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DEVELOPMENT AND TRANSFER OF TECHNOLOGIES

Progress report

I. INTRODUCTION

A. Mandate

1. The Conference of the Parties (COP), the Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI) have requested the secretariat to undertake a number of tasks regarding technology and technology transfer. These include, for example, the preparation of reports on adaptation technology, the development of a plan for technology information centres and networks, and an expansion of the survey of technology and technology information needs. A detailed summary of requests, as of the fourth session of the SBSTA, may be found in document FCCC/SB/1997/1. Further information may be found in documents FCCC/SBSTA/1997/4, FCCC/SBSTA/1997/6, FCCC/SB/1997/3 and FCCC/SB/1997/4.

B. Scope of the note

2. This note provides a progress report on the three specific tasks mentioned above. Background information is provided in technical papers on adaptation technologies (FCCC/TP/1997/3) and on options for technology information centres and networks (FCCC/TP/1997/4).

C. Possible action by the SBSTA

3. The SBSTA may wish to:

(a) Recall its request to the secretariat to expand the technology needs survey to all non-Annex I Parties and urge these Parties to co-operate with the secretariat in the conduct of the survey; and

(b) Urge Annex I Parties to co-operate with the secretariat by providing information about any surveys of the technology and technology information needs of non-Annex I Parties they have undertaken, including the methods utilized.

4. The SBSTA may also wish to urge Parties to provide the secretariat with information on planning and decision tools, including software relevant for adaptation to climate change, on topics such as health, water, coastal zone, natural ecosystems, agriculture and urban areas, and to encourage their research and development institutions to co-operate with the secretariat in the formulation of focused papers on adaptation technologies.

5. In addition, the SBSTA may wish to:

(a) Urge Parties to provide comments to the secretariat on plans for international centres and networks for enhancing the transfer of technology and technology information; or

(b) Decide to encourage the implementation of one or more of the options listed in section IV of this note, and to urge a Party or Parties, or an international organization to prepare a detailed implementation plan, including a budget, for consideration at the next session.

II. TECHNOLOGY INFORMATION NEEDS SURVEY

6. The secretariat reported the results of an initial survey on technology and technology information needs at the fifth session of the SBSTA (FCCC/SB/1997/1). Taking into consideration the guidance provided by the SBSTA at its fifth session, the secretariat will expand the initial survey of technology and technology information needs of non-Annex I Parties to the Convention. This will be done with the co-operation of the University of Amsterdam (IVAM Environmental Research).[1] A report will be available for the eighth session of the SBSTA in June 1998.

7. The secretariat has been informed that several Annex I Parties can, or may, in the near future, undertake projects which will build on the results of the initial survey. The aim of these projects is to co-operate and assist a small number of developing countries to undertake more detailed analyses of their specific technology and technology information needs. These projects may provide experience and lessons which could improve understanding of the technology transfer process and be beneficial to other Parties. For example, some aspects may lead to improvements in future surveys of needs while others may lead to new approaches to the transfer of technology.[2]

III. ADAPTATION TECHNOLOGY

A. Background

8. In response to the requests of the COP and the SBSTA, the secretariat engaged the Free University in the Netherlands to undertake the preparation of a technical paper on adaptation technologies (FCCC/TP/1997/3). An initial draft of the paper was sent to experts for review and comments. The experts were nominated by governments and selected from the roster. In addition, the initial draft was sent to participants in the Intergovernmental Panel on Climate Change (IPCC) workshop on adaptation held in the Netherlands between 21-22 March, 1997. Comments provided by experts have been incorporated by the authors, as appropriate, into document FCCC/TP/1997/3.

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[1] This activity is supported by the government of the Netherlands.

[2] As experience is gained from these projects, the secretariat will co-operate with the relevant Parties to assess modalities for making results available to other Parties.

9. The secretariat notes that the IPCC will host a workshop in 1998 on adaptation, which will go beyond technological matters, into all aspects of this subject (FCCC/SBSTA/1996/20).

B. Discussion

10. Considering adaptation technologies within a broader discussion of adaptation issues is a relatively new challenge for governments and the private sector. Adaptation technology is, by itself, a complicated and large endeavour with many different aspects. However, many institutions are already engaged in making autonomous adjustments, without explicitly recognizing the link to climate change, or the need to consider climate change as a criteria for decision. Given the scope and limited understanding of the issue, this technical paper should be viewed as an initial contribution, which may serve as a basis for a broad discussion.

Content of the technical paper

11. The technical paper provides an overview of adaptation issues and identifies the role that technologies could play as part of a broad approach. Other aspects of adaptation may include economic, legal and institutional measures. The paper attempts to define concepts and to address questions such as:

- What is adaptation?
- What should systems adapt to?
- How can technologies contribute to adaptation?
- What general technological opportunities exist in selected sectors?
- What arguments can be made in favour of undertaking some adaptation measures now?
- What criteria could be used for research and development and other investment decisions?
- What types of decision tools are available to assist in making decisions ?

12. The technical paper also identifies two types of decisions related to technologies. The first relates to decisions about infrastructure and planning by national, regional and local governments. The second concerns decisions about research and development priorities by corporations and government laboratories.

Conclusions of the technical paper

13. **Technologies could be used now and could play an increasingly important part in adaptation to climate change.** Many opportunities exist for the application of both hard and soft technologies to complement economic, legal and institutional adaptation options. In spite of the many uncertainties that still surround climate change, technology can already be employed in a cost-effective manner to enhance the robustness and flexibility of human systems, and the adaptability of natural systems.

14. **Many technologies that could be used to adapt to climate change have been used successfully as a means of adapting to contemporary climate variability and extremes.** Examples of existing adaptation technologies include air conditioning, flood-defence systems, irrigation, monitoring, forecasting and early warning systems for natural hazards. However, it may well be that climate change will exact new and higher standards of reliability and performance of adaptation technologies, at significantly lower costs.

15. **Innovation and new technologies are required in order to improve access by all countries at reduced costs.** This provides new challenges and opportunities to research laboratories, industry and other groups involved in research and development. Many such groups may not yet be aware of these opportunities, simply because they have never considered their activities as being relevant in the context of climate change.

16. **Adaptation to climate change can be autonomous. It can take place without the intervention of a decision maker and should be planned following informed and strategic actions.** Adaptation can also be reactive. It may be undertaken in response to an observed change. It can be anticipatory, that is, in advance of climate change. Planned adaptation can be both reactive and anticipatory, while autonomous adaptation is only reactive. In view of the suggested discernible human influence on global climate and in accordance with Article 3.3 of the United Nations Framework Convention on Climate Change (UNFCCC), anticipatory planned adaptation deserves particular attention from the international climate change community.

17. **Anticipatory planned adaptation is particularly important to reduce vulnerability to climate change.** Anticipatory planned adaptation can have a number of objectives. It may aim, for example, to increase the robustness of infrastructure designs and long-term investments; increase the flexibility of vulnerable managed systems; enhance the adaptability of vulnerable natural systems; and reverse the trends that increase vulnerability ("maladaptation").

18. **Anticipatory planned adaptation can be beneficial to a number of important sectors and systems.** Examples of sectors that could benefit from anticipatory planned adaptation are infrastructure, such as, port and harbour facilities, flood-defence systems, water supply systems, sewage systems and urban systems. Fragmented industries, such as those that are not part of a larger network of governmental and industrial organizations and human health programmes may also benefit.

19. **The arguments in favour of implementing some adaptation measures now are as follows:**

(a) The impacts of changing weather extremes may become apparent well before the impacts associated with changing trends;

(b) Large projects, currently being planned and implemented, could factor climate change into their designs and be cost effective. Many of these projects will be in place for 50 to 100 years; and

(c) Vulnerability to climate change in the long-term is a function of a society's experience in coping with current problems by means of economic, technical, institutional and socio-cultural measures. These capabilities can only be improved upon with experience.

20. **Many technologies that can be used to adapt to climate change also have other, non-climate, benefits.** These non-climate benefits are termed secondary benefits. Sometimes the secondary benefits of adaptation measures are sufficient to justify them in their own right. Such adaptation measures can be considered "no-regret" measures. Examples of these include technologies for increasing efficiency of water use, improved land-use planning, ecosystem and biodiversity protection, and monitoring, forecasting and early-warning systems.

21. **Some decision tools to evaluate alternative adaptation strategies, based on a number of criteria, are available. Others are undergoing further research**. The decision tools that are most relevant for climate change adaptation are cost-effectiveness analysis, multi-criteria analysis, risk-benefit analysis and cost-benefit analysis. A few of these decision tools have been incorporated into decision-support systems, which provide an important technology to assist planners and decision makers.

22. **Further activities to promote the development and application of innovative technologies could include:**

(a) Building awareness among planners and decision makers of the need to adapt to climate change, the part that technology can play in adaptation and the benefits of adaptation;

(b) Assessing the current and future availability, accessibility, potential, costs, environmental impacts and implementation requirements of technologies for climate change adaptation, as well as opportunities for innovation;

(c) Co-operating with research laboratories and industry to encourage research and development of adaptation technology;

(d) Creating a demand for climate change adaptation technology, for example, by setting standards that incorporate climate change projections, or via the market by requirements of the insurance industry;

(e) Establishing design and performance goals for adaptation technology; and

(f) Ensuring institutional coherence with related issues, such as those of national programmes for national disaster reduction or relief.

C. Issues for consideration

23. The SBSTA may wish to consider how it can promote the development of decision tools related to adaptation technologies, particularly those involving infrastructure and research and

development. These are complicated processes involving individuals, the private sector and governments.

24. The compilation of tools to assist in decision-making will be partially addressed in the context of the work programme on methodologies, specifically in the task to compile and synthesize information on tools related to adaptation (FCCC/SB/1997/INF.2). This compilation will mainly aim at identifying tools to assist in the preparation of national plans. Some aspects may also be helpful to decision-making at the regional level.

25. The latter type of decision could be the focus of future technical papers on specific sectors as identified in document FCCC/SB/1997/3. Substantial participation by research and development institutions would be needed in order to broaden the understanding of how climate change could affect their future activities. Such efforts could provide insights into what may be needed in the long-term.

26. The SBSTA may wish to consider whether the two activities, identified in paragraph 23, are sufficient and/or whether other practical steps should be considered to build understanding and affect decision-making.

IV. CENTRES AND NETWORKS

A. Background

27. In response to the COP and the SBSTA, the secretariat will make available a technical paper on technology information centres and networks (FCCC/TP/1997/4). It will describe current activities of national centres and international organizations, identify possible functions and users of information, and provide ideas about how to enhance the transfer of information, including options for international centres and networks. It will not contain detailed information on the costs of specific options.

28. The secretariat based this note on information obtained during a meeting of experts (see FCCC/SB/1997/4) and a literature search. The Climate Technology Initiative (CTI) also provided the secretariat with preliminary data from a survey of existing centres.[3] The survey focused on 19 countries[4] and was conducted via mail, fax and other electronic means. A report from the CTI may be available for the seventh session of the SBSTA, but was not available to the secretariat as of 7 September, 1997. The data provided in this note should, therefore, be viewed as preliminary.

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[3] This activity was supported by the government of the United States of America.

[4] The 19 countries included 16 non-annex II Parties and 3 Parties with economies in transition.

B. Types of centres

29. Currently, there are international, national, regional, and local centres that gather and provide information about technologies and know-how pertaining to environment, energy, agriculture and other sectors. They are often hosted by, or form part of, larger organizations that are supported by the private sector and/or governments. Their functions and users differ considerably. For the purposes of this paper, the following definitions are suggested for "climate change" centres:[5]

(a) International Technology Information Centre(s): An international entity whose primary function is to collect, catalogue, and synthesize information on environmentally sound technology and know-how to mitigate or adapt to climate change climate relevant technologies and know-how from sources, and to disseminate information to national technology information centres and other users;

(b) National Technology Information Centre(s): A national entity or a unit within another organization, for example, a national technology centre, whose primary function is to collect, analyse and disseminate information on environmentally sound technology and know-how to mitigate or adapt to climate change to users within a country;

(c) National Technology Centre: A governmental, non-governmental or private sector entity whose functions may include, the conduct of research, the development of technologies, economic and financial analysis, analysis of policies related to technologies, demonstrations, training, feasibility studies, the collection and dissemination of information, outreach and networking; and

(d) Network: A means of passing information, either electronic or human.

C. Current activities[6]

30. There is currently no single international climate change technology information centre capable of addressing all sectors and providing a full range of services to all users. A number of international centres operate in climate change relevant sectors, performing different functions and supplying some services. At the national level, numerous entities conduct activities in climate relevant sectors with different levels of service.

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[5] Preliminary definitions are provided in FCCC/SB/1997/4.

[6] This document focuses primarily on items (a) and (b) above.

Activities supported by international organizations and Annex II Parties

31. Several international organizations, for example, the United Nations Environment Programme (UNEP), the Food and Agricultural Organization of the United Nations (FAO), the United Nations Development Programme (UNDP)[7] and the International Energy Agency (IEA) support information centres and systems (see Table 1 below). Annex II Parties provide support through organizations such as, the Japan Information Centre for Science and Technology (JICST), the German Aid Agency (GTZ), and the US National Renewable Energy Laboratory (NREL) (see Table 2 below). These organizations are involved in a number of activities including the development of web accessible information systems on cleaner technologies in different fields of application. In general, the systems are operated by a small sub-unit of 5-10 staff, or as a programme within an organization, specifically established with an information dissemination mandate.

32. These technology information systems may be divided into those that provide more general information, such as FAO and JICST, having been involved in information dissemination for the longest time and those that provide information that is more directly relevant to the climate change issue. For example, FAO began operation in 1957 and AGRIS and CARIS were established in 1975. The development and operation of more specific climate relevant information systems came about more recently. For example, GREENTIE was introduced at the Earth Summit in 1992.

Directories and intelligent search engines

33. One important task being undertaken by a number of the above organizations is the development of systems to quickly access the rapidly expanding information available on the Internet. This requires a means of systematically collecting and organizing information on climate relevant technologies. This means is usually called a search engine. Improved search engines and directories could significantly reduce the time required to access useful information in the future.

34. Recently, the International Environmental Technology Centre (IETC) at UNEP launched one such system at the fifth session of the Commission for Sustainable Development (CSD), held in New York from 7 to 25 April 1997. The newly developed Searchable Information Directory on Environmentally Sound Technologies (ESTs) called “maESTro”, through its Directory Interchange Format (DIF), is fully compatible with UNEP’s Global Resources Information Database (GRID), the database of the National Aeronautics and Space Administration (NASA), the Committee on Earth Observation Satellites (CEOS), the National Space Development Agency of Japan (NASDA) and others. The searchable EST directory includes the IETC’s survey on EST information systems, a compilation of about 130 institutions throughout the world that are involved with ESTs and an overview of “eco-friendly” technologies in IETC’s field of activity.

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[7] Provides technical and financial support to build and maintain networks and national centres.

Table 1. Examples of centres and systems supported by international organizations

Abbreviation	Network	Launched	Institution	Location	Area of Application
ICPIC	International Cleaner Production Information Clearing-house	1990	UNEP - Cleaner Production Programme	France, Paris	Industry and government
OAIC	Ozone Action Information Clearing-house	1991	UNEP - IE's Ozone Action Programme	France, Paris	Government
AGRIS	International Information System for Agriculture Science and Technology	1975	FAO	Italy, Rome Austria, Vienna	Agriculture: science and technology
CARIS	Current Agricultural Research Information System	1975	FAO	Italy, Rome	Agriculture: research
GREENTIE	Greenhouse Gas Technology Information Exchange	1993	IEA/OECD	Netherlands, Sittard	Product and company information

Table 2. Examples of national systems and networks

Abbreviation	Network	Launched	Institution	Location	Area of Application
JICST	Japan On-line Information System		Science and Technology Agency	Japan, Tokyo	Science and technology
ISAT	German Information and Advisory Service on Appropriate Technology	1988	GTZ	Germany, Eschborn	Appropriate technologies
EREN	Energy Efficiency and Renewable Energy Network	1994	NREL	USA, Colorado	Energy (technologies)
EREC	Energy Efficiency and Renewable Energy Clearing-house	1994	NREL	USA, Colorado	Energy (specific applications)

National technology information centres and networks in developing countries

35. Non-Annex I countries also have numerous centres that collect and disseminate information on technologies. For example, the Indian Centre for Promotion of Cleaner Technologies (ICPCT), established in 1996 at the National Environmental Engineering Research Institute of India (NEERI), founded in 1958 as part of the National Information Centre for Cleaner Technologies (NICCT)), has developed a database of 510 case studies on cleaner technologies, and is in the process of developing an information system. Also, the Southern Centre for Energy and the Environment in Harare, Zimbabwe is host to the South African Network on Energy and Environment (SANEE). The CTI data set includes 65 technology information centres in 19 countries.[8] It is, therefore, reasonable to assume that there are probably

[8] The CTI data indicate that most of the centres replying to the questionnaire were NGOs (63%), while 17% were commercial organizations. A majority of these centres provide services within their own country, but approximately 15% of the centres provide services on an international scale. Twenty-five percent of the centres were located in research institutions.

hundreds of centres throughout the world. However, because the CTI did not evaluate current centres, it is necessary to be cautious about the capabilities and effectiveness of such centres.

Summary of CTI data set on national technology information centres in developing countries

36. The CTI data set indicates that most national centres had more than one mission. Consulting services is the most common mission (46%), followed by information networking (35%). The same data set reveals that 52% of the responding centres are engaged in training, almost half of the centres (46%) concentrate on education and economic analysis and 11% are able to provide quality control to the information they collect. The CTI data set also provides information about who are the users of the information provided by centres. It found that most of the users are government organizations (88%). These users predominantly request information about energy (91%), environmental science applications (58%) and waste management (40%)[9] (See FCCC/SBSTA/1997/INF.4 for further detailed information).

37. Also included within the CTI data set is information about how national centres communicate with the users of information. The data set indicates that the fax (86%) and printed media, comprised of reports and documents (85%), are the most commonly used means of communication (86%). Approximately, 60% of all centres use the phone, e-mail and newsletters. Finally, centres use workshops (74%), professional associations (51%) and paid advertisements (20%) to promote their services.

38. A very important factor in the exchange of information on cleaner technologies is the use of language. As reported in the CTI survey, 83% of the centres provide services in English and 32% communicate in more than one language. Twelve centres use two languages and nine centres use more than two languages.

39. Depending on the financial support that technology information centres and networks receive from governments and other sources, they may charge users for their services. Free services are often provided by government institutions, but sometimes also by non-governmental centres and networks, depending upon the financial support they derive from, national and/or international institutions. Yet, more than half of the responding centres (52%) indicate no charges for calling on their information services. Of these, 32% of the centres reported no charges to the users for direct response to questions and 20% reported having minimal charges for direct services and other charges like membership fees and subscriptions.

Networks in developing countries

40. Eighty percent of the responding centres and networks to the CTI survey are using e-mail facilities as a means of communication. Access to the Internet by the same community is also

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[9] Comparable information may be found in the preliminary technology needs survey prepared by R. van Berkel, in co-operation with the secretariat. In that survey, Parties most frequently cited the energy and waste management sectors as ones about which they needed technology information.

improving in many countries, as evidenced by the increasing number of Internet Service Providers (ISP) in the Asian, African and South American regions. These ISPs provide services such as electronic mail, Internet access, on-line publishing, access to various search engines, and electronic conferences. A few examples are APNG (Asia Pacific Networking Group), JARING (Network for Malaysia), SDN (Pacific Sustainable Development Network), MauriNet (Mauritius Network), MANGO (Network for Non-Profit Community in Zimbabwe), and CCCNet (Co-operation Committee for Cambodia Network). Since access to the Internet has been improving, a number of networks are now being developed which focus on technological and environmental issues. Some examples include Pactok (PacificTalk), ScINET-PHIL (Science and Technology Network of the Philippines), and STACnet (Philippine Science & Technology Advisory Council Network). In most cases, these networks are still in the process of identifying the needs of their users and packaging information accordingly.

Current barriers

41. There are three barriers that users face in drawing information from electronic systems, as well as from printed materials. These may restrict current accessibility of technology information. First, most of the information is only available in English. Second, a lack of training in the use of electronic databases may prolong or even prevent some users from accessing appropriate data. This includes the lack, in some instances, of a "hotline" to answer relatively simple questions. Third, some databases have access and other fees that may be a barrier to obtaining technology information.

D. Options for possible centres and networks

42. There are numerous options for enhancing and/or building new international centres and networks, as well as for enhancing existing national centres. These options require consideration of the financial, institutional and operational aspects, some of which are beyond the scope of this initial report.

Enhancing existing and/or building new international centres and networks[10]

43. Options for enhancing and/or building new international centre(s) and networks need to consider the number of centres, the sectors to be covered, the type of services to be provided, the types of information needs and the user groups to whom information will be provided (see Table 3 below). Each of these factors directly affect the cost of options.[11] While not precluding any option, this paper focuses on three different levels to facilitate consideration by the SBSTA. The first level options are of relatively modest cost. The second level would be more costly, and the third the most expensive.

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[10] The term "building new" refers to a new capability at an existing physical facility or institution.

[11] Preliminary information on user needs was provided in the initial survey of technology information needs conducted by the secretariat. The survey will be expanded as described in section II of this document.

Table 3. Factors affecting the cost of possible future international centre(s)

Regions	Asia, Latin America and Africa
Sectors	Energy, agriculture, forestry, waste management, industry, transportation and adaptation
Information services	Identification, collection and compilation, synthesis and quality assurance
Users	National governments, local governments, business large/ small, education/research institutions, consultants/ engineering design firms, financial institutions and the public
Types of information	Strategic information on technology and policies, company lists, product lists, engineer/consultant lists, projects, financial services, policies, feasibility studies and scientific

First level

44. Extending existing information centres and networks could be a quick and relatively inexpensive option.

(a) Corporate and product databases. One possible approach to extending existing capabilities could be GREENTIE. Presently, GREENTIE, an initiative of the IEA and the Organisation for Economic Co-operation and Development (OECD) is a leading provider of information on corporations and product databases. It is accessible on-line and on CD ROM. It includes the participation of 25 member countries of the IEA/OECD[12] and its service is free to all countries. Approximately 9,000 organizations from 31 countries[13] are in the GREENTIE system. These organizations include suppliers of machinery and equipment, Research and Development centres, engineering and consulting companies, service suppliers, and also organizations that provide funding, training, reports or publications. For users in countries not yet actively participating, telephone and fax service is provided and sets of information are distributed in hard copies (FCCC/TP/1997/4).

GREENTIE provides information on technology to all countries, but transmits

[12] Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom of Great Britain and Northern Ireland, and the United States of America.

[13] Australia, Colombia S.A., Côte d'Ivoire, Denmark, Egypt, Eritrea, France, Germany, Hungary, India, Indonesia, Italy, Japan, Kenya, Mexico, the Netherlands, Norway, Philippines, Poland, Republic of Korea, Senegal, Seychelles, Sweden, Taiwan, Thailand, Tunisia, Uganda, the United Kindom of Great Britain and Northern Ireland, Uruguay, the United States of America, and Zambia.

information from sources only within the OECD member countries. Information on corporations and products from developing countries are not available. GREENTIE has been hitherto restricted to do so due, to its legal status and the implementing agreements, which bind it within the IEA and OECD context.

The GREENTIE database could be opened up to non-OECD information sources and users that meet agreed criteria. This might be accomplished at relatively low cost, perhaps in the range of 100-250 k (US$), but would need to be done on a multilateral basis.

(b) Improving linkages between national and international centres - Around 43% of the national centres and networks responding to the CTI survey cited inadequate computer equipment and limited or no Internet access as technical barriers. Improving access to equipment, and supporting users in how to make the best use of it, could foster access to climate-friendly technologies and could overcome barriers. Equipment could also help to link national centres to international centres and systems. Another barrier to accessing information electronically is the lack of training in the use of information technologies. This includes, in some cases, how to install and use hardware and software, how to develop Web pages and collect information from the Internet.

Bilateral and multilateral activities through workshops could be used to train experts in developing countries to access electronic information. Collaboration with industry might further strengthen the process of identifying technology information needs and solutions. A series of workshops might be held at a relatively modest cost, to ensure that there is a focal point to access information and train others in each developing country.

(c) Linking networks - Information about climate-friendly technologies is available at numerous institutions, spread over the whole world, each of which contains a part of the knowledge that together represents the current status of scientific and empirical knowledge as a whole. Many networks have been developed to disseminate such knowledge. However, one way to share this expertise is to improve linkages between institutions.

The Web itself has a “linking” nature. Any information put on the Internet can easily be linked to other sites through hyperlinking. Hyperlinking, moreover, allows providers to focus on their area of expertise while offering services to many users. There are many ways these linkages can be improved. Links between national centres and institutions in Annex I and non-Annex I countries can be established as can links between national centres and institutions within the countries.

The best way to improve these linkages is through the initiative of each institution. Although, in some instances national governments may need to provide an environment to enable this to occur.

Second level

45. A single international centre - A single international centre with limited functions could be established. The scope of such a centre would need careful consideration. One approach would be to focus activities on the needs of a few customers, such as national governments, local governments, small businesses and consultants/engineering-design companies (FCCC/SB/1997/4). Such a centre could also focus, initially, on providing only a few services like identifying sources and collecting and synthesizing information. Also, the types of information could be limited to publishing newsletters, for example, until such time that experience had been gained with the demand for its products. The cost of such a centre would be a function of its scope and location, but could range from 1 to 5 million US$.

46. The centre could focus on all or just a few sectors. If such a centre were to cover all sectors, it would need to rely on specialized centres for its information. Careful consideration would also need to be given to its institutional location. In this regard, options could include co-location with another international organization, such as, the Ozone Action Information Clearing-house (OAIC) of the UNEP or a national institution having complementary capabilities.

47. The abovementioned option would need either multilateral support directly from Parties on a voluntary basis or through the Global Environment Facility (GEF) and one of its implementing agencies.

Third level

48. Multiple international centres - Several international centres could be established either to serve regional users, providing limited information on all sectors, or to provide more detailed sectoral information on technologies for all users. As in the case of the single centre option, the services, customers and types of information would need to be considered. Multiple centres would, *a priori*, be able to provide more specialized information on technology information. Regional centres might have the advantage of being able to tailor products to meet the unique needs of each region. Sectoral centres would have the advantage of being able to focus on specialized technologies, such as renewable energy equipment.

49. Regional or sectoral centres could be co-located with other regional or specialized institution, so as to take advantage of existing capabilities. The cost of this option would depend on the number of centres and their functions. Its implementation would also need multinational support on a voluntary basis.

Enhancing existing national centres

50. National centres can be a complement to and an important user of information from an international centre(s). They can serve as an interface with the private sector and other local institutions, synthesize information and translate key information into local languages.

51. The enhancement of existing national centres could be pursued independently or in parallel with activities to enhance and/or build new international centres and networks. While several approaches could be considered. There are two ways to ensure the relevance to the Convention. The first would be to provide support to improve information for national communications. The second would be to provide support to developing countries.

52. As many non-Annex I Parties are preparing national communications, there is a need for the best available information on technologies. Enhanced support to improve the information collection capabilities in national centres could be accomplished, via modest support for enabling activities through the GEF. This support could take the form of the provision of software, equipment and training.

53. A second example might be the co-location of "community technology centres" with local industries in developing countries. These "centres" are typically equipped with personal computers, printers, a modem, a fax machine and a consultant. As a means of serving communities with modern communication facilities, community technology centres, sometimes called "telecottages", have been established by the private sector and governments in Australia, Brazil, Canada, some European countries and the United States of America. Such centres often start with basic functions, and then add functions as local people and organizations provide a demand. Often the following services are offered:

(a) Shared telecommunications, computer, and office facilities;

(b) Training in the use of the technology;

(c) Information technology consulting services;

(d) Local business and support services (data-processing);

(e) Electronic information access; and

(f) Local government information and meeting space.

54. There are three interrelated functions, in particular, that a community technology centre could address. These could include, providing a place where people in the community can become familiar with information and communication technology, increasing skill levels in the local business and community, and advising businesses and organizations on how to access information on technologies. A community technology centre could also provide a local capacity to evaluate and implement information technology. This type of activity has two aspects

in that both local initiative and involvement and some assistance are required. Technical support from governments in developing and developed countries could help to overcome initial barriers.

E. Issues requiring clarification

55. The SBSTA will need to consider whether the options provided in this document have merit and how it wishes to proceed. In this regard, the following issues warrant consideration:

(a) What general approach should be taken as a follow-up to this document?

(b) Are additional options needed and/or is more information needed on a particular option?

(c) If appropriate, what institutional arrangements should be considered regarding implementation of any of these options?

(d) How should the financial aspects associated with centres and networks be approached?

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