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Energy and sustainable development: key issues

Report of the Secretary-General

Contents

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I. Introduction

1. In its resolution 1999/60, the Economic and Social Council decided to hold the first session of the Ad Hoc Open-Ended Intergovernmental Group of Experts on Energy and Sustainable Development in New York in the first quarter of 2000, and invited the Secretary-General to prepare analytical reports and other documentation, as appropriate, for consideration by the Group of Experts at its first session. The present report has been prepared in response to that request.

2. The present report draws heavily on contributions and comments from the members of the Ad Hoc Inter-Agency Task Force on Energy, and also draws on the submissions and information provided by Governments as well as other relevant organizations, as requested at the seventh session of the Commission on Sustainable Development. The information contained in the submissions from Governments is presented in a separate report of the Secretary-General for consideration by the expert group.

II. Background

3. At its nineteenth special session, in its resolution S-19/2, the General Assembly adopted the Programme for the Further Implementation of Agenda 21. The Assembly underscored the essential role of energy for economic and social development and the need to reduce negative environmental impacts. Furthermore, it stated that sustainable patterns of production, distribution and utilization of energy are of critical importance to the above-mentioned objectives, and discussed a number of issues facing the challenge of energy for sustainable development.

4. At the special session, the General Assembly affirmed that the objectives envisaged for sustainable energy futures should reflect the need for equity, adequate energy supplies and increasing energy consumption in developing countries, where the increase in the level of energy services would have a beneficial impact on poverty alleviation by increasing employment opportunities and improving transportation, health and education. It recalled that advances towards sustainable energy utilization are taking place, and that all parties can benefit from progress made in other countries. It also stressed the need for international cooperation to ensure the promotion of energy conservation and improvement of energy efficiency, the adoption of renewable energy technologies, and the development and dissemination of other innovative energy-related technologies.

5. The Assembly also underscored the need for encouraging better coordination on the issue of energy within the United Nations system, under its guidance. It further emphasized the need for:

(a) A movement towards sustainable patterns of production, distribution and use of energy;

(b) Evolving measures to strengthen international cooperation in the field of energy, especially international assistance to developing countries in their domestic efforts to provide adequate modern energy services to all sections of the population in an environmentally sound manner;

(c) Policies and plans that take into account the economic, social and environmental aspects of the production, distribution and use of energy;

(d) Commitments for the transfer of relevant technology to developing countries and countries with economies in transition so as to enable them to increase their use of renewable energy sources and cleaner fossil fuels, and to improve efficiency in energy production, distribution and use and in other production processes that are intensive users of energy;

(e) Efforts in research on and development and use of renewable energy technologies at the international and national levels;

(f) Further research and development and the application and transfer of fossil fuel technology of a cleaner and more efficient nature through effective international support;

(g) Environmental cost internalization so as to achieve a more sustainable use of energy and to reduce and gradually eliminate subsidies for energy production and consumption that inhibit sustainable development;

(h) Better coordination on the issue of energy within the United Nations system;

(i) Integrated transport policies and international cooperation in the transfer of environmentally sound technologies in the transport sector;

(j) Measures to mitigate the negative impact of transportation on the environment, including improving efficiency in the transportation sector;

(k) Phasing out the use of leaded gasoline;

(l) Partnerships at the national level for strengthening transport infrastructures and developing innovative mass transport schemes.

6. To advance the move towards sustainable patterns of production, distribution, and utilization of energy at the global level, the Assembly decided that the Commission on Sustainable Development would discuss energy issues at its ninth session, in 2001. Noting the vital role of energy in achieving sustained economic growth, especially for developing countries, and recognizing the complexities and interdependencies inherent in addressing energy issues within the context of sustainable development, the Assembly decided that preparations for the ninth session of the Commission were to be initiated at the seventh session of the Commission, and should utilize an open-ended intergovernmental group of experts on energy and sustainable development, to be convened in conjunction with the inter-sessional meetings of the eighth and ninth sessions of the Commission. In line with the Programme for Further Implementation of Agenda 21 and the need for the Commission at its ninth session to contribute to a sustainable energy future for all, its sectoral theme will be “Atmosphere/energy” and the economic sector theme will be “Energy/transport”.

7. As part of a coordinated approach to preparations for the ninth session of the Commission by the United Nations system, the Inter-Agency Committee on Sustainable Development (IACSD), at its eleventh session (New York, February 1998), concluded that the Commission process in the period 1999-2001 provided an excellent opportunity for the United Nations system to elaborate a common approach to its energy agenda in the context of sustainable development. On that basis, IACSD established the Ad Hoc Inter-Agency Task Force on Energy for Sustainable Development with a mandate to elaborate such an approach and to support preparations for the discussions of the ninth session of the Commission.

8. Also envisaged in the preparatory process are events both within the United Nations system, including through the regional commissions, and beyond it that can provide appropriate inputs to the intergovernmental process. One such input to the preparatory process is the *World Energy Assessment*, which provides information on and analysis of sustainable energy issues and options. As inputs to the preparatory process, the Committee on Energy and Natural Resources for Development, which is a committee of experts, has provided the report on its first session, with other inputs planned in the form of a report to the Economic and Social Council on the specific energy issues identified at that session. That work will be facilitated by a number of reports to be prepared by the Secretary-General (see annex). The General Conference of the United Nations Educational, Scientific and Cultural Organization and the General Assembly have adopted several resolutions endorsing the World Solar Programme (1996-2005) launched at the World Solar Summit (Harare, 1996) as a contribution to sustainable development and calling upon member States to contribute to its successful implementation.

III. Key issues

9. Energy is linked to such major global issues as economic development, poverty alleviation and social development, and also includes gender-related issues, transportation, health, environmental quality and energy security. Even though the importance of energy for sustainable development is now well recognized by the international community, major challenges still remain that call for more focused attention to these global issues as well as concerted action to address them.

10. The magnitude and scale of the energy problem facing the world today in relation to sustainable human development and environmental objectives can be gauged by the fact that nearly one third of the global population of 6 billion continue to lack access to modern energy and transportation services. Wide disparities exist in the levels of energy consumption within and between countries. Current patterns of energy production, distribution and utilization carry the risk of becoming unsustainable. The health and environmental consequences of energy production and utilization have become major challenges. It has therefore become imperative to pursue sustainable energy paths for a sustainable energy future for all.

11. In its work on the topic of energy for sustainable development, the Ad Hoc Inter-Agency Task Force on Energy for Sustainable Development considered issues

pertaining to a sustainable energy future, with due regard to meeting socio-economic and environmental objectives that have been established by the United Nations, and took into account the issues reflected in the submissions and information provided by Governments as well as relevant organizations in connection with preparations for the ninth session of the Commission. The Task Force identified key issues and options under the following categories as input for discussion, at the intergovernmental level, as part of the preparatory process for the ninth session of the Commission:

(a) Accessibility of energy — the need for ensuring the availability of energy services in a reliable way at affordable costs, thereby contributing to security of energy supplies;

(b) Rural energy services — meeting basic and development needs of rural and dispersed populations;

(c) Financing the energy sector — funding the sector improvements needed for sustainability;

(d) Energy efficiency — improved efficiency in energy production, conversion, distribution and utilization;

(e) Advanced energy technologies — cleaner fossil fuel and improved nuclear energy technologies;

(f) Renewable energy as a component of sustainable energy systems — accelerated development and wider-scale utilization;

(g) Energy-related issues in transportation — improving energy efficiency in the transportation sector and mitigating environmental and health impacts;

(h) International cooperation — enhanced bilateral and multilateral cooperation, capacity-building, mobilization of investment capital and transfer of sustainable energy technologies.

A. Accessibility of energy

12. Accessibility of energy relates to a number of levels. Global demand for commercial energy services is expected to grow, especially with respect to the approximately 1.8 billion people without access to modern energy services and continued population growth. Global conventional energy resources are considered to be adequate to meet the projected growth in demand for energy services for decades to come, provided that technology is developed to exploit and utilize those resources in an efficient manner. Given the uneven distribution of energy resources, the issue of accessibility of energy focuses on the need to ensure the availability of energy services in a reliable way and at affordable costs within both national and global contexts, thereby contributing to security of energy supplies, while at the same time providing reliable energy markets that can generate a profitable income for producers.

13. While it is important to address ways of meeting long-term global need for energy through a transition to a sustainable energy system, it is also important to consider the issue of meeting the basic energy requirements of low-income people.

14. Thus, the issues related to energy accessibility at the international and national levels include the following:

(a) What international arrangements could be established to ensure greater reliability of energy supply at affordable costs for consumers as well as energy markets that generate appropriate prices for producers?

(b) What special international measures would be required to ensure that countries without any indigenous commercial energy resources have access to the basic energy to meet their minimal energy requirements?

(c) What national policies can be adopted to ensure that the basic energy requirements of low-income rural and urban dwellers are met with modern energy services?

15. Options available at the national level that could be considered include policies to subsidize modern energy supplies to low-income households, such as cross-subsidized “life-line” connections and services, and to remove obstacles to access to energy by the poor. The special circumstances of rural areas are examined below.

16. At the international level, the options for assisting least developed countries include increased official development assistance, which could be on a bilateral or multilateral basis; and increased international cooperation in the development of national sustainable energy strategies to address the needs of low-income households.

17. The options for addressing the issue of security of energy supplies and markets must also be tackled at the international level, and require a consideration of the dynamics of both market mechanisms and instruments that could be effective in achieving increased reliability.

B. Rural energy

18. Issues confronting rural energy are wide ranging. In a majority of developing countries, the provision of energy services to rural areas remains inadequate due to the dispersed nature of the population and the low-income levels of rural dwellers. Although there is a growing recognition of the importance of an integrated approach to rural development, which emphasizes the linkages between energy, agriculture and environment, efforts to find the most appropriate solution for rural area energy problems are hampered by insufficient attention to rural development in general and rural energy needs in particular. Policies aimed at providing modern energy services to rural areas in many countries have focused on extending the national electricity grids. Though successful in many instances, such policies have often necessitated substantial subsidies to customers in remote areas with low population densities since the unit cost of supply is higher. Current electricity pricing structures may have discouraged the adoption of renewable energy technologies despite life-cycle cost advantages, which exist for many rural areas since transportation and/or transmission costs are not a significant portion of the total costs.

19. The issues to be addressed with regard to rural energy include the following:

(a) How can obstacles to centralized and renewable energy systems, as well as other approaches to rural electrification, be overcome so as to promote use of sustainable and affordable rural energy systems, including cleaner and more efficient technologies for traditional biomass, modern biomass and other renewable energy systems?

(b) How best can capacity-building, with an emphasis on building local capacity as an integral part of rural energy policies, along with appropriate management and institutional arrangements for rural energy development, be promoted?

(c) How can market-based approaches for the provision of sustainable energy services to rural areas be fostered?

20. Policy options available to developing countries to address rural energy problems include integrating energy policies into overall rural development strategies; improving the quality and quantity of information on the availability and use of energy from all sources in rural areas for use by policy makers; initiating and/or strengthening rural development policies, including the elimination of bias towards urban development; establishing as a priority the provision of electricity in a cost-effective manner to unserved rural populations; launching, where reasonable, sustained programmes of investment in decentralized rural energy schemes based on renewable energy for rural areas not served by grids; adopting rational pricing of energy to encourage conservation and efficient use; and the phased removal of subsidies, except for “life-line” services.

21. Technology dissemination approaches at the national level include raising awareness and educating consumers about the advantages and disadvantages of renewable energy technologies, perhaps utilizing and/or strengthening existing extension programmes; disseminating information; and providing training.

C. Financing the energy sector

22. Since the energy sector is infrastructure-intensive it tends to be one of the more costly sectors of the national economy to improve and upgrade in the direction of sustainability. Thus, a major challenge facing the world as a whole is how to mobilize the investments necessary for sustainable energy systems. Moreover, given the vital role of electricity in social and economic development worldwide, developing countries face the particularly difficult challenge of mobilizing the investments needed for increasing the supply of electricity that is essential to sustain their economic growth and to meet basic needs. Problems relating to the financial viability of public electric utilities have also retarded effecting efficiency improvements in the generation, transmission and distribution of electricity, as well as in the management of demand.

23. Thus, the following are major issues at the national level:

(a) How can countries make greater use of their domestic private sectors and foreign partners for mobilizing finance for energy sector development, thus reducing pressure on government budgets?

(b) How can countries identify and select the right mix of policies and market-based mechanisms to accomplish market transformation and manage demand?

24. Options that can be considered for addressing this issue include institutional and legislative reforms, privatization and pricing reforms based on the internalization of environmental and social costs throughout the life cycle of energy services. More specific options include providing customs duty and tax concessions; introducing market transformation initiatives through government procurement programmes; promoting innovative financing arrangements, especially for low-income inhabitants, such as micro-financing, cooperative arrangements with credit and licensing agreements to encourage the private sector to provide certain energy services, particularly in rural areas; engaging development finance institutions and commercial banks in providing loans for small-scale projects; building capacity at the corporate and community levels; and inviting private sector and local communities to contribute to achieving the intended goals.

D. Energy efficiency

25. Improving the efficiency of energy conversion and end-use applications can lead to a reduction of the energy consumption per unit product or activity, a fact that has been demonstrated in several industrialized countries and a number of developing countries. Making the energy system more efficient contributes to improving local air quality and reducing regional acidification, and offers considerable potential for greenhouse gas reduction. It also reduces the investment requirements of the energy sector for any given level of gross domestic product.

26. In the consideration of policies and measures to achieve wider gains in energy efficiency, the issues of crucial importance can be classified into the following categories:

(a) Constraints and barriers that need to be addressed and measures to overcome them;

(b) Improving the efficiency of production and utilization of energy and materials;

(c) Sectoral energy efficiency improvement in industry, public, residential and commercial buildings and agriculture.

27. Many technological opportunities exist for improving energy efficiency in residential and commercial buildings, industry, transportation, agriculture and forestry. While numerous technologies to improve energy efficiency and manage energy demand more effectively are readily available, new developments can enhance the potential of this option further. In modern societies, industry consumes a substantial share of energy. A major part of industrial energy is utilized by the basic materials production and manufacturing sector, with non-manufacturing industries, including mining, oil and gas extraction, construction and agriculture, accounting for the rest. Therefore, material efficiency improvement, including the recycling of materials and management of waste, can reduce energy demand and greenhouse gas and other polluting emissions. The growth of the electric power sector, with its dominant role in modern societies, has environmental implications that need to be addressed. In the electric power sector, the use of coal will continue to be a major source of energy in many countries, and the inefficient burning of coal is a matter of concern from health and environmental standpoints.

28. The following issues arise from these concerns:

(a) Why have many developing countries yet to take full advantage of energy efficiency measures, particularly in industry? What are the constraints and barriers that need to be addressed?

(b) What can be done to accelerate the development of cleaner and high-efficiency coal-based power generation technologies and to facilitate their transfer to developing countries?

(c) What are the challenges facing the adoption of low-carbon fuels, such as natural gas, and of high-efficiency power generation options, such as combined-cycle technologies?

(d) How can international cooperation facilitate the movement towards more efficient extraction, conversion and utilization of energy?

(e) What international cooperation measures with time-bound commitments would enhance a movement to a more efficient energy system?

29. With the adoption of appropriate measures, sector efficiency would improve, thereby contributing to the desired effect of reducing energy demand and greenhouse gas and other polluting emissions. The options that can be considered are set out below.

30. Policy instruments to create an enabling environment and appropriate incentives include mounting public awareness campaigns; establishing energy audit mechanisms and monitoring systems; encouraging energy service companies; supporting research, development and demonstration and liberalizing the import of energy-efficient technologies.

31. Technology dissemination options for improving end-use energy efficiency in the residential and commercial buildings sector include wider diffusion of technologies, such as more efficient equipment and appliances; efficient heating and air-conditioning systems; and more efficient building envelope designs.

32. Institutional mechanisms that could be considered include those that are required for regulatory and legal frameworks for implementing policies on incentives; energy efficiency standards and labelling of equipment; and inviting the private sector and communities to contribute to achieving the intended goals.

33. At the international level, options include increasing the flow of information, technology and financial resources; and building capacity.

34. Issues and options concerning energy efficiency improvements in the transportation sector are dealt with in a separate section (paras. 50-58 below).

E. Advanced fossil and nuclear fuel technologies

35. Advanced technologies have matured in the industrialized countries for the development, production and utilization of fossil (oil, gas, coal, oil shale and tar sands) and nuclear fuels that would contribute to the reduction of environmental impacts by way of both efficiency improvements and reduced pollutant emissions. The emissions from fossil fuel combustion themselves have local, transboundary and global impacts. As the economies of developing countries expand in association with higher levels of consumption of energy, the resulting emissions will increase.

36. Both developed and developing countries are concerned with the magnitude and rapid growth of these emissions, and both have become interested in minimizing their increase, while at the same time not restricting the programmes and initiatives of developing countries for meeting their basic human needs and further developing their economies. Meeting that challenge calls for concerted effort on the part of the global community to engage in the mobilization of further financial assistance, technology transfer, infrastructure development and capacity-building. In addition to significant funding, some advanced technologies, such as nuclear technology, demand adequate infrastructure and capacities (regulatory, safety, educational and fuel-cycle management, including waste disposal) that need first to be established in those countries. This also applies to the development and utilization of advanced technologies that are characterized by very low pollutant emissions and reduced costs in meeting environmental objectives.

37. Thus, the issues related to advanced technology transfer include the following:

(a) As the economies of developing countries expand, requiring higher levels of energy consumption, what strategies will permit the associated levels of emission to be managed within the overall framework of reducing total emissions without sacrificing economic development?

(b) What kind of international cooperation arrangements can be made to facilitate the provision of capacity development and transfer of relevant technology to reduce the environmental impact of the development of fossil fuels and to reduce the associated local health hazards and environmental pollution?

(c) What kind of international cooperation arrangements can be made to facilitate the provision of capacity development for nuclear power management and the establishment of the necessary safety and regulatory environment?

(d) What kind of measures can be adopted by developing nations to enhance the acquisition of advanced fossil and nuclear fuel technologies to reduce energy-related emissions?

(e) How can the international mechanisms already in place be made more effective and responsive to the challenges of transferring clean fossil fuel technologies and/or nuclear fuel technologies?

38. Policy instruments at the national level to give a higher priority to the reduction of energy-related emissions include linking national energy policies to sustainable development policies; reorienting national budgets and priorities to focus more resources on acquiring the relevant advanced technologies and associated know-how, while enhancing rather than substituting localization of technology; adopting policies that improve the economic environment and security needed to attract foreign investment; and providing the institutional arrangements necessary to implement advanced fossil and nuclear fuel technologies.

39. Economic and financial instruments available at the national level cover economic restructuring; economic liberalization; privatization of the financial and energy sectors; balance of trade goals; and the proposed clean development mechanism.

40. Technology dissemination at the national level involves capacity-building, education, safety practices and environmental and integrated resource planning.

41. Institutional approaches available at the international level include assistance from industrialized nations to developing countries in obtaining the relevant technologies to minimize energy-related emissions and in developing the technical and managerial capacity to effect such reductions. This could be effected by providing funding in the form of development aid; providing access to the relevant technologies through concessional financing; consideration of increased cooperation in intellectual property matters regarding specific crucial technologies; North-South cooperative partnerships for institution strengthening; capacity-building and knowledge transfer; joint research and development efforts; and South-South cooperation.

42. In attempting to motivate developing nations to adopt advanced technologies, the promotion of attractive opportunities is very important. Consideration needs to be given to whether existing funding mechanisms that address this issue could benefit from a review of the scope for their improvement or for establishing new mechanisms that could help to meet these challenges more effectively.

F. Renewable energy

43. Although renewable energy in its modern forms, excluding large hydropower, currently plays a relatively minor role in the global energy system, its progressively increasing role is considered crucial if the objectives of energy for sustainable development are to be achieved. At its nineteenth special session, the General Assembly has recognized, *inter alia*, that action is needed by all actors — Governments, the international community and the private sector — to ensure increased development and utilization of renewable energy sources, including the promotion of research, development and demonstration, and training activities.

44. Since the time of the United Nations Conference on New and Renewable Sources of Energy, held at Nairobi in 1981, nearly all countries have been attempting to adopt strategies for promoting renewable energy, in diverse ways under distinct sets of constraints. Each form of renewable energy has specific availability characteristics. Diffusion of the technologies for harnessing each form faces distinct barriers and constraints. Policy options and strategies for wider scale application of renewable energy need to recognize that diversity of national circumstances, as well as of technology options.

45. Issues that need to be addressed with respect to renewable energy include the following:

(a) What mechanisms and strategies are needed for increased development and utilization of renewable sources of energy through national efforts and international cooperation, including the promotion of research, development and demonstration activities?

(b) How can international efforts be mobilized to facilitate an increase in the flow of technologies and investments in mature renewable energy technologies and at the same time strengthen national capacity in the policy, institutional, technology, financing and commercialization areas?

(c) What are the options available for addressing such issues as improving opportunities for decentralized energy, a more equitable basis for consumption, the specific energy concerns of women, public participation, grass-roots involvement, concerns about competition between food and biomass energy, water requirements for and soil impacts resulting from

new biomass applications, and concerns about the visual impact of wind farms?

(d) What mechanisms are needed to intensify renewable energy development in view of its potential for emission reduction and in what way could the proposed clean development mechanism facilitate this?

46. Policy options available at the national level include linking renewable energy policies to sustainable development policies and to actions consistent with international agreements; an enabling environment; legal and regulatory policies and frameworks for attracting investment; and providing a clear policy message to mobilize all key actors and catalyze them into action.

47. Technology dissemination options at both the national and international levels include market-oriented approaches for the diffusion of mature solar, wind, biomass and other renewable energy technologies; enhancing funding for research, development and demonstration; investing in the creation of national centres of excellence in renewable energy, which in turn can lead to strengthening local capacity; establishing networks at the subregional, regional and international levels in order to attract international support and to foster international cooperation, including South-South cooperation; facilitating joint research programmes and cost-shared research; and facilitating the process of learning from the experience of industrialized nations in establishing closer links between research and development and industry and in establishing international cooperation agreements and partnerships.

48. Institutional arrangements at the national level also include establishing national institutions in the public and private sectors for the implementation of policy and regulation; supporting decentralized institutions that can provide the necessary interfaces for programme promotion and serve a catalytic role by providing public information and encouraging participatory approaches involving NGOs and community-based organizations; and facilitating institutional networks for research, development and demonstration.

49. At the international level, additional options for increasing the contribution from renewable energy include promoting freer trade in renewable energy devices and systems; facilitating the creation of an enabling environment for rapid market growth; increasing funding for achieving cost reductions; facilitating technology transfer agreements on easier terms; supporting national efforts to build organizational and manufacturing capacity for the diffusion of renewable energy technologies; evolving innovative financing and credit mechanisms; and mobilizing private-sector investment. Also to be considered are ways and means of strengthening the linkage between existing international mechanisms, such as the Global Environment Facility, and renewable energy technology development and utilization. New mechanisms that could be considered include initiating international energy forums for dialogue on global issues, and linking centres of excellence into regional and international networks for the development and diffusion of renewable energy technologies and for training of scientists, engineers and technicians in the development and utilization of those technologies, as well as establishing regional networks for the exchange of experience in the development and application of renewable energy, research and development cooperation, including joint development projects, the sharing of testing and training facilities and South-South cooperation for capacity-building.

G. Energy-related issues in transportation

50. In the context of sustainable development, major policy objectives in the transportation sector are to:

(a) Ensure the adequate growth and efficient use of the transportation system to underpin growth in economic activity;

(b) Ensure that the development of the transportation system meets the needs of all sectors of society for mobility and accessibility;

(c) Mitigate the adverse impacts of transportation-related activities on human health and productivity and environmental quality.

51. The transportation sector is a major user of energy. Transportation, including equipment, travel and freight shipments, is one of the fastest growing sectors of the world economy. World demand for the major petroleum-based transportation fuels has been increasing steadily, having averaged an annual increase of about 1.9 per cent since 1970, for a current daily total of over 36 million barrels of oil. Continued growth in transportation fuels is anticipated as the

vehicle efficiency gains witnessed over the last two decades appear to have tapered off or stalled for the largest energy-using modes. Any continued efficiency gains will be overshadowed by rapid growth in all modes of transportation, resulting in continued increase in the demand for petroleum-based transportation fuels.

52. Worldwide, the transport sector accounts for about 23 per cent of anthropogenic carbon dioxide emissions today. Growing concerns over the environmental impact of transportation fuels related to carbon dioxide and other polluting emissions have stimulated research and development on alternative fuels and technologies. The available alternative transportation fuels that have attracted the most interest and for which technology is actively being tested and developed are natural gas, electricity, liquefied petroleum gas, methanol, ethanol, rape seed oil, methyl ester and hydrogen. Passenger vehicles offer the greatest opportunity for improving energy efficiency and reducing environmental impacts using advanced technology and alternative fuels.

53. Yet, despite vehicle efficiency improvements, (a) the increase in vehicle-kilometres travelled has more than offset the increase in average fuel economy, (b) increased use of heavy trucks appears to have substantially outpaced modest efficiency gains, and (c) in the airline industry, the rapid surge in passenger-miles travelled has offset the substantial increase in per-passenger fuel economy. Finally, since transportation accounts for a substantial share of emissions of gaseous, particularly greenhouse gases, pollutants and particulate matter, it is becoming increasingly important to monitor the relationship between transportation and the environment.

54. Thus, the energy-related issues in the transportation sector include the following:

(a) How can the cost that transportation imposes on society and the environment be managed, notably in terms of traffic congestion costs, accidents, pollution and the degradation of ecosystems and landscapes?

(b) How can growth in alternative-fuel vehicles, which currently constitute a small fraction of the total world vehicle stock, be stimulated? What measures are needed to encourage faster adoption of alternative fuels?

(c) What measures are needed to consolidate efficiency gains into an overall reduction of emissions resulting from passenger vehicle, truck and airline traffic?

55. Economic and financial options that could be considered are market instruments, such as fiscal incentives and regulations, and other measures for increasing availability through the establishment of the infrastructure necessary to establish convenient refuelling facilities for alternative fuels.

56. Technology options that can be considered to address the environmental impacts are improved performance of internal combustion engines and controls on motor vehicle emissions through the use of cleaner fuels, i.e., lead- and sulphur-free gasoline, fuel additives to reduce pollution and catalytic converters to reduce tailpipe emissions of gaseous pollutants, carbon monoxide, volatile organic compounds and nitrogen oxides. In addition, large-scale replacement of the current petroleum-based transportation system by a system using fuels derived from completely renewable sources of energy, including hydrogen from the electrolysis of water and electric vehicles powered by electricity from renewable energy sources, could reduce a significant proportion of the greenhouse gas emissions from vehicular transportation.

57. There are a large number of potentially useful policies for reducing the negative environmental and social impacts of transportation. A classification of such policies includes measures to: (a) rationalize demand; (b) encourage a change of transportation modes; (c) raise energy efficiency within each transportation mode; (d) promote alternative fuels; and (e) integrate urban planning and transportation planning, leading to higher reliance on public transportation systems. Thus, with the aim of reducing local air pollution, regional acidification and greenhouse gas emissions, national-level policies can focus on increasing efficiency and fuel flexibility by promoting short-term efficiency improvements; developing markets for alternative fuels; developing technologies for alternative fuel vehicles; rationalizing demand for travel; and putting in place adequate emission control measures with effective enforcement procedures.

58. At the international level, with many developing countries on the threshold of rapid motorization, a programme of action targeted at several major cities in

the various regions of the developing world with a view to developing blueprints for implementing the measures identified above could be developed, with international collaboration between city authorities, urban planners and bilateral and multilateral sources of finance, to demonstrate and thereby promote policies to mitigate adverse impacts on human health and productivity and environmental quality resulting from transport-related activities in urban centres.

H. International cooperation

59. The above discussion of issues and options concerning energy for sustainable development underscores the need for intensifying international cooperation, including South-South cooperation, in order to move towards sustainable patterns of production, distribution and utilization of energy that would lead to a sustainable future for all. Many issues lend themselves to constructive dialogue and genuine partnership based on mutual interests and benefits at the international level, and point to the need for private-public partnerships, both domestically and internationally, and both bilaterally and multilaterally. There is, therefore, a need for an evolving commitment to increased investments and financial flows, for the transfer of relevant technology and for promotion efforts in research and development in these areas. There is also a need to encourage Governments and the private sector to consider appropriate ways to gradually promote environmental cost internalization in order to achieve more sustainable use of energy.

60. It is of crucial importance that international cooperation also be directed at building national capacity, which encompasses creation of public awareness, education and training; promoting the need for detailed information flows regarding developments taking place worldwide; and facilitating the formulation and application of appropriate standards in the production, conversion, distribution and utilization of the various energy services.

61. Official development assistance (ODA) remains a significant source of external funding for many developing countries. Moreover, it plays an important complementary and catalytic role in promoting sustainable development.

62. To that end, the following important issues arise:

(a) What special measure or efforts can be envisaged to achieve donor Government commitments regarding the ODA target set for at the United Nations Conference on Environment and Development, part of which is to be used by recipient countries to address energy and related problems?

(b) What efforts can be made by the multilateral financial institutions to increase their support, including through concessional mechanisms, to developing countries in support of their efforts in implementing sustainable energy development?

63. In the effort to mobilize capital for investment in support of sustainable energy development, of crucial importance is the need for recipient countries to create a favourable climate for increased investment by the international community, including the private sector, as well as for donor support of activities in energy and related areas.

IV. Conclusions

64. Energy plays an important and pervasive role in modern societies; thus, its proper management is essential to the achievement of the goals of sustainable development. Moreover, examination of some of the key issues in the debate on energy and sustainable development clearly shows that achieving a sustainable future will require the concerted effort of all levels of Government, the private sector, civil society and the international community.

Annex

Reports of the Secretary-General to be prepared for submission to the Committee on Energy and Natural Resources for Development

- Energy and the residential sector
- Renewable sources of energy, with special emphasis on solar energy
- New financial mechanisms and economic instruments to speed up the investment of sustainable energy development
- Promising strategies and initiatives to accelerate the development and implementation of sustainable energy technology
- Coordination of energy activities within the United Nations system