical integration became a predominant pattern in agricultural management. The expansion of large food corporations triggered a positive feed-back loop, making the capital-intensive factory farming increasingly favored against the labor-intensive small-scale farming. In China, the government implemented the Shopping Basket Program in late 1980s. One of the goals was to build large-scale animal farming bases to meet the growing demand in cities. Nowadays, China's meat industry is starting to see more vertical integration and larger facilities controlled by big corporations. In Brazil, as new global markets emerge, the government strongly supports the intensification of animal farming. Intensification has also been used to respond to the international call for forest conservation. Meanwhile, big corporations from the U.S. have also entered Brazil to make a profit through vertical integration.

**Sustainability Solutions.** To ameliorate the negative impacts of mis-regulated factory farming, several solutions are proposed: choosing production patterns that fit in local landscapes; introducing economic measures to green the industry; and "delegitimizing" the over-consumption of meat to calm/limit the demand growth. To "delegitimize" does not mean to vilify the meat industry, but to help the public realize the limitation of current consumption pattern, and summon a more sustainable one.

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## **Managing Process Innovation for Remanufacturing in a Closed-loop Supply Chain**

*Yu Zhou and Yu Xiong*

Remanufacturing is an opportunity to deliver all-round sustainability benefits. For the sake of both economic and environmental performances, firms may conduct process innovation to lower the remanufacturing cost. In this paper, we consider a supply chain in which the manufacturer has the opportunity to remanufacture used products and the supplier has the opportunity to lower the remanufacturing cost by conducting process innovation. The wholesale price of new components is decided by the dominant player in the supply chain, which may be either the supplier or the manufacturer. Our analysis characterises players' optimal decisions in an integrated supply chain and a decentralised supply chain with a dominant supplier or manufacturer. We find that a decentralised supply chain with a dominant supplier may overinvest in process innovation for remanufacturing, that is to say, the optimal innovation level of the dominant supplier may be higher than that of the integrated supply chain. We also numerically find that the supplier' profit in a decentralised supply chain with a dominant manufacturer may be greater than her profit in an identical decentralised supply chain dominated by herself.

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## **Individual Environmental Behavior: The Key of Building Low-Carbon Communities in China**

*Yun Zhu*

With the unprecedented speed of economic growth, especially the accelerating pace of urbanization, the living standards and lifestyle of Chinese residents have been improved tremendously. Although the CO<sub>2</sub> emission per capita in China is far lower than the world average, the number is growing at an astonishing rate year by year. People's social behavior, especially environmental behavior, has great impact on energy consumption and carbon emission. There are considerable studies on people's behavior in promoting low-carbon lifestyles and building low-carbon communities, mostly focusing on the individual recognition, i.e. values, habits, education, motivation, etc., but relatively fewer reports on the influences of external conditions, such as institution, infrastructure, encouragement, etc. This paper explores both categories of individual factors and social factors, with clarifying the correlation between them and their sub-factors. Low-carbon campus is a representative type of low-carbon community, and it's less difficult to build than other communities, for university students are well-educated thus to some extent more environmental aware and more willing to change their behaviors. Besides, they will become the backbone in all walks of life years later, so their environmental behaviors will lead the others and ultimately benefit the whole society. Energy-saving and environment-friendly policies implemented on campus are collected and overviewed. Additionally, the leaders and employees from the related administration departments are interviewed. The data of electricity amount and water usage are analyzed and a well-designed questionnaire is handed out. The survey, which is conducted both on-line and off-line, investigates the environmental knowledge, energy use habits, attitude towards low-carbon transformation, comments on the current institution and so on. Statistic analyzing results show the divergence in students' behavior caused by factors such as gender, grade, major, etc. Moreover, impediments and barriers are also explored and corresponding suggestions are made. Both individual's behaviors and social support play important roles in building low-carbon communities, and apart from raising people's awareness of energy-saving and emission-reducing, it also calls for the improvement of civil infrastructure, management system and green technology.

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## **Eco-city practices in China in the past five years: Learning from failure and the transformation of implementation mechanism**

*Tao Zou*

Many eco-city practices in China were conspicuous worldwide in the past years, and critical comments on sincerity and competence of local policies and actions have never come to a stop. After the death of the "zero carbon" Dongtan Eco-city and "model sustainable village" Huangbaiyu, Caofeidian International Eco-city is also on the blink. Although many other cases may still be running on the rail, major problems and critical challenges are not rare. Stimulating by land-based finance and political incentives, these new-town-type of eco-cities have experienced extraordinary short period of planning, design and infrastructure construction, and many costly demonstration projects without clear follow-up operational model have been built and running in straitened circumstances or even been put aside. Lessons from these past experiences have now been learned by many leaders either in political or market realm. Some local governments and developers have learned to transform their approaches to more realistic ones and tried to embed new business standards into conventional institutional structures. Implementation mechanism design is becoming a focal point in current situation. The question is now concentrated in two major aspects. The first is whether local government could withdraw from marketing their land, return to the position of balancing urban public policy and disclose their financial information so as to rebuild profound rationality in administration process. Another one is whether different business standards could established in a reasonable short period and logically embed into the institutional systems currently running. Other issues concerning leadership, stakeholders, technical supportive structure, indicators and guiding policies are also under broad discussions and springing up with significative milestones. Multiple cases from Beijing, Jiangsu, Anhui and Guangdong will be introduced to interpret these concepts. Along with the tendency of economic growth slowing down, after China has become Middle-Income Countries (MICs), urban development in China's major metropolitan areas has shown explicit interest in concepts related with sustainability. As a conclusion and outlook, major developed cities stepped into post-industrial stage will be playing a vanguard role in Chinese eco-city movement, which were led from top to bottom, but will finally be implemented from below.

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