

“Energy- and climate-efficient structures in urban growth centres”

Guiding principles for targeting the Federal Ministry of Education and Research’s funding priority on the sustainable development of the megacities of tomorrow

1. Background

In its “Fourth Assessment Report” on climate change in spring 2007, the UN’s Intergovernmental Panel on Climate Change, IPCC, established that the Earth has warmed up in the last 100 years by, on average, 0.74 °C. If the emission of greenhouse gases is not reduced, the average global temperature is expected to rise by 1.8 to 4.0°C rise over the course of the century. As a result, a rise in sea level and the increase of extreme events such as heat waves, severe weather conditions and flooding will be very likely. In order to restrict global temperature increases, the IPCC considers that it is necessary to stop the increase of emissions in the next two decades, and to bring about a 50–80% reduction by 2050. In addition, the advisory body stresses the need for adaptation measures, since the change in climate will lead to increasing damage particularly in the densely populated and coastal regions of the world.

In view of these developments, the German Federal Government has decided to take action in international climate protection and energy policy by promoting ambitious goals for the reduction of greenhouse gas emissions (mitigation) and the adaptation to climate trends and weather extremes. The Federal Government is advocating the negotiation of a new climate agreement by the community of nations following on from the Kyoto Protocol which expires in 2012, and putting this on a wider basis.

Within the framework of the German Presidency of the European Council, in March 2007, the heads of state and government of the European Union resolved to reduce the emission of greenhouse gases by 2020 by at least 20% compared to 1990 levels, preferably even by 30%, provided other industrialised countries try to achieve similar reductions. In June 2007, under German chairmanship, for the first time the G-8 Summit achieved consensus between the industrialised nations that global warming should not amount to more than 1.5–2.5 °C at most. In order to achieve this, the anthropogenic emissions of greenhouse gases on a global scale will have to be halved by 2050. The newly industrialising countries have agreed to play their part in this. Here the industrialised countries will support them by means of stronger technological cooperation. Moreover, signatories the United Nations Framework Convention on Climate Change such as Germany already agreed in 1992 to support developing countries in their adaptation to climate change.

The Federal Government will continue to develop its climate protection policy in a global dialogue and to form international partnerships in order to support the global realisation and dissemination of promising climate protection measures. It is pursuing an innovation strategy which uses research and the further development of new technologies and innovative services to enable the linkage of climate protection, economic growth and sustainable development.

The cornerstone of the innovation-driven, international scale approach to energy efficiency, climate protection and precautionary measures is the German “High-Tech Strategy for Climate Protection”, which is currently being prepared under the leadership of top representatives from business and research, and which is to be presented by autumn 2007.

Globally effective potential for energy efficiency and climate protection presents itself especially in those areas where greenhouse gas emissions are concentrated and where the consequences of climate change will be increasingly felt: in fast growing urban growth centres and “megacities”, particularly in developing and newly industrialising countries.

Following scheduled completion of its two-year preliminary phase, the Federal Ministry of Education and Research (BMBF) has therefore decided to continue the current funding priority on the sustainable development of rapidly growing megacities, adapting this to the changed national and international context.

The funding priority will therefore focus on the topic “Energy- and climate-efficient structures in urban growth centre” and will be embodied in the German Federal Government’s “High-Tech-Strategy for Climate Protection” as a supporting component with a global focus.

2. Problem definition

Efficient power supply and energy demands are set to become central questions of the 21st century. Mankind’s energy consumption is rising continuously and presents enormous challenges for climate protection and energy security. Thus, for instance, the International Energy Agency (IEA) predicts that worldwide energy consumption in the year 2030 will be at around 60% higher than the consumption in the year 2002. Approximately 85% of the power supply will then still be based on fossil sources of energy, the burning of which represents the most important driving force for climate change.

Urban agglomerations and, in particular, megacities in developing and newly industrialising countries are important arenas for energy use and production. Although cities only take up 2% of the earth’s land surface, they are responsible for three quarter of global energy consumption as well as approx. 85% of the global production of greenhouse gases. The underlying trend to urbanisation (with an approximately 1.8% increase per annum in the global urban population) and to the spreading of megacities is unbroken.

Cities not only drive climate change, they also receive the full brunt of its consequences, not least because about a fifth of the world’s population lives less than 30 kilometres from the coast in areas with a high population density. Floods, storm tides, strong winds, heavy rain as well as heat waves and droughts will occur more frequently in the future, endangering human life, residential areas, infrastructures, ecological systems, economic life and public health and safety in cities. Politics, economics and institutions of civil-society will be faced here with new challenges.

3. Objectives

Megacities offer strategic starting points for energy efficiency and climate protection. On the one hand, the concentration of people, material flows and residential districts in megacities makes it possible to reduce the consumption of resources because modern governance, planning and service concepts mean that more people can be supplied more economically using the same amount of transport, energy and space, and material cycles can be partly closed. Such gains in efficiency can flow into the hinterland and surrounding regions, and also into the whole national economy, to which large cities are integrated by means of resource flows and supply corridors.

On the other hand, the functional integration of urban industries, infrastructures and networks makes the accelerated dissemination of innovations possible, not least in the energy sector. In order to take advantage of this, integrative urban development is required which takes into account the overlapping fields of responsibility such as buildings, transportation networks, energy technologies, and also the lifestyles of the citizens, and integrates these into planning. In view of the intensity of competition in the search for energy- and climate-efficient solutions, megacities are also to be regarded as lead markets for energy and infrastructure systems, which are increasingly taking on a guiding function in the world economy, also for the industrialised countries.

Megacities are thus facing critical decisions on the direction to take. Their expansion could further fuel mankind’s energy consumption. In addition, however, innovations in technology and urban planning could help to set up sustainable structures and guidelines for energy demand and production (for instance in the residential and construction, household, traffic, industry and waste sectors), decouple economic growth and energy consumption, and lead emissions at least from an exponential to a flattening growth curve.

German researchers and businesses are in a good starting position to take part in determining future development. Thanks to their scientific authority and economic strengths in areas such as energy management, traffic and transport, structural building services and infrastructure engineering, environmental technology and management as well as engineering services, architecture and urban planning, they have special opportunities for proposing solutions and using co-operation and export possibilities, provided that they are adapted to specific local conditions.

Windows of opportunity are opening, up not least as a result of upcoming investments in the infrastructure area. On the basis of IEA and OECD data it is estimated that by 2030, 41 trillion dollars will need to be spent globally on establishing and renewing urban electricity, traffic and water systems. By 2030, for energy systems in total (urban and rural areas), IEA figures put the global investment demand at 20.2 trillion dollars. Experts estimate that, simply by employing the latest technology, the emissions of these systems could be lowered by about 25–35% compared to the status quo. Each additional development in energy production and consumption will be another step forward for climate protection.

The planning and investment decisions of today will thus determine the energy efficiency, economic productivity, social quality of life and ecological footprint of the expanding megacities and their surrounding areas for many years to come.

4. Further process steps

The current projects of the funding priority on megacities can apply for an extension up to max. 31.03.2008. At the same time, they will be invited to submit their applications for the upcoming main funding phase. For this, their applications are to be submitted by 15.11.2007. The main phase for successful project applications begins on 01.04.2008. All applications are subject to a two-stage evaluation procedure, consisting of a written assessment of the submitted applications followed by an assessment round which includes a project presentation by the applicants to the review committee.

5. Funding criteria and desired funding effects

Bilateral, dynamically developing R&D co-operation projects are envisaged, which build on the results and experiences of the preliminary phase.

In the main phase (scheduled for five years), the current research projects are to focus on the topic “Energy- and climate-efficient structures in urban growth centres”. Here, they should particularly tie in any existing results in this subject area which fit the new purpose and are worth continuing.

The goal of the projects will be to research, plan, develop and realise in an exemplary way technical and non-technical innovations for the establishment of energy- and climate-efficient structures. These should enable the city, along with its decision makers and inhabitants, to bring about increased performance and efficiency gains in energy production, distribution and use. Likewise, the resource consumption and greenhouse gas emissions by the energy-using sectors are to be reduced in a sustainable way in the future.

Projects are sought which link several segments of the power supply’s performance and value creation chain (from the supply of raw materials, energy production and distribution, right up to the energy demand of sectors such as construction, traffic, industry and private consumption) and join them together to form an integrated research design and/or a systems solution.

Under the heading of climate-efficient structures, those projects can also be promoted which further the adaptation of urban areas, structures and urban development concepts to foreseeable climatic changes and increasing weather extremes, and which reduce severe climatic effects, but which, under the right circumstances, also harness the economic or ecological opportunities brought by climate change to an urban agglomeration.

The methodical approach pursued in the preliminary phase is still valid and implies the following funding criteria:

- The scientific quality of the project proposal compared to international state of the art research has to be substantiated.
- The prospects of success for achieving the funding goals are to be corroborated.
- The research concepts are to be developed demonstrably in close coordination with decision makers and stakeholders in the respective urban growth centres and elaborated in the context of joint projects based on partnership and the division of work. Relevant interest groups

from politics, business and society are to be integrated into the development of the project concept.

- The elaboration and realisation of innovative, solution-oriented planning and management concepts are expected, which can, as far as possible, be transferred to other cities as a case of "good practice".
- The integrative, multi-disciplinary bundling of competencies and capacities within a manageable framework and the creation of competence networks is required in order to increase the international competitiveness of German research.
- A characteristic of the desired approach is its link to the concept of sustainable development. Ecological, economic and social facets of the development of energy-efficient structures and climate protection are to be considered in a closed and long-term concept.
- Co-operation with enterprises from within the German economy as well as local companies is desirable in order to promote the use, further development and diffusion of German technologies, procedures and services.
- Synergies with existing or developing parallel national and international research programmes and other initiatives are to be used. Integration into BMBF's "Scientific and Technological Co-operation" (STC) should be an aim.
- The prospects for appropriate involvement of the partner country, as well as, where applicable, third-party funding, are to be presented.