Energy for a Shared Development Agenda: Global Scenarios and Governance Implications

Key Findings

- The global energy challenge goes beyond securing basic energy access. In the long term it is about developing energy systems that enable long term economic development in all countries. Our Shared Development Agenda energy scenario demonstrates what achieving this might mean for different world regions, within constraints such as climate change and available land resources. Major strategies include a focus on efficiency, expanding low carbon electricity supply, electrification, and phasing out fossil fuels.

- Market-based instruments and current policies are not enough to achieve the transformations in energy systems that are needed to achieve energy goals. Both the public and private sectors need to step up their policies and strategies. In particular, the state needs to take a more active role in both mobilizing investment capital and nurturing and enabling innovation in energy systems.

- While governance and institutional frameworks are often in place at the national and sub-national level, there is a big gap at the international level. The global framework needs a transformative change if it is to effectively coordinate, steer and share knowledge and technology for energy systems development. The United Nations SE4All Framework is a good start. Its stated goals for 2030 on renewable, efficiency and access are roughly compatible with the pathways of the scenarios SDA and BEA scenarios in our study.

Background

The global debate on how to provide access to basic energy services for the world's poor has this year been high up on the international policy agenda, with the UN General Assembly naming 2012 as the official year of Sustainable Energy for All. Providing a clean, affordable, reliable supply of energy to poor households for lighting, cooking and heating is widely regarded as a prerequisite to successfully fight poverty and improve human well-being. Energy will, in one way or another, be a central component of future development goals, such as the currently discussed sustainable development goals (SDGs).

However, if our goal is to achieve *sustainable* energy for all, there are two linked challenges that need to be simultaneously addressed.

First, technical arrangements to provide basic energy access are difficult to sustain over time, unless people currently without access are provided with the tools to lift themselves out of poverty and generate income to pay for energy services. There is a strong correlation between income and energy demand. Income generation requires energy for productive use, and governments across the world share the legitimate aim to secure energy for productive use and development.

The Energy for All agenda must move beyond the "sticking plaster" approach (that is, addressing symptoms by securing only basic energy access for the poor) to also

address the root causes of under-development, which can be achieved by securing energy services that enable long term economic development.

Second, of all human activities, energy production is a key driver behind a number of critical environmental pressures, including greenhouse gas emissions (of which energy-related emissions represent roughly 75% of the global total); land and water use and degradation (where hydropower and bioenergy, if expanded further, may appropriate significant shares of available land and water resources); and emissions of dangerous pollutants. Energy must be supplied and used in ways which do not undermine other development goals by increasing climate risk, degrading land and using water unsustainably.
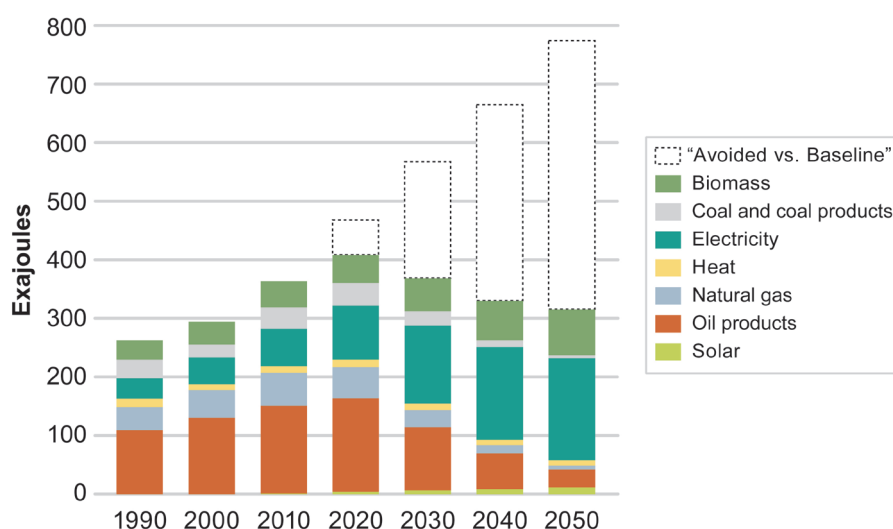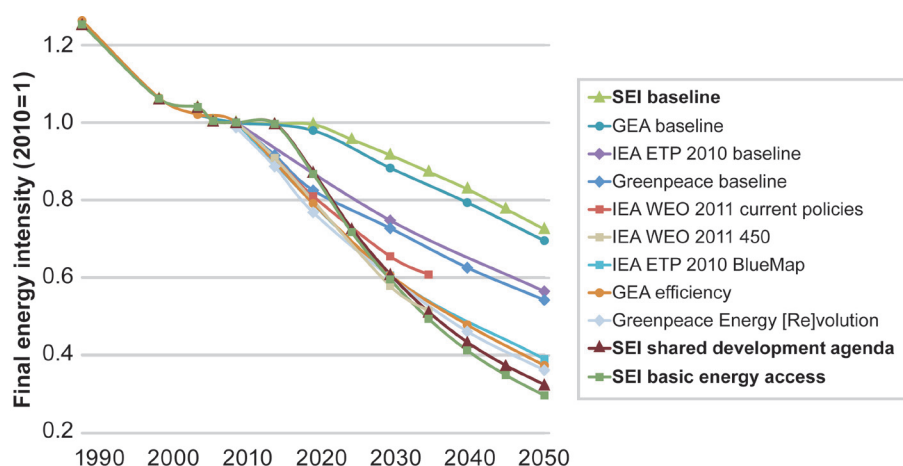

Figure 1: Energy demand by fuel in exajoules under SEI's basic energy access scenario

Figure 2: Comparison of global final energy intensity in SEI and selected scenarios

Final energy intensity (2010=1)

Legend:
- SEI baseline
- GEA baseline
- IEA ETP 2010 baseline
- Greenpeace baseline
- IEA WEO 2011 current policies
- IEA WEO 2011 450
- IEA ETP 2010 BlueMap
- GEA efficiency
- Greenpeace Energy [Re]volution
- SEI shared development agenda
- SEI basic energy access

Scenarios

The SEI report *Energy for a Shared Development Agenda* sets out three scenarios based on the latest evidence and produced with advanced modelling tools, which explore different energy futures. Our **baseline** scenario examines global "business as usual" trends for population, macroeconomic indicators, energy consumption, production and resource use, and GHG emissions. This scenario assumes that current economic and energy policies will broadly continue and that major efforts to tackle climate change will not materialize. The second is the **Basic Energy Access** scenario (**BEA**), which explores trends similar to those in the BAS but imposes a constraint on energy systems by assuming, a) major global efforts to tackle climate change, keeping the global average temperature increase to below 2°C, and b) the providing energy access for all by 2050. Finally, the **Shared Development Agenda** scenario (**SDA**) takes BEA as a starting point, but also explores the implications of more equitable trajectories of income growth. It asks the question, what are the implications for energy systems if by 2050 all countries reached per capita income levels equivalent to at least USD 10,000 (in 2005 purchasing power parity rates)?

Efficiency, sufficiency, expanded supply of low carbon energy, and electrification are the major strategies deployed to reach the scenario objectives. The BEA and SDA scenarios entail absolute decreases in total energy demand but large increases in electricity demand. This implies that conventional fossil fuel technologies for electricity generation would need to be virtually phased out well before 2050. Under BEA and SDA the only remaining such technologies by 2050 would be CCS-based systems.

In the BEA and SDA scenarios, electricity demand would be met through massive increases in renewable power generation (wind, solar, geothermal, and additional hydro in some regions) as well as nuclear expansion. There appears to be sufficient renewable energy potential to achieve such a scale-up. However, the required rate of expansion is a step change compared to current and recent rates.

The SDA scenario implies that energy intensity needs to decline at a rate of 2.8% per year, equalling 32% of its 2010 value by 2050. (Energy intensity is a measure of the energy efficiency of economies, calculated as units of energy used per unit of GDP). These reductions would rely heavily on technology but would also require measures that address lifestyles and consumption, which would initially be most relevant in richer regions. Such measures include, for instance, better urban planning, reduced growth in transportation, and smaller and more efficient housing.

Figure 3: Differences in primary energy use in 2050 by fuel in selected countries and regions under SEI's baseline and shared development agenda scenario

Per cent in 2050

Baseline / Shared development

Countries: China+, Eastern Africa, Indonesia+, U.S. and Canada, Western Europe

Legend:
- Biomass
- Coal and coal products
- Crude natural gas liquids and feedstocks
- Geothermal
- Hydro
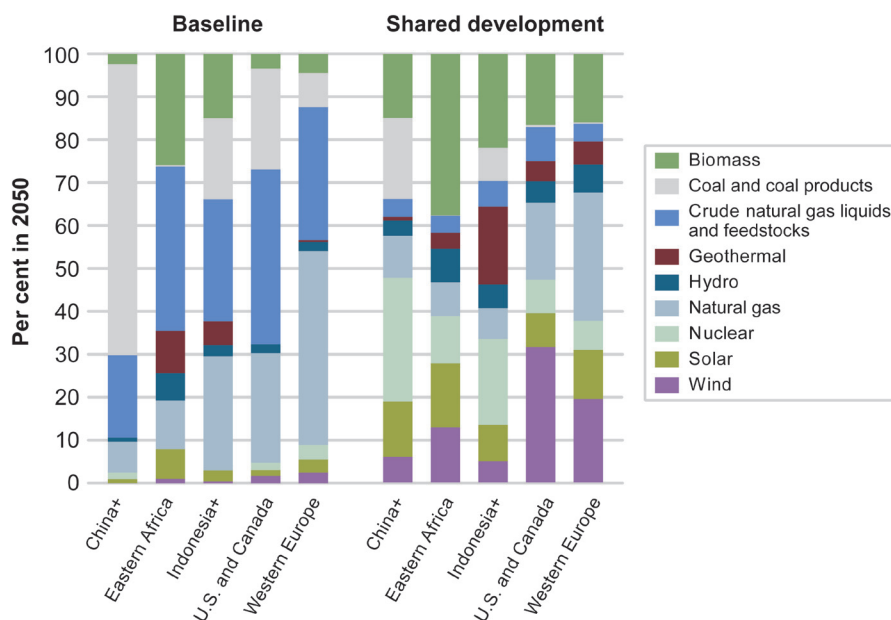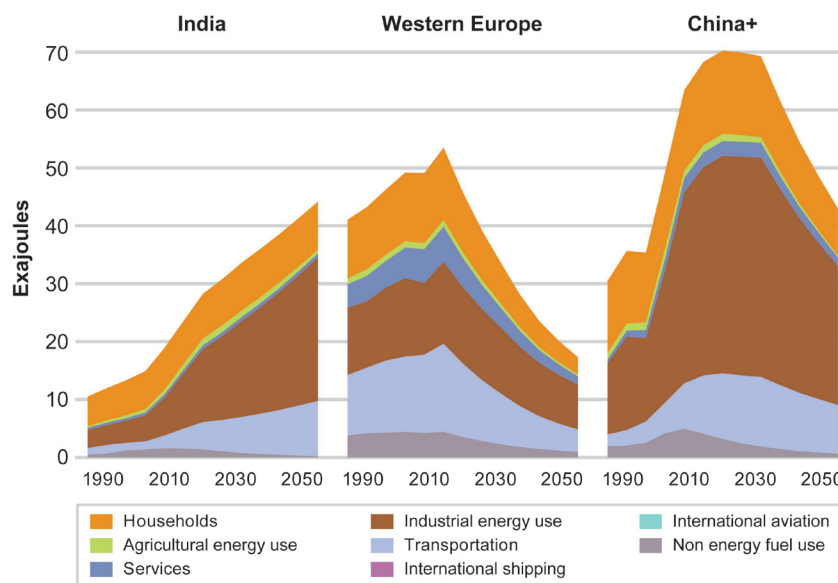- Natural gas
- Nuclear
- Solar
- Wind

Figure 4: The evolution of energy demand by sector in exajoules (EJ) in three regions: India, Western Europe and China+ under the SEI's shared development agenda scenario

The dynamics of transformation

Incremental changes in energy supply and demand will not on their own enable us to meet energy needs for economic development while respecting environmental and resource constraints. Strong early action and rapid turnover of infrastructures and technologies are needed on both the supply and demand side. How can such transformations come about? SEI's report presents case studies on the dynamics, barriers and drivers in on-going, real-world experience in transformation in three key pathways:

Extending energy access, including off-grid solar energy, and new cooking and heating technologies.

Expanding renewable energy supply, including wind, solar, hydropower, and bioenergy production.

Enhancing efficiency and lifestyles, including reorganization and shifts in urban and regional transport and infrastructure; energy efficiency in buildings and industry; and changes in consumption patterns and lifestyles.

The cases emphasize the mutually reinforcing and interlocked technologies, institutions, culture, politics and economic structures that shape trajectories of energy change and act as barriers to (or drivers of) transformation. Although it appears very difficult to achieve the objectives in the BEA and SDA scenarios, the case studies paint an optimistic picture of what can be achieved from the bottom up. For instance, despite the massive challenge of transforming our energy systems, many changes make economic sense for both private and public actors. Multiple co-benefits emerge, for example: modern energy access reduces greenhouse gas emissions, protects respiratory health, and promotes education, because women, and children need spend less time collecting fuel; renewable technology development has created new employment and export markets, not least for China; and efficiency and lifestyle measures contribute to smarter solutions and can improve lives.

Unlocking the potential: governing the transformation

Many transformations are stuck in a take-off phase and are unable to scale up. Political, institutional, cultural and economic barriers remain, due to both policy and market failures (fossil subsidies being the most blatant example).

Therefore governance responses are needed at different levels, including much stronger public policies for RD&D, public procurement, carbon pricing, and investment, as well as mechanisms for interactions between the state, the private sector and other actors in society that help to pool and coordinate resources and skills. Mobilizing the private sector requires new thinking about business models and opportunities. Governance can be enacted not only through policies but also through institutional structures and processes. We suggest that the following governance responses can support energy transformation:

- Articulating a *common set of priorities* for society

In order to raise the political profile of energy issues and integrate them effectively, the UN system must find a stronger permanent institutional home for energy. Energy targets need to be formally adopted within the SDGs. It is crucial to choose the appropriate follow-up indicators, and to balance uniformity and local adaptation.

- *Coherence* of priorities and goals

It is a major administrative challenge for both international and national governance to ensure that energy access, energy efficiency and renewables are integrated and coherent with other political priorities. It requires that capacity and trust are built over the long-term, as well as more comprehensive and forceful policy assessment frameworks.

- *Capacity to steer* towards those goals

There is no panacea for transforming our energy systems. Market-based measures are necessary but not sufficient, and need to be complemented with more ambitious and targeted government efforts on regulation, public procurement, R&D support, investment and financing mechanisms.

- *Accountability* for governing actions

Mechanisms for transparency and accountability are necessary to promote more open decision-making. In particular, a monitoring and evaluation system is urgently required for the energy access challenge.

Recommendations

- **Explore a shared development agenda.** Rio+20 and ensuing discussions must strategize around a shared global development agenda for the long term, a future without "us and them", where development is a shared commitment and the benefits of development are shared.

- **Set energy goals as SDGs.** Energy needs to be a major constituent of any globally agreed sustainable development goals. This means they need to include energy services for productive purposes for all countries, and provision of energy services in poor economies as an explicit goal. Similarly, SDGs should include goals for efficiency, social and industrial practice, and low carbon energy expansion.

- **Reshape global climate and energy governance.** While incremental changes in national governance can in many cases be sufficient, a real structural transformation of the global framework is needed to coordinate, share and steer the transformation across nation states. Such a global framework should include putting clean energy development efforts more centrally in the global climate change negotiations.

- **Strengthen public innovation governance.** Generic economic instruments such as carbon pricing are necessary but not sufficient as they tend to favour mature technologies. Bringing down the relative cost of new technology through increased public RD&D is central. Governments also need to take a more active role in taking energy innovations through the "valley of death".

- **Build government institutional capacity.** Putting technology and industrial policy back on the governmental agenda in turn requires enhancing the capacity of governments to manage complex systems and portfolios of projects.

- **Establish frameworks for monitoring and assessment.** Frameworks for accountable and transparent planning, performance monitoring of targets, and assessments of coherence between energy and other environment and development challenges need to be built up internationally and nationally.

- **Mobilize capital and finance.** Finance and investment must be urgently mobilized, directed and governed. Public funding should be set up so that it can be matched with private sector capital, and international funds to be matched by national funds.

- **Enable new practices, lifestyles and business models.** Access for the poor, efficiency and smarter energy solutions constitute important business opportunities, but they often require new social and industrial practices, forms of organization, and business models. A growing business community is taking an interest in these opportunities.