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Report of the Secretary-General

Addendum

Transfer of environmentally sound technologies,
cooperation and capacity-building*

(Chapter 34 of Agenda 21)

CONTENTS

	<u>Paragraphs</u>	<u>Page</u>
INTRODUCTION	1 - 3	3
I. PROGRESS ACHIEVED IN THE IMPLEMENTATION OF KEY OBJECTIVES	4 - 19	5
A. Improving access to and dissemination of information on environmentally sound technologies .	5 - 8	5

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CONTENTS (continued)

	<u>Paragraphs</u>	<u>Page</u>
B. Capacity-building for managing technological change	9 - 16	7
C. Financing and partnership arrangements	17 - 19	10
II. TRENDS WITH IMPLICATIONS FOR THE TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES	20 - 24	11
III. UNFULFILLED EXPECTATIONS AND CONSTRAINTS	25 - 27	12
IV. CHALLENGES AND PRIORITIES AHEAD	28 - 32	13

BOXES

1. Global market for environmental goods and services	4
2. Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal embarks on a survey of indigenous technologies	6
3. Computer networking technology supports implementation of the Beijing Platform for Action	7
4. Technology needs assessment under the United Nations Framework Convention on Climate Change	8
5. UNIDO/UNEP National Cleaner Production Centre Programme	9
6. Public-Private Partnership for Urban Development	11

INTRODUCTION

1. The present report reviews progress made in the implementation of the objectives set out in chapter 34 of Agenda 21 (Transfer of Environmentally Sound Technologies, Cooperation and Capacity-Building),¹ taking into account the decisions taken by the Commission on Sustainable Development on this subject in 1993, 1994, 1995 and 1996 at its first, second, third and fourth sessions respectively.

2. Many goals of Agenda 21 depend for their achievement on the introduction of cleaner and more efficient technologies (environmentally sound technologies (ESTs)). Since the United Nations Conference on Environment and Development, workshops and studies have been conducted, and information and awareness-raising campaigns initiated, at the national, regional and international levels. They are intended to stimulate the demand for ESTs and thus promote their transfer and diffusion. A few conclusions can be drawn as follows:

(a) Successful technology transfer involves more than the transfer of physical hardware. The skills to use the equipment are crucial to success. Without the education and training to enhance the capabilities for scientific inventions and technological innovation, and for adaptation and absorption of technologies, sustaining sound business operations, implementing environmental and quality management systems, and maintaining the equipment, the hardware will almost certainly fail to fulfil its purpose. Technology transfer and capacity-building to adapt, absorb and diffuse technologies and, finally, reach a higher level of capability for technological innovation are two sides of the same process;

(b) Technology transfer between developed and developing countries is not a one-way flow of resources. It works best when it builds upon sustained partnerships or cooperative arrangements in which all partners can realize their interests and share responsibilities and benefits over the entire technology transfer process;

(c) In identifying or developing technological solutions, it is essential to ensure that these solutions fit the conditions, needs and capacities of the potential users, and are consistent with community requirements for sustaining economic growth, lifestyles and the environment. Thus, suitable technological solutions are often the result of merging high-tech industrial knowledge transferred from abroad with low-tech indigenous knowledge existing in the user country;

(d) Technology transfer is primarily a business-to-business transaction. This pattern is steadily reinforced as foreign direct investment (FDI) becomes increasingly larger than official development assistance (ODA). A Government's enactment of an economic and legal framework, with a practical system of environmental regulations, compliance mechanisms, and supporting economic and fiscal measures, is accordingly the greatest single facilitator for accelerating and enhancing the demand for, and transfer of, ESTs. Although the main impact of policies will most likely remain through environmental regulations and standards, there can be a gradual shift, noted in a growing number of countries,

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towards balancing regulatory regimes through the use of economic instruments and voluntary approaches so as to provide more flexibility in achieving economic results, while practicing environmental responsibility in production and market operations;

(e) There is evidence that the shift from pollution control to resource efficiency has gained momentum. Many developed and developing countries and economies in transition have adopted cleaner production and eco-efficiency policies and programmes which put emphasis on the introduction of integrated technological solutions in production processes. It has been realized, however, that the level of technology transfer and technological transformation required to accelerate progress towards cleaner, more resource-efficient systems and processes of production in many developing countries and economies in transition needs financial support and partnership arrangements with donor countries and agencies, as well as private sector initiatives and investments. The promotion of cleaner production in developing countries figured as an important item in the agenda of the fifteenth meeting of the Working Party of the Development Assistance Committee of the Organisation for Economic Cooperation and Development (OECD), held in Paris, on 28 and 29 October 1996 (see box 1);

Box 1. Global market for environmental goods and services

According to OECD estimates, the global market for environmental goods and services amounted to US\$ 200 billion in the 1990s, and will rise to US\$ 300 billion by the year 2000. Within these overall figures, it is difficult to identify the proportion of the market devoted to cleaner production technologies. Though OECD countries actually account for around 80 per cent of the global demand for environmental goods and services, the markets for these goods and services are growing fast in other parts of the world, notably Asia and some Eastern European countries. This is due to accelerating rates of economic growth in those parts of the world coupled with efforts to address pollution problems.

(f) There is a trend within industry towards eco-efficiency and cleaner production. A recent study noted that less than 20 per cent of North American and European companies are at the forefront of the latest advances in eco-efficiency and cleaner production. Hence, significant and increasingly rapid gains in resource efficiency are required at a global scale. The most effective way to stimulate companies around the world to engage in eco-efficiency and cleaner production efforts is to convince them that investments in cleaner production technologies and methods result in competitive advantages and is a precondition for sustaining business operations. Though environmental awareness has increased throughout the world in past years, it is not yet sufficient as a driving force towards the adoption of ESTs and cleaner production methods by entrepreneurs;

(g) The biggest challenge for resource efficiency exists with small- and medium-sized enterprises (SMEs). SMEs make up the bulk of business ventures around the world and their environmental implications and resource demands are equally large. In many countries, in particular developing countries, the bulk of untreated industrial waste and pollution originates with the SMEs, which frequently lack the resources and access to finance needed to implement cleaner production.

3. While progress in adopting and implementing policies and programmes to promote and facilitate the transfer and diffusion of ESTs is well documented, it has been extremely difficult to make reliable estimates on the actual transfer of ESTs to developing countries and the real size and growth of EST markets, or on the share of investments that can be clearly assigned to financing of the transfer and diffusion of ESTs. A major reason for this is that most technology transactions and EST-related investments take place in the private sector at an enterprise-to-enterprise level. Information on these transactions or investments is generally not made available by companies although the Commission, in one of its decisions, called for the provision of more information in this regard. Another reason is that available information on domestic or international flows of goods and services usually do not specify transfers of, or investments related to, ESTs.

I. PROGRESS ACHIEVED IN THE IMPLEMENTATION OF KEY OBJECTIVES

4. Consistent with the conclusions of inter-sessional meetings and the programme of work on the transfer of ESTs² adopted by the CSD at its third session in 1995, the following three objectives are reported on: (a) improving access to and dissemination of information on ESTs; (b) capacity-building for managing technological change; and (c) financing and partnership arrangements. The report focuses on trends and processes rather than initiatives. A "Compilation of information on initiatives of countries and international organizations to implement the objectives of Chapter 34 of Agenda 21" is also being prepared for submission as a background document to the Commission on Sustainable Development at its fifth session.

A. Improving access to and dissemination of information on environmentally sound technologies

5. There is, in general, no lack of information on ESTs or of systems and sources that provide such information. Over the past years, there has been a proliferation of databases, information systems and clearing-house functions - public and private, national and international - dealing with particular types of ESTs or providing technological information more generally (see box 2). Problems that exist in information access and dissemination are related to (a) the ability of technology suppliers, users of ESTs and intermediaries to know about and to be able to access information systems and sources and (b) the level of cooperation and compatibility among these information systems and sources.

Box 2. Secretariat of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal embarks on a survey of indigenous technologies

The secretariat of the Basel Convention has decided to undertake a survey of existing information systems on indigenous technologies related to hazardous waste, and to make the information provided through this survey available to the Parties to the Basel Convention, through their Regional Centres for Training and Technology Transfer. The effort will respond to the need for promoting the development and use of indigenous technologies which has repeatedly been brought up, in particular by representatives of developing countries. In the preparation of the survey, the secretariat of the Basel Convention will use, as a basis, the Survey of Information Systems Related to Environmentally Sound Technologies prepared by UNEP.

6. A Survey of Information Systems Related to Environmentally Sound Technologies³ undertaken by the United Nations Environment Programme (UNEP) provided useful insights on the modes of operation of these systems and sources, their interaction with the relevant institutional infrastructures, and the services they provide. The Survey emphasized the need for concrete measures to increase compatibility and cooperation among information systems and sources related to ESTs, including the usefulness of a consultative mechanism to improve communication between information providers and users. UNEP's 1996-1997 programme of work has provided for the establishment of such a consultative mechanism that will take the form of a loosely knit network of institutions that provide and use information on ESTs. Its specific function will be to improve the dissemination of information on ESTs to industry and national and local authorities, and to enhance the abilities of users and decision makers to assess the social, economic and environmental performances of available technological options.

7. Interactive electronic networks, such as the Internet, offer a wide range of new opportunities for communication and information dissemination among technology providers and potential users. On the other hand, it is sometimes noted that, to date, industry has not made sufficient advances in exploiting the opportunities provided by electronic communication and networking in terms of business operations.

8. Information technology is no longer restricted to industrialized countries, either in innovations or in applications. In fact, rapidly industrializing countries, in particular in Asia and Latin America, are already competing successfully with industrialized countries in software development and data management techniques. However, a considerable number of developing countries still lack the technologies - "software" and "hardware" - to make adequate use of the rapid development of sophisticated modes of information and communication. The Conference on Information Society and Development, held in Midrand, South Africa, in May 1996, organized by the South African Government,

in cooperation with the members of the Group of Seven (G-7) and the European Union (EU), underlined the tremendous potential of information technologies for meeting basic needs of developing countries (see box 3). It also recognized that there is insufficient investment in developing information infrastructures in most developing countries, despite the fact that there is an extensive unmet demand for information and communication technologies and services.

Box 3. Computer networking technology supports implementation of the Beijing Platform for Action^a

The United Nations "Women Watch" project is aiming at facilitating the global information exchange for monitoring the implementation of the Beijing Platform for Action through the use of computer networking technology. Improving access, training and links with other communication tools and networks is considered essential for women with regard to their becoming more successfully involved in electronic communication and in using computer technology to their advantage.

^a Report of the Fourth World Conference on Women, Beijing, 4-15 September 1995 (A/CONF.177/20 and Add.1), chap. I, resolution 1, annex II.

B. Capacity-building for managing technological change

9. Building local capacities is essential to transferring, diffusing and creating innovative technological solutions that respond best to a particular social, economic or environmental problem. Capacity-building for technology management is an important element of technology cooperation between developed and developing countries. Activities undertaken by donors in areas of environmental legislation and planning, education and training, awareness-raising, institution-building, environmental management, and so on, have been directly or indirectly instrumental in terms of the development of local demand for ESTs as well as the ability to identify technological needs and assess available options.

1. Technology needs assessment and environmental technology assessment

10. Technology needs assessment (TNA) can be a useful tool for the Government or other constituencies of a particular country in identifying a portfolio of technology transfer projects and capacity-building activities to be undertaken to facilitate, and possibly accelerate, the development, adoption and diffusion of ESTs in particular sectors of the national economy (see box 4).

Box 4. Technology needs assessment under the United Nations Framework Convention on Climate Change^a

The secretariat of the United Nations Framework Convention on Climate Change is currently working on technology needs assessment, as comments were requested of non-annex I Parties with regard to their technology needs in respect of addressing climate change and its adverse effects. Furthermore, developing-country Parties will be required to include more detailed information on their technology needs (technologies and know-how) in their first national communications.

^a A/AC.237/18 (Part II)/Add.1 and Corr.1, annex I.

11. Practical experiences gained by some countries and international agencies in carrying out TNAs yielded concrete results in different ways. They presented an opportunity to emphasize the demand-driven approach. Identified technology transfer and capacity-building projects were tailored to the actual needs of the local beneficiaries in the developing countries concerned, and helped coordinate follow-up activities at the national level. They are also offering opportunities for the collaboration of donors in financing and implementing the identified projects. As many providers and recipients of ESTs are private enterprises, a determined and early effort is needed to harness their potential technology and financial capacities. It was also useful for a local institution to carry out the TNA.

12. If undertaken on the basis of an integrated and participatory approach - with the Governments as the formulators and enforcers of economic and legal policies, non-governmental organizations and the scientific community as the environmental agencies that know the most about the resilience and carrying capacity of the Earth, and the private sector as the prime mover for technological development, transfer and diffusion - TNAs can contribute to policy integration by making both public and private decision makers more aware of the environmental consequences of their actions.

13. It was emphasized that, if sustainable development is the goal, the potential environmental impacts of a particular technology must be identified before a decision to acquire that technology is made. It is therefore important to integrate environmental technology assessment (EnTA) with technology needs assessment as an important tool for evaluating potential ESTs and the organizational, managerial and human resource systems related to the proper use of these technologies.

14. At the international level, there has been an emerging interest in sharing the experiences gained by a number of countries and international organizations in conducting and implementing TNAs. In response to this growing interest, the Governments of the Netherlands and Switzerland organized an international

workshop of experts, with the objective of elaborating guidelines on strategy and methodology for national technology needs assessments. The meeting agreed on a set of conclusions and recommendations regarding TNAs which was made available by the Governments of the Netherlands and Switzerland to the Commission for Sustainable Development at its fourth session in 1996 in the form of a "Guidance document on natural needs assessments (NNAs) regarding environmentally sound technologies (ESTs) for developing countries" (E/CN.17/1996/34, annex, annex I).

2. Cleaner production centres as facilitators in technology transfer and technological transformation

15. National cleaner production centres (NCPCs) were established as the result of country initiatives as well as, in a number of developing countries and economies in transition, with the support of donors or international organizations, including in the framework of multilateral and bilateral cooperation projects (see box 5). They have begun to play a major role in developing a "culture" for cleaner production in local communities and country-wide by coordinating cleaner production programmes, acting as an interface among industry, government, universities and non-governmental organizations, and building the human capacities required to acquire and manage cleaner technologies. According to OECD experiences gained in working on specific environmental issues in Central and Eastern Europe, cleaner production centres are very useful in coordinating and running cleaner production programmes, with the support of, among others, professional engineers' associations, technical institutes or industry associations. The secretariat of the Basel Convention reported that Regional/Subregional Centres for Training and Technology Transfer being operated under the Convention have become important vehicles for the promotion of the transfer of ESTs related to hazardous wastes.

Box 5. UNIDO/UNEP National Cleaner Production Centre Programme

Under the United Nations Industrial Development Organization (UNIDO)/UNEP National Cleaner Production Centre Programme (NCPCP), national cleaner production centres (NCPCs) were established or supported in the following countries: Brazil, China, the Czech Republic, India, Slovakia, Mexico, Tunisia, the United Republic of Tanzania and Zimbabwe. In order to improve communication and consultation among these NCPCs, counterparts, sector-specific working groups and other supporters, UNEP has set up an e-mail-based conference network (NCPC-NETWORK listserver). This e-mail network is intended for the circulation of information and news on programme events. It also provides an easy mechanism for self-help among subscribers with respect to obtaining quick answers on various questions that may come up during centre operations.

16. The main incentive for local companies to engage in cleaner production efforts is the expectation of enhanced competitiveness and more cost-effectiveness. NCPCs need, therefore, to focus on the argument of economic benefits by providing detailed information about the cost-benefit ratio and the payback periods of successfully implemented cleaner production programmes. Demonstration projects that display "technology in action" are essential to enhancing the confidence of entrepreneurs that investment in ESTs not only makes their operations environmentally more sustainable but constitutes good business sense as well. Consultation and information exchange, including through the use of interactive electronic networks, among existing NCPCs and with other parts of the local or national EST support structure (for example, information systems and sources related to ESTs, technical advisory and consultation services, marketing support and legal advice services, and institutions of research and development), are important.

C. Financing and partnership arrangements

17. Some studies have indicated that the problem is not just lack of financing, per se, for the transfer of ESTs, and that the issue is more one of market development than of mobilization of finance. According to this argument, if the market for ESTs is properly developed, particularly within developing countries, there will be no lack of finance available on reasonable terms. This view contends that, as of now, there is no firm market for environmental technologies in many developing countries, hence finance is not being attracted to such technologies. The first step, therefore, is to provide an appropriate context for private sector investment to take place.

18. In some cases, financial resources have been made available by Governments and this has demonstrably accelerated the transfer of ESTs. An example has been provided by the Multilateral Fund under the Montreal Protocol on Substances that Deplete the Ozone Layer, a protocol to the Vienna Convention for the Protection of the Ozone Layer. According to UNEP, the Fund has made available, since 1991, US\$ 0.5 billion to developing countries for the transfer of ozone-friendly technologies. The financial mechanism under the Montreal Protocol is the first international instrument to mobilize the resources required to change over to ozone-friendly technologies and successfully implement large-scale technology transfer. Each country that is a Party to the Montreal Protocol has listed and estimated in its country programme the resources required for the transfer of technologies. A preliminary estimate totals US\$ 3 billion-US\$ 7 billion.

19. Public-private partnerships are being implemented that try to link the advantages of private sector companies - access to finance and technology, managerial efficiency, entrepreneurial experiences and engineering expertise, the capacity for producing technological innovations - with the social responsibility, environmental awareness-raising, scientific research and job generation functions of local or national Governments. In implementing public-private partnerships, a strategic interaction has been established, in some cases, among governmental agencies, private sector entities and institutions of science and technology (see box 6).

Box 6. Public-Private Partnership for Urban Development

The UNDP-led Public-Private Partnership for Urban Development initiative represents a concrete type of strategic interaction referred to as the "technology triangle" in section IV, B.3 of the report of the Secretary-General on Chapter 34 of Agenda 21 (E/CN.17/1995/17) submitted to the fourth (1995) session of the Commission on Sustainable Development and in the report of the Commission on Sustainable Development at its third session,^a that is to say, the Partnership constitutes a strategic collaboration among business and industry, institutions of science and technology, and government agencies. This UNDP-led initiative involves the independent not-for-profit Swiss association Sustainable Project Management and the Technology and Development Program (TDP) of the Massachusetts Institute of Technology (MIT). The central objective is to promote joint ventures between the private and public sectors to address key urban environmental problems in developing countries. Inherent components of the projects being implemented are community participation and capacity-building needs. The technologies being acquired must be both affordable and appropriate to the needs of the beneficiaries concerned.

^a See Official Records of the Economic and Social Council, 1995, Supplement No. 12 (E/1995/32), chap. I, sect. C.1, para. 143, work programme (para. 4 (e)).

II. TRENDS WITH IMPLICATIONS FOR THE TRANSFER OF ENVIRONMENTALLY SOUND TECHNOLOGIES

20. Freer flows of goods, services, finance and technology have resulted in expanding markets and new investment opportunities. These processes have, in general, broadened the scope for the transfer of ESTs and technology-related investments in developing countries and economies in transition, and for cooperative and partnership arrangements between these and developed countries. They have also, however, posed new challenges to developing countries and economies in transition with regard to their ability to realize economic growth and competitiveness.

21. As a consequence of the globalization process, a gradual change in the structure and manner of operation of enterprises can be noted. One agent of this change in the global arena is the transnational corporation (TNC). New management practices, forms of organization and approaches to industrial relations are associated with the building of supply and production chains and enterprise networks so as to be able to capture the full benefits of technological developments and applications. The rapid advances in the information and communication technologies have opened up new possibilities of

coordinating production and market operations of companies that are dispersed geographically while linked electronically.

22. A growing number of Asian and Latin American countries have made rapid advances in economic growth and standards of living, fuelled by expanding trade, and capital and technology flows. Many developing countries and economies in transition are adopting far-reaching economic and political reform programmes to successfully integrate into an increasingly competitive and interdependent world, and to attract private investment flows. The beginning economic recovery of Central and Eastern European countries has opened up new opportunities for productive investments, domestic and foreign. It can be expected that international trade in environmental goods and services will increase considerably in Asian, Latin American and Eastern European countries.

23. The expansion of economic activities of large companies and TNCs, as they set up foreign operations or seek opportunities for productive investments, can facilitate the access of companies of developing countries and economies in transition to finance and technologies, through, for example, subcontracting or including them in production and supply chains of larger companies and TNCs. SMEs of OECD member countries are another distinct source for technology partnerships with companies of developing countries and economies in transition. According to OECD, about half of the environmental industry in Europe, the United States of America and Japan consists of SMEs. To internalize their research and development (R and D) costs and blend the necessary multidisciplinary know-how and marketing skills, these SMEs would have a strong incentive to collaborate with partners abroad.

24. The further development and implementation of new concepts linking quality management to environmental management, such as the Environmental Management and Audit Scheme (EMAS) and the International Organization for Standardization's 14000 Series of standards (ISO 14000), are emerging as an important tool within companies' overall management systems. The application of these standards will most likely make the environmental implications of industrial processes more transparent, and will have an impact on companies in adopting measures that promote eco-efficiency and cleaner production.

III. UNFULFILLED EXPECTATIONS AND CONSTRAINTS

25. Although no concrete data are available, there is overall recognition that the level of technology and technology-related investments from public and private sources in developed countries directed to developing countries has not, in general, been realized as envisaged at the United Nations Conference on Environment and Development. Increased private flows have led to investments in industry and technology in some developing countries and economies in transition. However, the fact that many developing countries have been left behind has slowed the process of technological change in these countries. Particular concern has been expressed by developing countries over the lack of commitment of developed countries to the following objective: "to promote, facilitate, and finance, as appropriate, the access to and the transfer of environmentally sound technologies and corresponding know-how, in particular to developing countries, on favourable terms, including on concessional and

preferential terms, as mutually agreed, taking into account the need to protect intellectual property rights as well as the special needs of developing countries for the implementation of Agenda 21" (para. 34.14 (b)). It is for the same reason that representatives of developing countries have highlighted the importance of access to, and transfer of, ESTs that are in the public domain.

26. Many developing countries, particularly in Africa south of the Sahara, continue to lack a sufficient level of national scientific capacity including a critical mass of well-trained scientists, technicians and engineers, which is required to generate scientific inventions and produce technological innovation, and to adapt and absorb technologies. In this context, there is great need for developing and supporting intensive interaction between institutions of education and training and of research and development on the one hand, and local industries on the other.

27. More attention has to be given, including in technology cooperation and partnerships between developed and developing countries, to the promotion and use of environmentally sound indigenous technologies and related knowledge that exist in developing countries. Joint ventures or other forms of foreign direct investment in developing countries that combine high-tech industrial knowledge of developed countries' companies with low-tech indigenous knowledge of the host countries' enterprises could become effective mechanisms for stimulating the demand for ESTs and thus promoting their transfer to, and diffusion in, developing countries.

IV. CHALLENGES AND PRIORITIES AHEAD

28. More information is needed from both national and local Governments and the private sector regarding the effectiveness of policies to facilitate and accelerate the transfer and diffusion of ESTs. Such information could provide greater insights into (a) the relationship between environmental concerns and the demand for technologies and technological innovations; (b) the effectiveness of company strategies for adapting to the requirements of technological change and support for production processes that are environmentally responsible and competitive; and (c) trends regarding the dynamics of national environmental technology markets and more accurate international data regarding technology flows to developing countries.

29. The promotion of cleaner production in developing countries including through development cooperation and public-private partnerships is an important issue. Work under way and practical experiences gained on this issue should be shared with interested parties in order to improve understanding with regard to the policies that must be in place and measures to be taken to successfully implement cleaner production efforts in developing countries. Opportunities for the transfer and diffusion of ESTs that are in the public domain should be addressed.

30. Handling the human resources and capacity-building component of the technology package has become a key requirement. More sophisticated education and training of firm managers, engineers and other senior staff involved in scientific inventions, technological innovations and technology adaptation and

absorption are needed. Strengthening the ability of developing countries to incorporate EnTA as a basic principle for decision-making on technology transfer and diffusion is also important.

31. The predominant role of the private sector in the transfer and diffusion of ESTs and, more importantly, its leading function in the transition to cleaner production, have increased the private sector's responsibility for ensuring that technology-related investments and industrial and business operations are consistent with community requirements for sustainable lifestyles and environmental protection. Corporate responsibility must become an essential element of company policy, and the precautionary principle must be practised to avoid the transfer and diffusion of technologies that could have negative impacts on human health or the environment.

32. The strategic interaction between private sector entities and institutions of science and technology needs to be strengthened and supported by local Governments. The demand of SMEs for ESTs is growing in the process of their adapting to cleaner, more efficient production processes. They do, however, lack the resources to engage in R and D. Institutions of R and D need to orient themselves more towards the production of marketable R and D results. They have the manpower resources, technical equipment and experiences to produce technological innovations that would meet the needs of SMEs for ESTs.

Notes

¹ Report of the United Nations Conference on Environment and Development, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

² See Official Records of the Economic and Social Council, 1995, Supplement No. 12 (E/1995/32), chap. I, sect. C, para. 143.

³ UNEP, April 1996.
