ENVIRONMENTAL IMPACTS OF UK CONSUMPTION – EXPLORING LINKS TO WEALTH, INEQUALITY AND LIFESTYLE

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Introduction

While the concept of sustainability has the ability to encompass vastly different opinions on future development paths, it is generally accepted that the pre-condition for a sustainable society is one that lives within ecological limits. The operational concept of "Sustainable Consumption and Production" can be seen as the vehicle that can help deliver this goal.

In terms of carbon dioxide, a factor 4 reduction in emissions in the UK has been identified to achieve this goal. This adds to mounting evidence that a 60 to 75% reduction in carbon dioxide emissions is required to live within ecological limits. The UK government has championed the climate change agenda in the Sustainable Development Strategy (Government, 2005) and committed to a series of targets for reducing greenhouse gas emissions such as:

- The reduction of carbon emissions by 20% from 1990 levels by 2010. This exceeds the UK's international commitments of the Kyoto Protocol;
- The reduction of greenhouse gas emissions from by 60% from 1990 levels by 2050.

Interestingly, there is a serious contradiction between different government departments when forecasting the carbon emissions of the UK. Figure 1 identifies a number of projections of carbon dioxide emissions to 2025. Included within the projections are the government's CO_2 target, the Department of Trade and Industry projections and added to these is the projection by the Civil Aviation Authority.

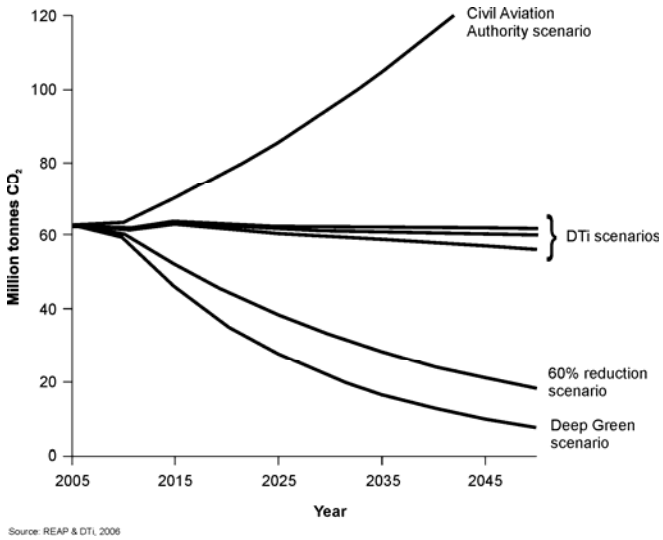

Figure 1. Carbon Dioxide Predictions

The "Civil Aviation Authority" scenario identifies the potential consequences of a free market aviation economy. All the DTI scenarios represent very small changes to the present situation. The "60% Reduction" Scenario represents the UK's target to reduce carbon dioxide emissions by 2050 by 60%. Finally, the "Deep Green" scenario represents a 90% reduction in emissions.

The scenarios highlight that small variations in current policy will bring about very little change in the UK Government's level of carbon dioxide emissions. It demonstrates that a radically different development path is required. It highlights that there are a number of very difficult decisions ahead of us that cannot be ignored, such as:

- Is it acceptable the allow people to fly as often as they like?
- Should we allow highly polluting cars in the UK?
- Are current building standards acceptable even though they are a long way off best practice?
- Are current levels of consumption acceptable if the goal is to achieve a global equity?

Methodology

The Stockholm Environment Institute has developed the Resources and Energy Analysis Programme (REAP) in an attempt to provide answers to some of these questions. REAP is a highly sophisticated model that helps policy makers to understand and measure the environmental pressures associated with human consumption. It can be used at local, regional and national level and generates indicators on:

- Carbon dioxide and greenhouse gas emissions measured in tonnes per capita;
- The Ecological Footprint required to sustain an area in global hectares per capita;
- The Material Flows of products and services through an area measured in thousands of tonnes;
- All other environmental indicators provided in the national sectoral environmental accounts (see ONS, 2005).

The indicators are derived from a consistent environmental-economic accounting framework. In particular, input-output models (Leontief, 1970; Miller and Blair, 1985) are used to establish to link the environmental impacts of intermediate use of goods and services in the (global) industrial supply-chain to the different categories of final demand. This allows not only assessment of the direct, but also the indirect environmental impacts of final consumption.

In the framework of national accounts the final consumption of products is illustrated in the final demand section of the input-output tables. In the UK, a 123 sector breakdown of final demand expenditure is available annually. More importantly, the expenditure of private households is disaggregated by functional headings using the COICOP classification (Classification of Individual Consumption According to Purpose) (ONS, 2005). This allows a detailed allocation of environmental impacts to a number of household consumption activities and provides information directly relevant to sustainable consumption policies.

Results

The results of the analysis show that domestic consumption patterns in the UK have triggered a total of 681 million tonnes of CO_2 in 2000. This figure resembles what has been referred to in the literature as a 'consumer responsibility account'. It excludes the 240 million tonnes of CO_2 associated with exports and includes 306 million tonnes occurring in the production processes elsewhere in the world, which feed the UK's domestic demands. This gives rise to a physical CO_2 trade balance with an import surplus of 66 million tonnes. 75% or 506 of the 681 million tonnes of CO_2 from consumption in the UK are directly or indirectly related to private households.

It strikingly highlights the importance of two key areas for climate change policies: housing and transport. While 30% of the household expenditures are directed towards these two functional spending categories, they trigger 60% or 320 of the 506 million tonnes of emissions associated with UK households. This is almost half of the total CO_2 emissions arising from domestic consumption activities in the UK. Each pound currently spent on transport triggers almost 2kg of CO_2. Similarly each pound spent on housing causes 1.7 kg of CO_2 emissions directly and across the supply chain. In contrast, 'Food and non-alcoholic drinks' as the consumption category has the third highest CO_2 intensity with (only) 0.7 kg per pound spent. To meet the comparatively ambitious reduction targets of the government, it will therefore be key to thoroughly rethink the way how transportation and housing can be provided in the future in a less carbon intensive way.

Socio-Economic Analysis

It is a well known fact that specific societal groups are more open to change in their behaviour than other groups. A study conducted by Hines and Amer (2000) looked at consumer patterns and peoples socio economic groupings. In their study they identified 5 different social groups and suggested that government policy on sustainable consumption might need to engage these different groups in different ways. For example, specific socio economic groups may not shift towards more sustainable consumption patterns unless forced to do so by product standards and price incentives whereas other groups may be more open to shifting their consumer choices. For the latter such information opens a window for individualised marketing to be developed where cost effective schemes can be generated that work on changing consumption habits.

REAP has much to offer for this type of policy formation as it can calculate the consumption patterns and associated environmental impacts of different socio-economic groups within the UK. CACI data provides a breakdown of consumer expenditure by COICOP classification for 55 different socio economic groups as defined by the ACORN classification system (A Classification Of Residential Neighbourhoods)[1]. This data allows the further disaggregation of the final household consumption vector in the input-output tables and can hence be used to generate a highly detailed consumption profile, material flow analysis and Ecological Footprint for each different socio economic group covering the entire spectrum of household expenditure consistent with Government statistics. To our knowledge the results provide the most detailed assessment in the UK of environmental impacts of socio-economic groups.

Results show that the variation in the overall Ecological Footprint of ACORN types is substantial. The greatest extreme is an Ecological Footprint of 6.61 gha/cap for ACORN Type 21 ("Prosperous Enclaves, Highly Qualified Executives") compared with 4.09 gha/cap for ACORN Type 50 ("Council Areas, High Unemployment, Lone Parents"). The results of our study also support the findings by Lenzen and Murray (2001) who established a strong positive relationship between per capita expenditure and the Footprint[2].

Using a panel-type regression approach we are able to control for many influencing socio-economic factors on CO_2 emissions. The model results reinforce earlier findings that income levels have a strong positive impact on households' CO_2 emissions. However, there are other important socio-economic factors. Very intuitively, the larger the house a household lives in (keeping all other factors constant), the higher the emission levels.

It is well documented that living together saves resources and therefore reduces emissions. This is asserted by our results from the REAP model. However, the regression analysis shows that *at the margin* (controlling for all other influences), "sharing" increases CO_2 emissions of households. Hence, shared ownership (and open access – even though for a limited number of people) leads to a

[1] See http://www.caci.co.uk/acorn/whatis.asp for more details on the ACORN classification system

[2] In fact, both a linear and a quadratic specification of the regression model show a good fit. In the latter case, there would be evidence for an inversed U-shaped relationship between per capita expenditure and the Footprint. This could be seen as evidence for an intra-societal environmental Kuznets Curve. However, the estimated turning would be far out the sample size.

less careful use of resources. This reconciles two competing arguments about "sharing", which have been provided in the product service and the common property resource literature. Sharing is environmentally beneficial even though the positive effects seem to be reduced through a less careful use of resources caused by the shared ownership.

Similarly interesting are the findings for education. Controlling for all other variables, a better education reduces CO_2 emissions. Hence, controlling for all other influences a better-educated household makes greener choices. However, the overall emissions of these households are still higher due to their higher income (and expenditure) levels. Even though green consumerism is a crucial element of a sustainable consumption and production agenda, policy makers might be ill-advised to rely too heavily on informed choices to bring about the required reductions in CO_2 emissions. Instead, there is the urgent need to edit consumer's choices and this will require society to make tough choices.

Hence, the summary of some previous analysis done at SEI shows that quantitative methods can provide important policy support for decision-makers to help understanding the differences in the environmental impact of consumption patterns across socio-economic groups. This is key for targeted policy actions. However, a sound understanding can often only be obtained, if one controls for the complex interplay of socio-economic driving forces behind these patterns.

Search for a Sustainable Carbon Community (SCC)

Our analysis demonstrates that 50% of the reduction can come from individuals changing their lifestyles. The other half will have to come from changes in government procurement and improvements in the eco-efficiency of products and services. Therefore, if we assume that our products and services can be delivered in a way that for every pound spent they only have half the impact, and the footprint for government procurement can be halved, what does a sustainable lifestyle look like?

REAP has be used to assist policy formation and decision making by exploring the impacts of different communities living in different types of housing. As highlighted, housing plays a significant role in driving resource consumption both directly, through construction and operational requirements, transportation (due to its location) and indirectly, by influencing lifestyle choices such as use of residential heating or public transportation. Hence the potential of reducing environmental impacts from the construction process lies not only in the ability to source locally and use non energy intensive materials but also in the potential day to day reductions that can be achieved through living in such homes. An example being that if the homes are well insulated the tenants can use less energy to heat their homes, or if there are solar panels built into the design this will reduce the environmental impact of the individual living in the home. Across Europe, there are an increasing number of innovative housing developments demonstrating how careful design can help reduce the resident's carbon dioxide emissions.

In this case study we present the results from the Thames Gateway project[3]. The Thames Gateway area was highlighted by the UK government as being one of four growth areas within its Sustainable Communities Plan and the project looked at the implications of building these 200,000 new homes to different environmental standards. Included is a comparison between homes built to 2002 Building Regulations, a home achieving a BRE EcoHomes 'excellent' rating and a home at the pioneering multi-award winning BedZED eco-village[4] development. A typical UK home is also assessed to give an indication of the performance of the vast majority of existing stock. Additionally, a choice of different lifestyles of BedZED residents was explored to include the impact of consumer behaviour alongside the technical differences between house types.

[3] Report available from www.regionalsustainability.org

[4] The Beddington Zero (fossil) Energy Development (BedZED) is a mixed-used housing scheme in South London designed to enable people to live sustainably. It was initiated by BDG and Bill Dunster Architects and was completed in 2002.

Scenario Number	Acronym	Description of Home Type	Description of Consumption Patterns / Lifestyles
1	**'Typical UK'**	based on BRE[5] data for 100 home development	UK average consumption patterns
2	**'New 2002'**	built to 2002 Building Regulations	UK average consumption with slightly reduced energy and water consumption
3	**'EcoHomes Exc.'**	BRE EcoHomes with 'excellent' rating	reduced consumption mainly due to technical efficiency improvements
4	**'BedZED'**	BedZED eco-village development	clearly reduced consumption due to specific BedZED conditions
5	**'Keen BedZED'**	BedZED eco-village development	intensely reduced consumption due to specific BedZED conditions and an ambitious environmental friendly lifestyle of residents

The graph below identifies the carbon dioxide emissions of different scenarios.

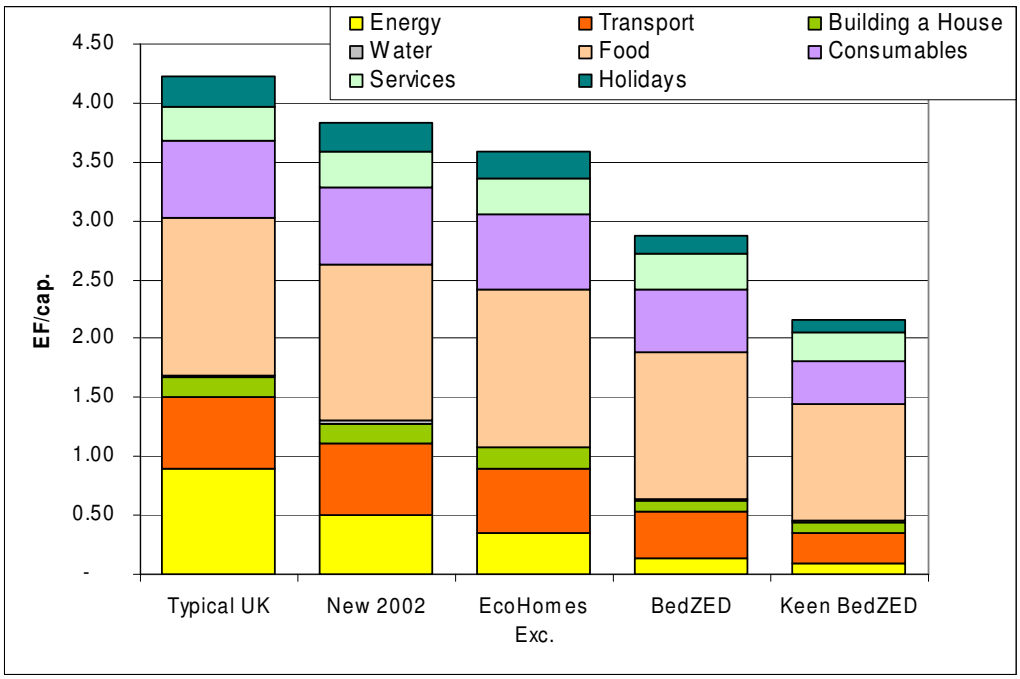

Figure 2. Sustainable Carbon Communities

The "New 2002" highlights the reduction in carbon dioxide achieved by the average household living in a new house. The only component that has reduced is the direct energy use, approximately a 30% improvement. This reflects the improvements in energy efficiency over the past 50 years.

The "Eco-Homes Exc." is an example of a household living in a house that has scored Excellent in the BRE accreditation scheme. Interestingly, the BedZED (Beddington Zero Energy Development) example was also graded as "Eco-Home Excellent" demonstrating the variation in ecological performance that can be achieved under the scheme.

BedZED had been divided into two examples. BedZED, located south of London, represents the first large-scale 'carbon neutral' community in Europe. One hundred houses were built on an old industrial site. Keen BedZED represents a household living in a BedZED home with a specific environmental agenda. The main features of the development were:

- Building materials selected from natural, renewable or recycled sources and brought from within a 35-mile radius of the site, where possible;

[5] Building Research Establishment Ltd

- A combined heat and power unit able to produce all the development's heat and electricity from tree waste (which would otherwise go to landfill);
- Energy-efficient design - south-facing houses to make the most of the heat from the sun, excellent insulation and triple-glazed windows;
- A water strategy that reduces mains consumption by a third - using water saving appliances, and making the most of rain and recycled water;
- A green transport plan, supported by a car pool, which aims to reduce reliance on the car by cutting the need for travel;
- Kitchens fitted with the latest energy saving appliances;
- Recycling bins in every home.

Homes in BedZED use construction resources 1.5 times more efficiently than the average British home, resulting in a construction Footprint one-third the size of a typical home[6]. The planning and layout of these developments encourage lifestyle choices that result in additional Footprint savings. BedZED homes achieve an 84% reduction in the energy Footprint. The development's transport plan reduces residents' travel Footprint by 36%. Recycling measures reduce waste between 17 – 42%. Choices in food sourcing reduce the food Footprint by 8 to 40% and other lifestyle changes reduce the community's Footprint of consumable items by up to 20%.

Conclusions

SEI has not yet found a community in the UK that has achieved a sustainable carbon footprint. The challenge is immense and the present policy responses to the issue do not seem to understand this fact. BedZed provides a strong example of what can be achieved through smart design. At the same time, it does not bring about all the changes that are required in the resident's lifestyle to achieve a sustainable carbon community. A full of range of policy levers will be required that acknowledge the complexity of changes individual behavioural patterns, combined with policies that can drive forward resource productivity at a considerably faster pace than current policy.

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