

Environment and Sustainable Growth

**A Statement by CAETS,
International Council of Academies
of Engineering and Technological Sciences, Inc.
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At the 17th CAETS Convocation held in Tokyo on 23-26 October 2007, a wide range of global energy and environmental issues was reviewed and discussed by more than 250 CAETS academy representatives and specialists. The state-of-the-art of various technologies for improving energy efficiency, energy production with reduced carbon dioxide (CO₂) emissions, carbon-free electricity generation; including nuclear power, and carbon dioxide capture and storage (CCS) was reviewed and discussed.

The Convocation also considered water resources and pollution, control of noise pollution, recycling of materials and electronic devices, global environment monitoring systems and various strategies and measures for realizing sustainable growth. It recognized the need for urgent international and national development and implementation of counter measures for foreseeable local and global energy and environmental challenges.

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The Convocation participants noted that much progress has been made in controlling air, water and other environmental pollution in developed countries, but that air pollution remains a serious problem, especially in rapidly developing countries, that millions of the planet's inhabitants still lack clean drinking water and sanitation, and that environmental noise is a constraining factor for sustainable development.

The Convocation focused particularly on the impacts of increasing carbon dioxide concentrations in the atmosphere resulting from human activities as the world economy grows. Greenhouse gas emissions in the newly industrializing countries are increasing rapidly to rival those of the highly developed countries. As reported by the Intergovernmental Panel on Climate Change (IPCC), most of the observed global warming since the mid-20th century is very likely due to human-produced emission of greenhouse gases and this warming will continue unabated if present anthropogenic emissions continue or, worse, expand without control.

The Convocation participants agreed that the adverse impact of global warming could be dramatic in the medium- to long-term future. The Japan Earth Simulator and other global earth system modeling centers are making many sobering predictions of the likely impacts as CO₂ concentration, global mean temperatures and sea levels continue to rise. CAETS, therefore, endorses the many recent calls to decrease and control greenhouse gas emissions to an acceptable level as quickly as possible. The Council recognized that it is the responsibility of the academies of engineering and technological sciences worldwide to alert their governments and citizens to the dangers posed by unbridled damage of the natural environment and future shortages or depletion of natural resources for fossil fuel; to work actively to apply existing solutions; and to foster new and improved technology as part of the global effort to avert dangerous human interference with the climate system.

In light of the Convocation deliberations and in order to realize sustainable growth and enhance the quality of life while reducing the use of fossil fuels for energy and curtailing greenhouse gas emissions, CAETS recommends that the following measures be urgently addressed through well planned implementation programs and research and development, including partnerships between governments and international organizations experienced with the relevant environmental issues.

1. Energy saving technologies must be greatly improved and disseminated as quickly as possible among both developed and emerging countries. Key initiatives considered most promising in the short term (in the next two decades or so) include the improvement of the efficiency of electric power generation and transmission and energy storage by batteries, effective use of heat pumps, advancement of the efficiency of internal combustion, electric and hybrid vehicles, improved energy efficiency in commercial buildings and residences, and utilization of Light Emitting Diode (LED) technology for illumination.
2. The opportunities provided by information, communication and control technologies for reducing energy consumption — for example, by reducing the need for travel and through development of optimized logistics and smart power systems — should be exploited aggressively, along with efforts to reduce energy consumption in ICT devices and systems themselves.
3. Development of renewable and alternative energy sources must be promoted and their application should be encouraged. Breakthroughs in the technologies for hydroelectric, nuclear, solar, wind, biomass and geothermal energies, and high-voltage DC power transmission in combination with high-frequency power conversion, should be explored for near- to medium-term exploitation and their appropriate use should be considered in light of the situation of each region.

Development of innovative technologies for remote exploration and enhanced extraction of oil, gas and mineral resources from the oceans must be encouraged.

4. Studies must proceed to determine under what circumstances technologies for the capture and storage of carbon dioxide are feasible and cost-effective. Other proposals to reduce emissions should be also encouraged and their effectiveness evaluated. Since, for some time to come, the use of fossil fuels will inevitably play a key role in economic growth to meet the needs of expanding populations for an acceptable quality of life, immediate attention to development of more effective (cleaner) and efficient use of coal and oil is essential.
5. The increased use of the nuclear power generation as an energy source must be addressed as a key issue for sustainable growth. CAETS recommends the promotion of studies on new generation reactors in the short and medium term and fusion research for the long term. Research to enhance safety measures, waste handling, economical performance and obstacles to non-proliferation are necessary for conventional reactors and associated fuel cycle facilities.
6. Other promising technologies warranting priority for medium- to long-term development, including hydrogen production, transport and storage, and application of fuel cells for vehicles should be explored. The discovery and environmentally sound management of gas hydrates should also be promoted.
7. Together with advances of the new technologies referenced above and the more effective and efficient use of traditional energy sources, the modification of social infrastructures, consistent with the conditions of each economy, must also be seriously considered. For example, development of well organized public transportation systems, should be

investigated and implemented as appropriate to offer an alternative to the expansion of automobile fleets.

8. Nations should work together to ensure development and sustained operation of the Global Climate Observing System (GCOS) and the Global Earth Observation System of Systems (GEOSS) to provide the data and information needed to support global, national and regional strategies for sustainable development, including, for example, evaluating the total emissions of greenhouse gases and enabling more reliable projections of climate change.
9. Governments of all the countries should work toward a new post-Kyoto climate change framework, codifying the urgent and concerted actions needed to suppress the emission of greenhouse gases.

CAETS members are well prepared for presenting objective data to facilitate the debate on these issues by governments and national communities. By engaging their national leaders, CAETS academies will encourage increased investment in research and development on energy, and promote policies to encourage avoidance and mitigation of environmental pollution and global warming. Through their leadership in the technological sciences and engineering, the CAETS academies will continue to contribute to the goals of sustainable development worldwide. Engineers and technologists must work together for the benefit of humankind and promote wise utilization of the gifts of nature as represented by the Chinese character for engineering, '工'.

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