

# Building a Low Carbon Economy

## TRANSFORMATIONAL CHALLENGES

### Why a Transformation Towards a Low Carbon Economy?

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The international political consensus is that a global temperature rise by more than 2°C would overtax the ability of many societies to adapt. If global warming is to be successfully limited to a temperature increase of 2°C, no more than 750 Gt of CO<sub>2</sub> from fossil sources should be released into the atmosphere by the middle of this century. If emissions are set at this level, the probability of reaching 2°C would be 66%. If emissions were to be frozen at current levels (WBGU 2009), this global greenhouse gas budget would be exhausted within 25 years. Thus, the global low carbon transformation within the 2°C corridor must be implemented quickly.

In addition, transforming the current high carbon global economy into a low carbon one is challenging, given that the global population is still growing and, fortunately, becoming richer. Development paths, which are compatible with the 2°C limit, require a profound transformation of the global energy system. Currently, global energy production is still based 85% on fossil fuels and only 15% on non-fossil carriers. By 2050–60, this correlation should be reversed; that is, 85% of energy production should be non-fossil fuel based and 15% should be based on fossil fuels. On the demand side, energy efficiency must be improved significantly in many sectors and at a much faster path than during previous decades. Within this global context, very little scope exists for fossil-driven growth in developing countries.

Building a low carbon economy goes beyond incremental innovations. It requires profound structural changes in the economy, technological shifts, new sets of policies, reorientations in the research and education sectors, and low carbon-oriented investment priorities. Against this background, the German Advisory Council on Global Change (WBGU) talks about “a great transformation” towards a low carbon economy. The good news is that many of the technologies needed to trigger this low carbon shift are already available, the necessary policies are already known, and the required financial investments are manageable. However, no automatism exists towards a low carbon transformation. Multiple path dependencies, collective action problems, lack of innovative capacities, and lack of vision and leadership on the part of the economic and political elites might impede this low carbon transformation.

### What Needs to be Transformed?

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The low carbon transformation concerns three key areas: firstly, the energy sector, including the transportation system, which all economies depend on; secondly, urban areas, which are currently responsible for three-quarters of the

Dirk Messner

Director, German Development Institute

Vice-Chair, German Advisory Council on Global Change

June 2011



global energy demand, and whose population will double to 6 billion by 2050; and, thirdly, land-use systems (agriculture and forestry, including deforestation), which are currently responsible for almost a quarter of global greenhouse gas emissions. In these three areas, the world and most national economies are still far from setting a clear course towards low carbon development. The challenge is to transform these three basic areas of the global economy in a very fundamental way and within a very tight timeframe.

These three sectors are relevant for any developing economy that is moving towards a low carbon path. But beyond this point of departure, low carbon strategies in developing countries must be country specific, depending on the structure of the economy, major sources of greenhouse gas emissions, private sector capacities, and governance capabilities of public actors. Objectives should be to: significantly reduce and avoid greenhouse gas emissions; avoid high carbon path dependencies; exploit leapfrogging opportunities; foster inclusive growth and employment based on low carbon investments; and realize co-benefits, such as improving energy security, improving health by reducing emissions, and reducing energy poverty in rural and urban areas based on innovative renewable energy solutions. Two and a half billion people still lack access to essential modern and low carbon energy services. The challenge lies in giving these people access to these energy services as soon as possible, while at the same time significantly reducing greenhouse gas emissions from the use of fossil energy carriers. This can only succeed if investments in low carbon energy carriers grow substantially in rural and urban areas, and if energy efficiency is drastically increased.

In many economies, low carbon islands and low carbon pilots already exist. Major criteria for such transformational strategies are:

- scaling up from pilots to systems;
- accelerating low carbon activities;
- setting the course, developing roadmaps and defining milestones (2015–2020–2030);
- sector to system reforms (cities, mobility, energy, land use/forestry/agricultural nexus);
- reducing high carbon incentives and developing low carbon incentive structures; and
- motivating people and having veto players in mind.

## The Transformation Process

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Historical analyses show that a concurrence of multiple changes in economies and societies can trigger historic waves and transformations, such as: changes in the price system (a carbon tax, emissions trading and reducing subsidies for high carbon investments); significant low carbon oriented R&D investments; new developmental thinking; emerging green sectors becoming economically and politically powerful; the next generation of decision makers avoiding path dependencies; and successful green pioneers in the global economy gaining relevance in development discourses. The low carbon transformation process is not a short-term “event” but rather a long term-process (like other significant transformation processes in the past, such as the industrial revolution). A significant change in direction should be carried out at the national and international levels during the next decade in order to reduce global greenhouse gas emissions to a minimum by 2050, and, thereby, to maintain the possibility of avoiding dangerous climate change.

The social dynamics for changes must be created through a combination of measures on different levels, including the following:

- The transformation process needs to be knowledge based: Which sectors are the most relevant? Where are the “low hanging fruits”/strategies? Costs need to be calculated and targets defined.
- Dialogues and public participation are critical for overcoming path dependencies and creating legitimacy for change.
- Change agents in the private and public sectors are important in order to develop low carbon concepts and business models and to demonstrate the viability of reforms.

- Concrete low carbon solutions need to be developed (technologies, policy packages, and institutional and sector reforms).
- International partners might help finance low carbon investments, create new capacities and demonstrate that low carbon strategies work.

## Low Carbon Investments, Costs and Priorities

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The financial challenges faced by such a transformation are significant, but controllable, and are described below.

- Globally, the additional investment required for such a low carbon transformation (compared with business as usual paths) is in the range of US\$200 to US\$1000 billion per year by 2030. All models show that these investments will be offset by later savings of a similar size and will avoid the costs of dangerous climate change. The major challenge, therefore, is that a significant volume of upfront investments is needed.
- To put these investments into perspective, annual consumption subsidies for fossil-based energies are estimated to be in the range of US\$300 to over US\$500 billion worldwide.
- A comparison of different integrated assessment models shows that a global low carbon transformation strategy might reduce global growth by 0.12% annually between 2010 and 2050.
- The low carbon investments mentioned will be directed towards the following areas: 20% for low carbon energy; 50% in transport systems, new mobility concepts and buildings (energy efficiency); 15% in low carbon oriented R&D; and 15% in industrial sectors and agriculture/forestry. US\$7 to US\$38 billion in investments would be required annually (2011–2030) to finance universal access to modern energy services for 2.5 billion people.
- A look at the different transformative scenarios suggests that the global primary energy demand should not rise to more than 400–500 EJ per year by 2050 (in 2010, it was approximately 350 EJ). This is in

order to reduce transformation costs and to have a real chance at creating a low carbon energy system compatible with the 2°C target over the next four decades. Within the business as usual scenarios, the primary energy demand could more than double during the same period.

In undertaking this transformation, each country needs to develop a national low carbon investment strategy, calculate incremental costs and savings, and develop upfront investment mechanisms.

## Transformational Policies

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Measures which, taken on their own, have little transformative impact can together, when skillfully combined, have a far greater impact and generate unexpected positive dynamics. The following ten measure bundles might produce transformative impacts to accelerate and spread the low carbon transformation:

1. Improving a proactive “low carbon-oriented role” of the state in order to reduce high carbon incentives and create a low carbon incentive framework, extending participation opportunities for civil society actors, the private sector and the research community.
2. Advancing carbon pricing.
3. Promoting low carbon energy strategies and developing regional cooperation strategies for a low carbon energy transformation (in order to reduce investment costs).
4. Promoting feed-in tariffs for renewable energies (nationally, regionally).
5. Promoting sustainable energy supply services for poor people.
6. Developing low carbon urbanization strategies.
7. Advancing climate-friendly land-use strategies (reducing deforestation, developing and implementing climate-friendly agricultural management methods, and promoting climate-friendly eating habits).
8. Encouraging and accelerating investments into a low carbon future (stable framework conditions



for climate-friendly investments, public guarantees, international cooperation, and emissions trading schemes).

9. Investing in low carbon research and education strategies.
10. Improving international cooperation and governance structures in the areas of climate, energy, land-use and urbanization policies.

## Literature

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WBGU (German Advisory Council on Global Change) (2009): The budget approach. How to solve the climate dilemma, Berlin ([www.wbgu.de](http://www.wbgu.de))

WBGU (2011): World in transition. A social contract for sustainability, Berlin ([www.wbgu.de](http://www.wbgu.de))

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