

*Technology Development
and Transfer*

COORDINATORS

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TECHNOLOGY DEVELOPMENT AND TRANSFER

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The RSWG called for greater cooperation among all nations to improve and transfer existing technologies, develop and transfer new technologies, and improve the exchange of technological information to limit or adapt to climate change.

Many countries noted the need to tailor technologies to the domestic technological and human resource capabilities of developing countries and to better develop those capabilities.

Impediments to technology transfer and mechanisms to overcome those impediments were discussed at length.

8.1 TECHNOLOGICAL DEVELOPMENT

A. OVERVIEW

- 1) Technological development, including improvement and reassessment of existing technologies, is urgently needed to:
 - (a) limit or reduce anthropogenic greenhouse gas emissions;
 - (b) absorb greenhouse gases—i.e., protect and increase greenhouse gas sinks;
 - (c) adapt human activities to the impacts of climate change; and
 - (d) monitor, detect, and predict climate change and its impacts.
- 2) Technological actions designed to limit or adapt to climate change must be founded on a sound scientific basis, and must be consistent with the concept of sustainable development.
- 3) Criteria
 - (a) In selecting technologies, priority should be given to those technologies that provide

significant economic and social benefits in addition to benefits in limiting or adapting to climate change.

- (b) Appropriate criteria for selecting technologies (and for technology transfer measures) also include economic efficiency, taking into account all the external costs and benefits. Account must also be taken of suitability to local needs and conditions, additional benefits, ease of administration, information needs, legal and institutional constraints, national security (including defense, economy, energy, and food), and acceptability to the public.
 - 4) (a) Technological development will have to be pursued in a wide range of sectors and activities such as energy (including non-commercial sources), industry, agriculture, and transport and management of natural resources.
 - (b) Adequate and trained human resources in all the countries are a prerequisite for development and transfer of technologies.
 - (c) The growth of industrial and agricultural activities is one of the main anthropogenic components of the greenhouse effect. Technological advances to limit or adapt to climate change are critically important to provide a sound basis of sustainable development.
- ### B. MEASURES FOR PROMOTION OF TECHNOLOGICAL DEVELOPMENT
- 1) Policies
 - (a) Appropriate pricing policy that takes into account external (including environmental) costs and benefits, while recognizing

that it may not be easy to assess them accurately, is one of the key factors in determining the rate and direction of technological development.

- (b) In sectors where price signals do not elicit an adequate response, appropriate policies and incentives will be needed.

2) Information

- (a) There is a need for international information exchange to enable decision makers to continuously monitor development of technologies to limit or adapt to climate change. In this connection, it is necessary to ask where and how existing information systems are inadequate.
- (b) Governments should work cooperatively to conduct periodic assessments of the state of these technologies.
- (c) There is a need to develop methodologies to assess the social, environmental, and economic consequences of actions or inactions on climate change.
- (d) There is an urgent need for economic analyses and supporting scientific information to determine external costs and benefits referred to B.1.(a) above.

3) Support of Technological Development by Governments

Governments may need to support the development of technologies where such development by the private sector is not feasible.

4) Collaborative Efforts

- (a) International collaborative efforts can accelerate development of technologies and offer substantial potential savings for all countries. Such efforts as already exist in bilateral and multilateral contexts, including those in several UN and other international organizations, need to be strengthened and expanded.
- (b) Such collaborative efforts as those existing in some countries between the private sector and government to develop technologies could be expanded further to include developing countries and international organizations.
- (c) Industrialized countries should take every

feasible measure to assist and cooperate with (help) developing countries to acquire and apply these technologies effectively. Developing countries should be encouraged and assisted to develop their own technologies to achieve self-reliance.

C. AREAS FOR TECHNOLOGICAL DEVELOPMENT

The following areas have been suggested for consideration for technological development:

1) Limitation

- (a) Limit or reduce CO₂ emissions globally.
- (b) Absorb emitted CO₂ (by growing biomass, by work on chemical methods).
- (c) Limit or reduce emissions (use) of ozone-depleting substances with greenhouse potential (under the Montreal Protocol to the Vienna Convention).
- (d) Limit or reduce CH₄ emissions globally.
- (e) Limit or reduce N₂O emissions globally.
- (f) Limit or reduce O₃ emissions globally.

2) Adaptation

- (a) Manage coastal resources—e.g., erosion or flooding of coastal cities, ports, transport routes, agriculture, estuarine salinization from storm/tidal surges.
- (b) Manage water resources—e.g., water supply, flood control (groundwater, catchments, irrigation, river navigation, etc.).
- (c) Ensure adequate agricultural response (availability of temperature- and dryness-tolerant varieties; correct rotation).
- (d) Ensure adequate forestry response (availability of temperature, dryness- and fire-tolerant varieties; correct rotation).
- (e) Ensure adequate fishery response (changes in ocean currents, fishing grounds).
- (f) Revise soil mechanics criteria (permafrost, soil moisture, pore-water pressures).
- (g) Respond to changes in duration of ice-closure of ports, rivers, coastal seas.

3) Monitoring and Scientific Analyses

- (a) Global monitoring and related modeling

of atmospheric and ocean phenomena to try to detect warming signals, improve predictive capacity, assess climate sensitivity, and estimate delays in reaching equilibrium conditions.

- (b) Monitor build-up of GHGs in atmosphere.
- (c) Monitor sea level changes.
- (d) Monitor forests.
- (e) Systematic integrated monitoring of human-induced changes in ecosystems, land use, and ocean resources to determine their contribution to climatic change.
- (f) Investigate biogeochemistry of past and ongoing climate-change related phenomena for better understanding of climate change mechanisms and impacts.

(The RSWG recommended that the question of biodiversity and climate change be examined by Working Group II.)

8.2 TECHNOLOGY TRANSFER

A. OVERVIEW

- 1) As the greenhouse gas emissions in developing countries are increasing with their population and economic growth, rapid transfer, on a preferential basis, to developing countries, of technologies that help to monitor, limit, or adapt to climate change, without hindering their economic development, is an urgent requirement.
- 2) It is important to understand the needs, opportunities, and constraints of the recipients when undertaking technology transfer.
- 3) Many of the available technologies or those being developed in industrialized countries will have to be adapted to meet the conditions or needs of the developing countries.
- 4) Substantial efforts to transfer technologies to developing countries are now occurring under

existing bilateral and multilateral arrangements. These should be strengthened and expanded.

B. FACTORS THAT IMPEDE EFFECTIVE TRANSFER OF TECHNOLOGIES AND SUGGESTED SOLUTIONS

- 1) A consensus has emerged on some of the factors that impede effective transfer of technologies that assist to limit or adapt to climate change and on the steps needed to address them. Such factors include:
 - (a) lack of necessary institutions and trained human resources in developing countries;
 - (b) social factors that inhibit change from established ways;
 - (c) lack of resources for purchase, operation, and maintenance of new technologies; and
 - (d) higher initial capital costs in the case of some technology options.

The suggested solutions to address these factors are: better utilization of existing multilateral and bilateral development institutions to finance transfer of technologies; strengthening or creation of the necessary institutions; training of human resources; and introduction and operation of new technologies and establishment of new funding mechanisms, as appropriate, to address these issues. The issue of funding mechanisms is discussed in the paper on Financial Measures and the report of the Special Committee. The governments, it is suggested, can provide grants, loans, and loan guarantees to overcome obstacles of high initial costs.

For many countries, in particular developing countries, addressing this matter is of high priority.

- 2) Introduction of new technologies is sometimes delayed by decisions of governments aimed at prevention of closure of existing industries that might cause economic and social disruption. The national governments and the international community should constantly

strive to remove the difficulties and to facilitate the introduction of new environmentally benign technologies, without hindering sustainable development.

- 3) There are two other factors that impede transfer of technologies that assist to limit or adapt to climate change. These are:
 - (a) existence of legal barriers and restrictive trade practices which impede transfer of technologies; and
 - (b) constraints arising from property rights involved in the development of technologies.

There is, however, a divergence of opinion on the solutions needed to address these factors. While some hold that a strict protection of property rights, patents, etc., will promote effective development and transfer of technology, others hold that the level of such protection should conform with overall economic and development policies of the recipient countries. There are differences of opinion on the legal barriers and the methods to remove restrictive trade practices. It is noted that these issues are under in-depth discussion in other forums such as GATT and UNCTAD, but no agreement has emerged.

C. ISSUES TO BE FOLLOWED UP

Developing countries are of the view that transfer of technologies on a non-commercial basis is necessary and that specific bilateral and multilateral arrangements should be established to promote this. Some other countries where technologies are not owned by the government believe that transfer of technologies would be a function of commercial negotiations. It has not been possible to bridge the difference on views on these questions. It is extremely important to reach early international agreement on these issues, and other questions raised above, in order to promote effective flow of technologies to monitor, limit, or adapt to climate change.

8.3 SUGGESTIONS FOR PROGRAMMES

The following illustrative programmes are suggested to facilitate technology development and transfer:

- 1) *Global energy programme.* Designate experts on energy programming from respective countries who are to cooperate among themselves to formulate a coherent global energy programme, taking into account energy requirements and environmental objectives.
- 2) *Technology research centers.* Establish or expand regional or national technology research centers to develop technologies for basic infrastructure, energy efficiency, and alternative energy sources, agriculture, forestry, and water resources.
- 3) *Energy efficiency standards.* Establish standards on the energy efficiency of imported and locally manufactured technologies.
- 4) *Energy services.* Establish a policy to encourage private sector involvement in energy conservation and supply.
- 5) *Access to CFC substitutes.* Initiate a programme to promote CFC substitutes as well as provide assistance to developing countries in the acquisition and manufacture of the substitutes.
- 6) *Extension services.* Organize a network of extension services to provide assistance to government agencies, communities, and the private sector in designing and implementing mitigation and adaptation projects.
- 7) *Forestation/Afforestation programme.* New or expanded reforestation or forestation programmes could be linked to offset programmes for fossil-fuel-fired power plants, biomass energy projects, or a timber products industry as a means of obtaining financing and management for the programme. The social and economic incentives needed to en-

- courage long-term planting and maintenance should be identified.
- 8) *Technology advisory committees.* Establish technology advisory committees comprising representatives from government and business to recommend approaches for increasing export, joint venture, and other business opportunities related to global climate change limitation and adaptation efforts and to advise governments on ways to increase access to and encourage the development of commercial sources of new technologies.
 - 9) *Technology research and development.* Promote research and development on technologies to: (1) monitor and detect climate change; (2) limit or adapt to climate change; and (3) predict regional and local change and to assess possible effects.
 - 10) *Technology conferences.* Conduct conferences to transfer existing technologies to:
 - (1) monitor and detect climate change; (2) limit or adapt to climate change; and (3) predict regional and local changes and to assess possible effects.
 - 11) *Pilot transfer programmes.* Conduct pilot programmes to transfer technologies in selected countries and sectors.
 - 12) *International guidelines for technology transfer.* Introduce international guidelines for technology transfer.
 - 13) *International clearinghouse.* Establish a clearinghouse to match needs with the skills and technology.
 - 14) *An inventory of research organizations.* Compile an inventory of research organizations.
 - 15) *Training and education programme.* Organize a programme for training and education of personnel to develop and use new technologies.

