Joint science academies' statement on growth and responsibility: sustainability, energy efficiency and climate protection

Introduction

It is important that the 2007 G8 Summit is addressing the linked issues of energy security and climate change. These are defining issues of our time, and bring together the themes of growth and responsibility in a way that highlights our duties to future generations.

In 2005, the Academies issued a statement emphasising that climate change was occurring and could be attributed mostly to human activities, and calling for efforts to tackle both the causes of climate change and the inevitable consequences of past and unavoidable future emissions. Since then the IPCC has published the Working Group 1 part of the Summary for Policymakers of its fourth assessment report, and further reports are expected later this year from IPCC. Recent research strongly reinforces our previous conclusions. It is unequivocal that the climate is changing, and it is very likely that this is predominantly caused by the increasing human interference with the atmosphere. These changes will transform the environmental conditions on Earth unless counter-measures are taken.

Our present energy course is not sustainable. World population is forecast to reach 9 billion by 2050, with the most rapid growth in the poorest countries. Escalating pressures on land will accelerate deforestation. Major increases in demand for energy are inevitable as economies around the world accelerate and peoples justifiably seek to improve their living standards. Responding to this demand while minimising further climate change will need all the determination and ingenuity we can muster.

The problem is not yet insoluble, but becomes more difficult with each passing day. A goal of confining global warming to an average of 2 centigrade degrees above pre-industrial levels would be very challenging, and even this amount of warming would be likely to have some severe impacts.

Energy, development and climate

Many of the world's poorest people, who lack the resources to respond to the impacts of climate change, are likely to suffer the most. The dilemma, however, is that climate protection goals appear to conflict with prosperity targets within the traditional development paradigm. Access to energy resources and affordability of energy services are key factors for the wealth of nations and the well being of their people.

Last year our academies addressed a further important aspect of the challenges related to energy: the implications for security. We noted then that a key strategic priority will be a diversification of energy sources, as a way to address the wide variety of circumstances and resources, and to decrease vulnerabilities to a wide range of possible disruptions in supply.

Major investments and successful technological and institutional innovation will be needed to achieve better energy efficiency, low- or zero-carbon energy sources and carbon-removing schemes. A clear area for increased investment is energy conservation and efficiency. This has immediate and long-term benefits for local and regional health and environment, security of energy services and climate change, while having potential for local economic development and build-up of local technological capabilities.

Against this background it will be necessary to develop and deploy new sources and systems for energy supply, including clean use of coal, carbon capture and storage, unconventional fossil fuel resources, advanced nuclear systems, advanced renewable energy systems (including solar, wind, biomass and geothermal energy), smart grids and energy storage technologies. Research focused on the energy field must be enlarged significantly. The InterAcademy Council (IAC) is preparing a report on these challenges, which will be available later this year.

Promoting efficiency: a key element

It is urgent to increase efficiency in the global production and use of energy. Energy efficiency has been a major field for the G8 countries since the 2003 Evian Summit. Concentrating on energy efficiency is an effective contribution towards meeting the global energy challenges.

The implementation of measures to increase energy efficiency will depend to a decisive extent on financing options and technology knowledge. A sound financial and technological framework and improved global investment conditions will therefore be vital.

The common strategic priorities should concentrate on the following points:

Sustainable buildings Around 27 % of final energy is consumed by private households, and much could be done with existing technologies to improve the energy performance of buildings. The energy demands of buildings can be covered to a significant extent by using renewable energies.

Efficient transport and alternative fuels There are around 600 million motor vehicles across the globe. This figure may double by 2020. Here in particular lies a large package of possible measures, like innovative engine concepts with energy efficiency standards, alternative fuels and integrated transport systems.

Modern power technology Fossil fuels will continue to dominate electricity production over the next two decades. The best coal-fired power stations now achieve efficiencies substantially better than the average. Modernisation of old power plants could help to save energy and to reduce carbon emissions.

Electrical appliances are proliferating rapidly. New appliances on the market should be brought in line with the state of the art.

Energy consumption is strongly influenced by human behaviour. It is important to create the conditions and opportunities for energy consumers to use energy more efficiently.

Research and innovation

Increasing energy efficiency is a first crucial step towards solving the climate-energy problem. An entire portfolio of approaches will be needed, especially the substitution of fossil fuels by renewable energy sources, clean coal technologies, carbon capture and storage and advanced exploitation of nuclear fission and, in the longer term, fusion. This portfolio can be developed only through aggressive investment in research, development and innovation, with the efforts ranging from basic science over strategic analyses to practical applications.

Key research and innovation issues include: overcoming the intermittency problem for renewables, converting biomass (eg lignocellulose) to transport fuels, and coming to grips with the challenges of safety, waste, and non-proliferation in the nuclear energy domain. A whole-systems approach to energy security needs to be pursued.

Fundamental research is also needed on the climate system, climate impacts, and vulnerability at all scales in order to enhance the adaptive capacities of societies. It is equally vital to promote research on behavioural and other social issues that are central to implementing technological and institutional solutions.

The G8+5 countries should develop national road maps for innovation along with well-defined research agendas. There should be an intense international dialogue about these road maps, agendas and best practices.

Conclusions

We call on all countries of the world to cooperate in identifying common strategic objectives for sustainable, efficient and climate friendly energy systems, and in implementing actions toward them.

G8 countries bear a special responsibility for the current high level of energy consumption and the associated climate change. Newly industrialized countries will share this responsibility in the future.

We call on world leaders, especially those meeting at the G8 Summit in June 2007, to:

- Set standards and promote economic instruments for efficiency, and commit to promoting energy efficiency for buildings, devices, motors, transportation systems and in the energy sector itself.
- Promote understanding of climate and energy issues and encourage necessary behavioural changes within our societies.
- Define and implement measures to reduce global deforestation.
- Strengthen economic and technological exchange with developing countries, in order to leapfrog to cleaner and more efficient modern technologies.
- Invest strongly in science and technology related to energy efficiency, zero-carbon energy resources and carbon-removing technologies.

Academia Brasileira de Ciéncias, Brazil

Royal Society of Canada, Canada

Chinese Academy of Sciences, China

Académie des Sciences, France

Deutsche Akademie der Naturforscher Leopoldina, Germany

Indian National Science Academy, India

Accademia Nazionale dei Lincei, Italy

Science Council of Japan, Japan

Academia Mexicana de Ciencias, Mexico

Russian Academy of Sciences, Russia

Academy of Science of South Africa, South Africa

Royal Society, United Kingdom

National Academy of Sciences, United States of America