Low-carbon technology for the rising middle class

Policy brief

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Abstract

This policy brief will discuss the role of local and international technology and innovation policies for low-carbon development of the rising middle class in developing countries. Although a large segment of the population of most developing countries remains severely deprived, most developing countries also have a significant and growing part of the population that could be a feasible target for low-carbon policies.

In addition to how industrialised countries decide to reduce their emissions, a major determinant of the carbon intensity of the world economy and our collective ability to stay below 2°C global mean temperature rise, is how the rising middle class in developing countries will develop – along a low-carbon or a higher-carbon pathway. If this rising middle class could embark on a lower-carbon consumption pathway, for instance in their electricity use, their transportation demand and modes, their eating habits and other consumption patterns, this could structurally avoid a considerable amount of greenhouse gas emissions and yield other social, environmental and health benefits.

As strong carbon policies incentivising such pathways are unlikely to happen soon in developing countries, technology policies can provide a solution, given they can be aimed at consumption patterns of the rising middle class specifically. This paper makes several case-based recommendations that can put those in developing countries that benefit from a more sustainable lifestyle on a low-carbon development path.

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Introduction

This policy brief will discuss low-carbon options for the rising middle class in developing countries as well as the role of local, national and international technology and innovation policies that can contribute to the implementation of such alternative pathways. The usual rhetoric around low-carbon development revolves around national averages of both incomes and emissions, resulting in policies and measures for most developing countries as if the whole population were living in abject poverty. However, although a large segment of the population of most developing countries remains severely deprived, most developing countries also have a significant and growing part of the population that is more affluent.

The consumption patterns that are emerging in this part of the global population are starting to resemble those of the middle class in industrialised countries. For many in this rising middle class, now is the time when the decision is made and the conditions are created to pursue sustainable, low-carbon lifestyles, or the high-carbon lifestyles that many developed countries are socially, behaviourally and technologically locked into. Urgent questions include what innovations – social, institutional and technological – could lead to a different, environmentally and socially more desirable outcome. The focus of this paper is on those currently in the process of reaching higher incomes, but the findings could also apply to those already in high-consumption and high-carbon lifestyles.

Two case studies, on energy-efficient lighting and on Bus Rapid Transit (BRT), are taken as a basis to explore possible interventions by local and international policymakers that can lead to innovations for low-carbon lifestyles. This brief focuses on the urban middle class as that is where consumption growth is greatest as well as the potential for reducing baseline emissions.

The rising middle class

The number of people in the global middle class is projected to increase greatly in the years until 2030. If it is defined as daily expenditures from USD2005 10 – 100 based on purchasing power parity, as part of the global population the middle class will grow from ca. 1.5 billion people in 2009 to almost 5 billion in 2030. The share of the global middle class outside of Europe and North America would increase from around 45% in 2009 to almost 80% in 2030. In terms of middle class consumption, the developing-world share will increase from a little over 50% to around 70%. It is clear that the rising middle class, both in numbers of people and in consumption, lives in non-Annex I countries. As consumption is a major driver of CO_2 emissions, how the rising middle class in developing countries will develop – along a low-carbon or a higher-carbon pathway – is a major determinant of the carbon intensity of the world economy and our collective ability to stay below 2°C global mean temperature rise over this century.

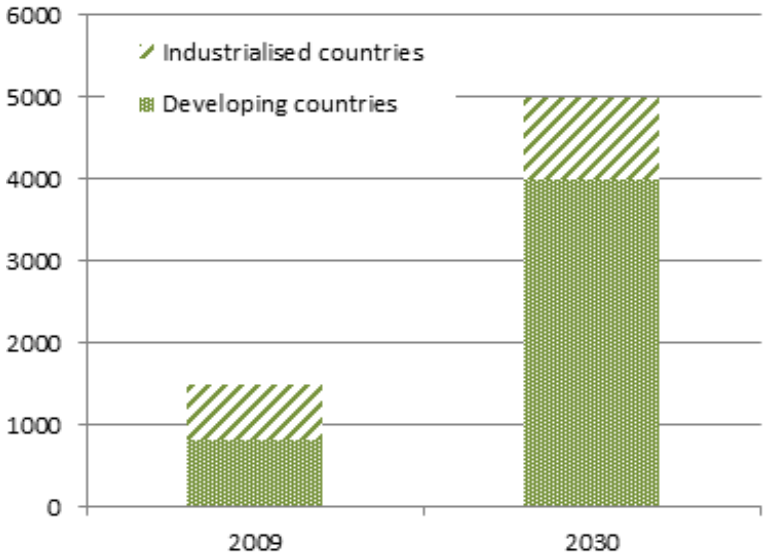

Figure 1: Millions of people in the global middle class split by an approximation of industrialised (North America and Europe) and developing (rest of world) countries. Source: Kharas, 2010.

Chakravarty et al. (2009) plot 2030 data on "individual emissions" of CO_2, based on income distributions and CO_2 intensities in countries. Although middle class is usually defined over income, their data seem to reveal an emissions-based lower middle class: those emitting between 2 and 9.6 tCO_2 per person in 2030 (the maximum allowable cap for CO_2-only per person concluded in this study). Whether a person is in this emission-based middle class depends partially on his income, but also on the carbon intensity of the country where he lives. Such a CO_2-based estimate would mean the lower middle class would amount to some 3 billion people in 2030. About 1.2 billion people, the rich and the higher middle class, emit more than 9.6 tCO_2 per person and would be the first candidates for deep emission reductions (Chakravarty et al., 2009), but low-carbon policies could also be pursued with the next 4 billion significant emitters. Some 3.7 billion people still emit less than 2 tCO_2 per person.

Bottom-up inquiries about energy and CO_2 emissions data per individual or household reveal great differences based on availability of access to public or non-motorised transport modes, climate and geography, surface area, household size and consumption characteristics. Studies differ in whether indirect emissions (emissions for instance resulting from the manufacture of goods consumed or the refining of fuel used) but as a rule of thumb, the total emissions can be around twice the direct emissions. Direct emissions consist mainly of transportation, space heating and cooling, appliances, hot water and lighting.

Low-carbon options for the rising urban middle class

Based on consumption patterns and emission profiles, what are low-carbon options? What could a low-carbon lifestyle look like? Table 1 provides a comparison of the "business as usual" development as we see it currently developing in growing cities all

over the developing world; and as we have already seen it developing in many cities in developed countries, with the United States representing of the most high-carbon lifestyle.

Table 1: Elements of business as usual and lower-carbon (urban) lifestyles of the rising middle class

Consumption sector	*Business as usual*	*Lower-carbon variant*
Urban planning	Sprawling suburbs with mainly road connections for access to shops and recreation	Neighbourhoods planned to accommodate sustainable transport means and shops and recreation within walking distance
Transportation	Private car, several per household	Partial modal shift to foot, bicycle and mass public transit
Electric household appliances	Normal-efficiency fridges, washing and drying equipment	High-efficiency fridges, washing and drying equipment
Lighting	Use of incandescent light bulbs	Use of high-efficiency LED or CFL lighting
Cooling	Conventional air-conditioners	Energy-efficient housing design or adaptations, efficient air-conditioners
Heating	Water and space heating using oil, gas or electricity	Energy-efficient and passive-energy housing design or adaptations, solar boilers
Food patterns	Daily meat consumption, carb-rich diet	Reduced meat consumption, e.g. to two times per week, fresh food
Consumption goods	One-way use of materials, limited re-use and recycling, poorly organised waste collection and conversion	Move towards circular economy, extensive re-use, recycling and waste reduction, waste-to-energy

The lower-carbon options listed in Table 1 are all at different levels in terms of mitigation potential, stakeholders involved, costs and institutional complexity of implementation. Some would rely more on individual choice while others on centralised planning processes, although all can be enabled by good policy. Food patterns, for instance, can rely on individual choices but the unsustainability of the food system is as much blamed on systemic characteristics and wide-spread agricultural practices as on consumption behaviour. Having said that, the table attempts to show that many lower-carbon options can be implemented at low costs and moderate reduction of comfort levels if organised well, some of which can also lead to reduction of wealth-related health problems.

While discussing the reduced spending on energy, transportation, meat, etc., the so-called “rebound effect” needs to be taken into account (Sorrell, 2009): that emissions due to spending of the saved money on carbon-intensive activities can be considerable. No rule-of-thumb number for the rebound effect can be established, as the results depend on a range of factors. Studies that have averaged over a large number of data sources put the rebound effect at around 30% of the total emissions reduced.

Two case studies (Byrne, 2013; Coninck, 2013) illustrate the specifics of two of the options in Table 1. They discussed the specific considerations around CFLs in two African countries and BRT in various cities around the world. Both options are

surrounded not so much by technological and economic issues, but in particular by issues around the political economy and capabilities of their contexts.

The CFL cases in Kenya and Ghana reveal that the programmes for CFL replacement were generally successful but raised a dilemma of on the one hand instituting performance standards to allow only high-quality CFLs on the market, and on the other allowing local producers to benefit from the programme. In the case of BRT, the political economy around the informal public transport that the BRT replaces is important: re-employment programmes for former public transport drivers is key. In addition, good planning of BRT routes and integration in the general transport system is essential.

In both cases, capacity development plays an important role in the eventual success of a measure. For African CFL manufacturers to meet the quality standards, rapid capacity development can help. In the case of BRT, the former informal public transport drivers need to be re-trained, and capacity for planning BRT routing needs to be developed or purchased from international companies.

A conclusion from the case studies, which can be generalised to other options in Table 1, is that often-suggested economic policies, such as a carbon tax or a subsidy, cannot be expected to suffice for incentivising a change in the carbon development pathways for the rising middle class in developing countries. Instruments that take into account behaviour, capabilities and the political economy are needed. The next section will suggest a number of those.

Innovation policy interventions

In many developing countries, strong climate policy instruments such as emissions trading or feed-in tariffs are can be difficult to implement. This has a variety of reasons: from immature or distorted markets and lack of institutional and technical capacity to implement complex policies to politically hard to remove energy subsidies, which render subsidising renewable energy unaffordable and energy efficiency policies unattractive. Policy interventions in the field of technology and innovation that enable lower-carbon pathways for a growing middle class with fast-rising, unsustainable and unhealthy consumption patterns. Various literature sources (Ockwell and Mallett, 2012; Blanco et al., 2012; Byrne et al., 2012; Aubert, 2005) provide insight into policy interventions for low-carbon technology, including aimed at the rising middle class in developing countries.

International interventions

- Spread insights on both the relevance of low-carbon technology and innovation policies (including capabilities); it needs to be part of the global mind-set as much as putting a price on carbon. Take into account political-economy aspects in policy considerations. For example, the positive opportunities associated with such policies can be placed in the context of green growth – new jobs, alongside health and environmental benefits.
- Agree in the UNFCCC, for instance in the Technology Executive Committee (TEC) on internationally on environmental policies and regulations, and in

Multilateral Development Banks and/or the Green Climate Fund on provisions for financing and assistance to countries with weaker capabilities to implement or fund these. International donors and funders could also help facilitate regional and global learning from other contexts.

- The Climate Technology Centre could identify needs for capability development as well as the programmes to provide it in countries. The CTC&N could also investigate long-term benefits of hit-and run programmes like CFL in Kenya and Ghana.
- International collaborative R&D programmes between developed-country research institutions and those in developing countries can be functional in building innovation capabilities in developing countries. International research funding programmes are necessary for this. They should be set up in such a way that they build capabilities and develop low-carbon technologies and lifestyles in those areas where specific developing countries have a good starting position. Developing country researchers should be enabled to be part of international networks.
- International business could form coalitions around low-carbon options, such as BRT systems, in order to make decision-makers aware of the possibilities, and create more business.

National and local interventions

- Integrate technology policies specifically for low-carbon development in the rising middle class in national and urban plans on climate change, spatial planning and welfare. For instance, develop urban planning policies that enable sustainable lifestyles and Include policies on efficient technical appliances but also on behavioural matters such as transportation and food.
- Develop national innovation plans, and aim innovation ambitions to be aligned with strong capabilities in the country or area. Also, identify where capabilities can be usefully built up.
- Develop innovation systems for technologies that can reduce emissions relative to a baseline – such as CFLs, LEDs, energy-efficient “wet” and electronic appliances, air conditioning and the like. Integrate micro-, meso- and macro-level support of the innovation systems.
- Along with building support for low-carbon technologies and innovations (as mentioned in the international interventions), work with local stakeholders (or stakeholder groups) to identify where the positive development opportunities might lie in exploiting low-carbon innovations. This could, in turn, feed into national level needs assessments (such as, but not limited to, TNAs) and requests directed to the CTC and/or other low carbon technology centres (such as Climate Innovation Centres).

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