Energy and Employment

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Inadequate energy supply in many developing and emerging countries hampers productivity, competitiveness and private sector employment. Particularly poorer developing countries characterised by low capital and labour productivity, low labour income and high unemployment have a low electrification rate.

A reliable and high-quality supply of energy has positive effects on the living situation of the people and their opportunities for income as well as on the social and economic development and employment in a country.

Our Financial Cooperation (FC) projects create jobs both directly in construction and operation, as well as indirectly in the upstream supplier sectors. In this regard renewable energies in particular show great employment potential, which can also be tapped in rural areas not connected to the electricity supply grid.

However, more important economically are the positive impacts on growth and employment over the medium to long-term which arise primarily through the productive use of energy services or increases in energy efficiency in a country. In this regard the overall economic efficiency and costs of supplying energy are an important factor for growth and employment outside of the energy sector. Therefore, along with climate impacts these are one of the most important criteria for evaluating KfW energy projects in developing and emerging countries.

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Energy: Key factor for economic and social development

A secure and economically efficient supply of energy and electricity is a basic precondition for the development of trade and industry of a country.

The availability of electricity and modern fuels for cooking, heating and transport not only creates additional income opportunities in households, but also stimulates positive growth and employment effects particularly through the productive use of energy services through enterprises. The use of energy increases labour and capital productivity in the agricultural and the manufacturing sector, and enables the expansion of branches of production for which energy was thus far the limiting factor.

In its publication "Development needs sustainable energy", the German Federal Ministry for Economic Cooperation and Development (BMZ) also refers to the correlation between energy availability and economic and social development which many studies have proven empirically.[1]

The KfW energy portfolio in Financial Cooperation - renewable energies dominate

In light of the importance of an ecologically and economically sustainable energy supply for economic development, a key promotional focus of Financial Cooperation (FC) is the energy sector. This comprises plants for generating, transmitting and distributing electricity and heat, as well as programmes to increase energy efficiency.

In 2011, KfW commitments for energy projects in developing countries and emerging countries amounted to EUR 1.3 billion or 30 % of total FC commitments (EUR 4.5 billion). Renewable energies dominate the energy portfolio over the years 2007-2011 with a total share of 56 %. Projects to construct and rehabilitate electricity grids accounted for 21 % of the commitment volume, while thermal power plants such as coal or gas combined-cycle power plants accounted for 6 %. Projects for increasing demand-side energy efficiency in private and public buildings or small and medium-sized enterprises accounted for the remaining share of the commitment volume.

Direct and indirect employment effects in construction and operation

Investments in electricity and heat supply or measures to increase demand-side energy efficiency trigger immediate direct and indirect employment effects during a project's construction and operation phase.

A distinction is made as to where the jobs arise on the value creation chain. The *direct employment effects* comprise all jobs directly created by the measure in the energy sector. In this regard programme proposals for FC projects often include rough estimates broken down by employment during the construction phase and employment in the operation phase. Although the employment effects during the construction phase are considera-

[1] BMZ, Entwicklung braucht nachhaltige Energie, BMZ-Materialien 186, 2008.

bly higher than in the operation phase, they are only temporary.

For example the construction of the 450 MW hydropower plant Shongtong Karcham in India, which KfW, the Asian Development Bank and the project-executing agency in India are jointly financing, will likely employ 3,000-3,500 workers over the six-year construction period and 250-300 people after completion.

Less qualified workers, often from the region, usually perform construction and assembly work. Operation and maintenance work is carried out by engineers and technicians, unskilled and semi-skilled workers employed by the project-executing agency, creating local jobs. Since in general local expertise for project planning, implementation and supervision is lacking in the partner countries, foreign consultants are usually assigned these tasks.

Indirect employment effects are achieved during a project's construction and operation phase in all upstream economic sectors which supply the energy sector with services and intermediate inputs. The latter comprise for example plant components such as wind turbines or power generators, construction material, steel or fuels (e.g. biofuels) for the operation of plants. Determining all indirect employment effects is complicated and requires knowledge about the linkages between the sectoral intermediate inputs. To what extent the indirect employment effects take place in partner countries or abroad depends greatly on whether there are regional supplier industries and local service providers which have a chance of winning the required international tenders for supplies and services. In emerging countries such as India, where technology markets are well developed and plants are manufactured almost completely within the country itself, the indirect employment effects are higher than in less developed countries in sub-Saharan Africa.

To what extent locally-based companies are contracted can depend (along with professional qualification) on the lot size in the invitation to tender. Among other factors smaller lot sizes tend to promote companies in the region. They are, however, not always reasonable from an economic point of view and are often not practicable in the energy sector.

More employment through renewable energy technologies?

The global energy sector contributes 10-15 % to global GDP but employs only 1-2 % of the global workforce. These numbers clearly show that the energy sector is more capital than labour-intensive. New studies reveal that investments in renewable energies are associated with significant positive gross employment effects. According to the newest *Global Status Report* by the REN21 network, already more than five million people worldwide currently work directly or indirectly in renewable energy industries. In India the renewable energies sector accounted for about 350,000 jobs in 2009. Of these about 190,000 employees were working in the area of off-grid solar energy systems, biogas and small hydropower.[2] In the future significant employment potential is forecast for decentralised renewable energies in developing countries: The International Renewable Energy Agency (IRENA) estimates that decentralised electricity generation with renewable energies alone will create about 4 million direct jobs as part of the implementation of the goal "Energy Access for All" until 2030.[3]

In addition, an evaluation of 15 studies for the USA shows that in the construction and operation of a power plant, renewable energies create more direct employment per unit of generated electricity (led by photovoltaics and followed by geothermal energy, thermal solar power, biomass and wind) compared to conventional energy technologies.[4] Although these results are not directly transferable to developing countries, they point to the high employment potential of renewable energies.

Take into account feedback effects on the rest of the economy

The direct and indirect gross employment effects should certainly not be the primary criteria in determining the selection of energy technologies. Equally decisive are questions regarding energy security and climate protection, but also productivity and cost efficiency in the provision of energy services. For example, there are major country-specific differences between the electricity generation costs of individual energy technologies. Renewable energies are often still comparably expensive, particularly when the costs for reserve capacities and power storage to offset fluctuating electricity generation are taken into account. The costs also vary depending on the size of the generating plant and of the integrated network.

High energy costs and electricity prices in the production sector increase the price level and weaken the competitiveness and demand for

Energy access and employment

The United Nations declared 2012 as the year of "Sustainable Energy for All". The goal is to help all people gain access to modern energy services by 2030.

Within the scope of many projects, KfW promotes access to energy. These include projects to connect population groups to the national grid (plus the construction of necessary generating units) as well as decentralised solutions such as isolated grids, solar home systems or biogas plants to supply rural off-grid regions.

One example is the solar energy programme in Bangladesh, in which KfW, together with the World Bank and the Global Environment Facility (GEF), is promoting the installation of decentralised solar home systems in rural households not connected to the grid. In this way 750,000 people are supplied with electricity and benefit from new income opportunities, e.g. through lighting and use of communication technologies. According to the *Global Status Report* by REN 21, in Bangladesh the installation of 1.2 million solar home systems created 60,000 jobs in the solar industry alone.[5]

A further example is a project in Indonesia for rural electrification, where KfW (in cooperation with the World Bank) is providing USD 300 million to help approximately 200 villages gain access to modern electrical energy. Establishing isolated grids with photovoltaic and small hydropower plants largely substitutes expensive and environmentally harmful diesel generation and even enables low productive use of electricity.

[2] See REN21, Renewables 2012 Global Status Report, Paris, 2012, p. 26.

[3] See IRENA, Renewable Energy Jobs & Access, 2012, p. 11.

[4] See OECD, Energy, OECD Green Growth Studies, OECD Publishing, 2012, p. 74.

[5] See. REN21, Renewables 2012 Global Status Report, Paris, 2012, p. 27.

goods of other industries. The energy sector can have negative impacts on the rest of the economy, thereby causing job losses in other sectors. These negative effects can quickly more than offset the primarily positive employment effects.

Therefore, in the framework of FC energy projects the criteria of productivity and cost efficiency are assessed and weighed against other criteria, such as employment effects, along with climate impacts.

Additional income creates employment

All investments with employment effects - whether they are made in the energy sector or other sectors - create not only employment in the industries involved in construction and maintenance through the demand triggered by the investment, but also through the fact that direct and indirect employees earn income that they spend on consumer goods. In turn this additional demand results in jobs and income in the corresponding consumer goods industries. This is called an income multiplier effect, which overall leads to higher demand for goods from other industries and thus to further positive employment effects.

Medium to long-term growth and employment effects through the productive use of energy

The productive use of additional or improved energy services in the trade, industry and services sector can generate medium to long-term employment effects that can greatly exceed the previously mentioned effects.

Measures which expand and stabilise energy supply (e.g. by grid connection or additional electricity being fed to the grid) or make it less expensive (e.g. by reducing grid losses) contribute to economic growth. Many studies have already provided evidence on the empirical relationship between energy supply and (quantitative) economic growth or, expressed conversely, the negative relationship between a non-reliable electricity supply (blackouts) and economic growth. How developed a region is and to what extent a secure and adequate energy supply can activate unused productive capacities in the local economies will determine how much the production level and employment will increase in existing enterprises. New companies will enter the market, leading to further increases in employment.

Households and small businesses also benefit from a reliable electricity supply. This enables additional sources of income to be tapped. Examples include selling chilled food through the procurement and operation of refrigerators, or having longer opening hours through lighting at night-time.

However, certain framework conditions are needed to unlock the positive employment effects of energy projects. This includes a business-friendly climate, free access to markets and corresponding sales possibilities. It is also important for end energy consumers to be able to finance investments with high initial costs, e.g. through access to low-interest loans.[6]

Last but not least, the modern supply of electricity and heat leads to positive growth and employment effects by increasing labour productivity through better health resulting from less harmful emissions locally, improved medical care (for example by securing cooling chains) and improved access to drinking water through electric pumps. Moreover, electrification of educational facilities as well as the lighting and use of modern information and communication technologies raise the education level and thereby labour productivity.

Further information

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Project example: Job creation through rehabilitation of the grid in Mozambique

Mozambique is one of the least developed countries in the world with a low electrification rate. The inadequate electricity supply poses a significant development bottleneck.

KfW had provided financing of EUR 18 million for two projects related to grid rehabilitation in Mozambique which have in the meantime been completed. The first one comprised the renovation of a 200 km long 110 kV power transmission line, which transports electricity from a hydropower plant from the provincial capital of Nampula to the port town of Nacala. The second project was aimed at rehabilitating the medium-voltage and low-voltage grids in Nampula and Nacala. This also included transformer equipment and 19,000 consumer connections.

Both measures were aimed at providing access to a reliable energy supply in the cities of Nampula and Nacala in order to contribute to commercial and industrial development.

That the projects were able to achieve these objectives is evident in the Ex-post evaluation 2010:

- As an indicator for economic growth in the region, electricity demand from households and commercial electricity customers grew by over 20 % in both cities in the time period between project completion and evaluation.
- In the last few years manufacturing industries, cement factories, dry docks and service providers have established themselves in the framework of a "special economic zone" in Nacala. The facilities currently under construction have alone led to the creation of 5,000 jobs. The mining industry and commercial agriculture in the province have also benefitted.
- Likewise manufacturing companies have established themselves in the province of Nampula; also of note is the expansion of the deepwater port.

These growth and employment effects would not have been possible without the improved energy supply.

[6] See also: UNDP, Integrating Energy Access and Employment Creation to Accelerate Progress on the MDGs in Sub-Saharan Africa, April 2012.