Title: Reducing Energy Dependence at Urban Scale as an Aspect of Degrowth

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Special Session: Technology and Degrowth Part 2: Practical Cases

If considering growth and degrowth within the context of the built environment, it can be noted that, for example in Germany, there has been a considerable rise in land use per person over recent decades (e.g. in Germany from 14 m² per person in 1950[1] to 45,1 m² in 2010 [2]. This is one of the reasons why household energy use has also grown. In turn this leads to rising energy bills, hence strain on financial resources, leading in some cases to fuel poverty. There is thus the imperative to reduce the consumption of all of these resources: Land, energy and money. This paper focuses on the latter two.
While degrowth is urgent in the area of building energy and its related economic impacts, it does however have an image problem, being associated with a reduction in comfort and convenience. Key questions are: Can low-impact living be achieved that leads to genuine and longterm reductions in energy consumption? Can this be made socially acceptable or even attractive? Can appropriate technologies in the construction sector provide solutions that minimize impacts by default, without relying on residents making the "right" decisions (as developed by Sunstein and Reisch (2013)[3].

Over the last 10 years a wealth of examples of large scale urban sustainable energy projects across Europe have emerged. The authors have analysed over 50 such projects.
These projects generally aimed to reduce the energy demand of new buildings by 30% against national standard, while existing buildings had to be brought to the same level as standard new buildings.

The sites considered typically tackled the energy demand on the one hand by using appropriate construction technologies to achieve an energy efficient building fabric, such as high levels of insulation, triple glazing or coated double glazing and air-tight construction techniques. There was a notable focus on applying such techniques also to existing building stock. At the same time the projects aimed for a more sustainable energy supply by using a mix of several on-site renewable energies technologies to suit the potentials of the locations, ranging from large PV-arrays via biomass district heating and CHP to reclaiming heat from mine water. They demonstrate that the optimisation of whole neighbourhoods can have advantages over optimising each building individually, due to the option for networks and balancing loads. Monitoring results are however ambiguous. Generally, it could be proven that the savings targets are achievable and hence realistic for construction projects throughout Europe in a variety of socio-economic contexts and climatic zones. However, there were also cases where the anticipated energy and cost savings did not materialise. While there could be technical reasons for underperformance it was obvious, that in some cases rebound effects (people preferring higher temperatures to lower energy bills – compare Ray & Sunikka-Blank, 2013[4]) or prebound effects (an overestimation of the baseline by ignoring already frugal energy behaviour of occupants) were to blame. The authors consider rebound effects to be a general issue standing in the way of degrowth of energy in the building sector. In turn this suggests that an efficiency-focussed approach is insufficient for achieving degrowth. Efficiency measures in the built environment therefore always have to be accompanied by measures that encourage a sufficiency approach amongst residents. In fact, it could be observed that building efficiency programmes usually were concurrent with energy awareness campaigns. Competition schemes amongst

1 Statistisches Bundesamt, Pressemitteilung vom 25. Mai 2000 – in: Stefan Krappweis (Hrsg.) (2003), Entfernungspauschale und Raumordnung Die Gestaltung von Mobilitätskosten und ihre Wirkung auf die Siedlungsstruktur, Institut für Stadt- und Regionalplanung Technische Universität Berlin, p.8Destatis: Bewohnte Wohnungen nach Wohnfläche 2010

2 https://www.destatis.de/DE/ZahlenFakten/GesellschaftStaat/EinkommenKonsumLebensbedingungen/Wohnen/Tabellen/BewohnteWohneinheiten.html accessed March 2014

3 Cass R. Sunstein and Lucia A. Reisch (2013): Green by Default, KYKLOS, Vol. 66 – August 2013 – No. 3, 398–402

4 Minna Sunikka-Blank & Ray Galvin (2012): Introducing the prebound effect: the gap between performance and actual energy consumption, BUILDING RESEARCH & INFORMATION (2012) 40(3), 260–273

neighbours appeared to work particularly well (e.g. in Växjö [5]). Whenever occupants have successfully been tied into such sustainable energy projects, dependence on fossil fuels and national energy infrastructure could be genuinely reduced, making such neighbourhoods more resilient against rising energy prices and potential supply shortages and playing a role in "degrowing" economic activities related to energy.

The projects considered also contained a considerable number of ambitious buildings such as passive houses and energy-plus buildings, which generate more renewable energy than they consume. Substantial reduction of dependence of energy in buildings on fossil fuels could thus be achieved. Ultimately, they were however constraint by as of yet unsatisfactory energy storage technologies, which are needed to overcome day/ night and summer/ winter imbalances.
Overall, the projects provided ample learning ground and critical mass to convince many stakeholders, that lower impact living is possible. Across the board, however, they have not aimed high enough to achieve substantial degrowth. On the one hand the need to achieve best possible demand side reduction has to be emphasized, so that the energy to be supplied by renewables or from storage is minimised. On the other hand, having in principle the technologies and strategies ready for minimizing the energy demand in the use phase of the buildings, shifts attention to the need to minimize it also in production – e.g. also for production of energy efficiency measures (insulation, efficient boilers…).

Overall, a stepping up of efforts in construction is required. A blue-print for a suitably ambitious approach has been provided by the BedZED –project in South-London. Its point of departure is that if everyone in the world consumed as many natural resources as the average person in western Europe, we'd need three planets to support us, while BedZED is designed to reduce the share of those elements that can be influenced by housing are reduced to the so-called "one-planet-living"-standard[6]. The 100 unit dense urban development built in 2003 considered embedded energy of construction materials as well as energy in use. It was built to passive house standard. The concept extends to technologies for generating electricity for plug-in appliances and electric cars include PV and a biomass CHP. Reedbeds are included for decentralised waste water treatment, rainwater harvesting, small allotments and private gardens for food production, prominent energy meters and easy to use waste segregation facilities in kitchens. The overall aim was to provide for the "eco-slob" – a person who wants to live a low-impact lifestyle theoretically, but finds the practicalities arduous. Though not all elements work in reality (the CHP currently runs on gas), the concept demonstrates how by providing buildings and services that automatically lead to a much reduced ecological footprint, low-impact living becomes the "default."

In summary, the growing number of large scale urban projects striving towards decentralised, local energy solutions certainly help the acceptability of lower-impact living. Substantial reductions in not just energy consumption but overall environmental impact are possible. Careful planning and design can go a long way in not just furthering acceptability, but also supporting behavioural defaults to some degree. Nevertheless, the authors point out that, generally speaking, efficiency solutions will have to go together will awareness campaigns to promote sufficiency principles in order to live up to their full potential.

Keywords:
energy technologies, renewable energy, energy efficiency, sufficiency, neighbourhoods, rebound

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Pamphlet: CGI-group (2013), VEAB Energy Management
(http://www.cgi-group.co.uk/sites/default/files/files_uk/casestudies/Case_Study_-_VEAB_-_Energy_Management.pdf)

6 http://www.bioregional.com/oneplanetliving/what-is-one-planet-living/