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COORDINATION OF ACTIVITIES IN SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Activities of the United Nations system in the field of science and technology for development, including cooperation in technology assessment

Report by the UNCTAD secretariat

The present report has been prepared by the UNCTAD secretariat to provide supplementary information to the report of the Secretary-General on the division of labour and coordination within the United Nations system in the field of science and technology (E/1994/70) submitted to the substantive session of the Economic and Social Council in 1994. It has been prepared on the basis of inputs received from organs, organizations and bodies of the United Nations system.

The report contains updated information on the current activities of the United Nations system in the area of science and technology for development. A number of organizations have made suggestions and recommendations on improvement of cooperation and coordination and on a more rational use of resources.

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BACKGROUND

1. At its substantive session in July 1993, the Economic and Social Council (ECOSOC) adopted decision 1993/321 on the report of the Commission on Science and Technology for Development on its first session and on a provisional agenda and documentation for the second session of the Commission. In line with that decision, the Commission will consider at its second session, under agenda item 3, the question of coordination of activities in science and technology for development.

2. According to the above decision and for the purposes of agenda item 3, the Commission would have before it two reports. The first report on "Division of labour and coordination within the United Nations system in the field of science and technology" (E/1994/70) (submitted to the second session of the Commission under the symbol E/CN.16/1995/6) was prepared by the Department for Policy Coordination and Sustainable Development (DPCSD) of the United Nations Secretariat and was considered by the Economic and Social Council, in July 1994, in its deliberations on coordination of the policies and activities of the specialized agencies and other bodies of the United Nations system related to science and technology for development. This present second report provides supplementary information on the main activities of the United Nations and the secretariat in the field of science and technology for development, including cooperation in technology assessment and forecasting, as well as the role of the United Nations system in endogenous capacity-building in science and technology.

3. In preparing the present report, the UNCTAD secretariat requested the executive heads of 25 organs, organizations and bodies of the United Nations system to provide the necessary information to assist in the preparation of the report. Below is a synthesis of the replies and the material received from these organizations on their respective work in the area of science and technology.

I. UNITED NATIONS ORGANIZATIONS AND BODIES

(a) Department for Development Support and Management Services (DDSMS)

4. The current mandate of DDSMS does not include the subject of science and technology, except insofar as it relates directly to technical cooperation programmes. With regard to activities related to the relevant policies of the Vienna Programme of Action, DDSMS and its predecessor, the Department of Economic and Social Development (DESD), which had absorbed the former United Nations Centre for Science and Technology for Development, carried out, until June 1993, and subsequently in agreement with the UNCTAD secretariat, the pilot project "Endogenous capacity-building in science and technology". This was undertaken in close cooperation with the UNDP Fund for Science and Technology and the Organization for Project Services in six selected countries over a period of four years. These countries were: Cape Verde, Jamaica, Pakistan, Togo, Uganda and Viet Nam. The objective of this pilot project was to develop a novel operational concept for science and technology derived and translated from the concept of building of endogenous capacity in science and technology, as introduced by the Vienna Programme of Action in 1979. With the completion of the pilot project, documentation is under preparation containing the experiences and results, including the operational concept which guided its implementation.

5. The summary of the project findings, conclusions and recommendations states the validity of the operational concept, but also its limitations. It points to the necessity to shift in international cooperation from primarily supply to primarily demand oriented approaches in promoting science and technology as a tool of socio-economic development; to perceive "capacity" in science and technology as a "system" which is determined by various societal

interests, functions and policy decisions affecting science and technology in the national context of application; to define "capacity-building" as a "process" of interaction of various actors towards a consensus on the role of science and technology in development and its most effective use, as a capacity to take informal and independent decisions on the application and generation of technologies for socio-economic development in its national context. This perception and approach is also reflected in follow-up activities which were initiated by the implementation of the pilot project in each of the six countries.

(b) Department for Policy Coordination and Sustainable Development (DPCSD)1/

6. As the secretariat for the Commission on Sustainable Development (CSD), DPCSD coordinates the preparatory process for CSD sessions. Among the cross-sectoral issues addressed by CSD, DPCSD is the Task Manager for (a) critical elements of sustainability; (b) financial resources and mechanisms; (c) transfer of environmentally sound technologies, cooperation and capacity-building; (d) decision-making structures; and (e) roles of major groups.

7. In the area related to the transfer of environmentally sound technologies, cooperation and capacity-building, DPCSD has monitored the progress made and problems encountered in the implementation of Chapter 34 of Agenda 21 (reported in the annual Task Manager's report to CSD), organized and/or participated in the intersessional activities of CSD, and provided substantive support to the relevant work of the Inter-agency Committee on Sustainable Development (IACSD), as well as CSD.

8. The monitoring of activities under Chapter 34 relates to three major areas, namely: (a) policies and programmes to promote environmentally sound technologies; (b) improving access to and dissemination of information on environmentally sound technologies; (c) capacity-building for managing technological change; and (d) promoting technology cooperation and partnerships.

9. For 1993-1994, the main CSD-related activities in the area in which DPCSD was involved included: (a) workshop organized by UNCTAD on technology transfer (Oslo, Norway, 1993); (b) preparatory meeting on technology transfer (Cartagena, Colombia, 1993); (c) Inter-sessional Ad Hoc Open-ended Working Group on Technology Transfer and Cooperation (New York, February 1994); and (d) Workshop on the Promotion of Access to and Dissemination of Information on Environmentally Sound Technologies (Seoul, Republic of Korea, November-December 1994).

(c) Economic Commission for Africa (ECA)

10. Formulation and implementation of relevant policies constitute a major area of focus in ECA activities in science and technology. ECA provided advisory services to several member States in connection with the establishment or strengthening of their national machineries for science and technology policy-making and planning. Within this activity, ECA carried out a performance review of science and technology policy institutions in 11 African countries. The study recommended reforms which could lead to removal of the disparity between the observable performance and the statutory powers and functions of these institutions, and thereby increase their effectiveness. Furthermore it recommended that greater emphasis be given to technology issues, as the institutions concerned tended to focus more on science and scientific research.

1/This Department has prepared for consideration by the Commission on Science and Technology for Development at its second session a separate report on the progress achieved and problems encountered in the application of science and technology for sustainable development (E/CN.16/1995/12).

11. At the regional level, ECA provided professional, technical and other forms of support to key regional institutions in science and technology. The Commission organized the biennial meetings (1991, 1993) of its Intergovernmental Committee of Experts for Science and Technology Development (IGCESTD). The four Working Groups of the IGCESTD provide an avenue through which member States can focus on important problems in their respective subregions and work out collaborative measures for their solution. ECA was the implementing agency for UNDP-funded projects for improving the institutional capacity of a number of regional institutions in science and technology. In this respect, ECA cooperated closely with UNIDO, UNDP, the International Development Research Centre (IDRC), the Carnegie Corporation, the Organization of African Unity (OAU), and other international organizations. The Vienna Programme of Action (VPA) (1979) provided an important reference point in the evolution of the ECA programme of activities in science and technology.

12. ECA was involved in the operational activities of several regional institutions. In the area of capacity-building, it dealt with the development of the computer-based information systems at the African Regional Centre for Technology (ARCT). ARCT has developed several data bases of particular interest to the member States, including: ARCTIS (multidisciplinary bibliographic data base); AFRDIR (Directory of Scientific and Engineering Societies in sub-Saharan Africa); ERG (bibliographic data base on energy); INSEXP (Directory of S&T Experts and Institutions in Africa); and FORMA (Directory of Technician Training Institutions in Africa). Computer equipment and relevant software have been provided to national information focal points to permit on-line connection with them. Various training programmes have been undertaken at the ARCT headquarters and throughout the region to upgrade the member States' capacity in retrieval, processing and dissemination of scientific and technological information, particularly in the priority areas of ARCT, i.e. food and energy. Similar efforts have been made at the African Regional Organization for Standardization through its Network of Documentation and Information System (ARSO-DISNET). An international training seminar on science and technology management in Africa was held in Conakry, Guinea, in 1992. Another training seminar was held in Kampala, Uganda, in 1993 on the integration of science and technology, economic and development policies. A third was organized in the same venue in September 1993 on the subject of technology assessment: concepts, methodologies and institutional arrangements. In 1992, ECA organized an ad hoc expert group meeting on the application of nuclear science and technology in the field of agricultural production and food preservation. The subsequent meeting of the ad hoc group of experts (May 1994) reviewed the current status of capacities for nuclear science and technology in member States and dealt with measures for increasing that capacity. In September 1994, ECA organized an ad hoc expert group meeting which examined various issues on the transfer of technology, particularly in the sectors of industry, transport and communications.

13. In the view of ECA, closer cooperation amongst bodies and agencies pursuing activities in Africa will be necessary. This could evolve during intergovernmental meetings on science and technology at which issues are considered in great detail and subregional and regional approaches developed. There is a need for better cooperation between United Nations headquarters and the regional commissions.

(d) Economic Commission for Europe (ECE)

14. While the majority of the ECE's subsidiary bodies promote the exchange of information on sectoral technologies and their application, the principal subsidiary body responsible for strengthening scientific and technological cooperation consists of the Senior Advisers to ECE Governments on Science and Technology (SAST).

15. In order to assist science and technology authorities and policy-makers, SAST undertakes reviews of major changes in overall national science and technology policies, including those relating to international science and technology cooperation. The last review was held in 1992 and the next one will be carried out in 1996. Within this activity, SAST aims at collecting, in close cooperation with the Conference of European Statisticians and the Organisation for Economic Cooperation and Development (OECD), statistical data on the main science and technology indicators in the economies in transition. In this context, SAST organized, in 1990 in Prague, a seminar on the role of long-term forecasting in the formulation of science and technology policies.

16. SAST examines issues related to policies on science and technology aimed at promoting innovation in industry. A workshop on science and technology in the economies in transition aimed at promoting innovation in industry was held in Warsaw in 1992, and a similar seminar is planned in 1995. SAST also examines issues related to the reorganization of the system of management of science and technology under the new economic and political conditions in order to preserve and develop the scientific and technological potential of the economies in transition. A seminar will be held in 1996 in the Russian Federation.

17. SAST maintains an inventory of existing safety guidelines in biotechnology, including existing laws and regulations and, where relevant, any planned measures in order to identify developments and national experience gained in this field. In early 1995, ECE published an inventory of safety guidelines in biotechnology.

18. At their regular sessions, the Senior Advisers discuss particular subjects of common interest to member countries, such as: the organization and management of R&D in the economies in transition (1991); managerial aspects and the relationship between national and federal/regional bodies in promoting innovation (1992); and main issues of national science and technology policies in the economies in transition and the role of international organizations in maintaining and developing their R&D potential (1994).

(e) Economic Commission for Latin America and the Caribbean (ECLAC)

19. One important theme of ECLAC activities in science and technology has been the technological modernization and upgrading in the region. Science and technology has thus been a major thrust of major secretariat position papers. In the period 1991-1994, the topics covered in these papers included: sustainable development: changing production patterns, social equity and the environment (1991); social equity and changing production patterns: an integrated approach (1992); education and knowledge: basic pillars of changing production patterns with social equity (1992); and a study on telecommunications and information (1992). In addition to these major secretariat documents which received widespread diffusion at the biannual ECLAC Conferences and seminars, the Commission is concluding work on a study on competitiveness and restructuring in four important sectors in five countries of the region, and in which technological upgrading is one of the key dimensions analyzed. Two seminars have already been held on early drafts of these documents, and four separate monographs are being prepared on each of the sectors.

20. A UNDP-financed project of ECLAC has also had as one of its key policy concerns the definition of technology policies to assist in the restructuring process and to enhance competitiveness in the region. This project has given rise to technical assistance missions and reports on technological policy in nine countries, conferences on technological policies in another four countries, and 13 published papers on industrial and technological policies in open economies. The counterpart institutions for this project have been industry ministries and entrepreneurial associations. With respect to

science and technology and the environment, ECLAC has prepared a special report on the environmental impact of the paper and pulp industry and relevant technologies. In addition, ECLAC is undertaking a study on successful cases of domestic innovation in the development of cleaner technologies which have also proven to be cost-efficient. A seminar with industrial leaders was held on this subject in 1994 in Santiago, Chile. Finally, ECLAC has provided important technical assistance to science and technology institutions in the public sector in Bolivia, Brazil, Chile and Mexico.

(f) Economic and Social Commission for Asia and the Pacific (ESCAP)

21. During the 1991-1994 period, activities of ESCAP to strengthen the institutional infrastructure for science and technology included expert group meetings and workshops on patent laws and the legal aspects of technology transfer, national standards system, technology management and the application and extension of the Technology Atlas. The Meeting of Ministers of Industry and Technology expressed support for the temporary establishment of a technical consultancy development programme for Asia and the Pacific as an interim measure preceding the selection of a body to oversee and manage regional activities on the basis of technical cooperation among developing countries (TCDC). The transfer and diffusion of technology was also given high priority, especially with regard to energy conservation and new and renewable sources of energy. Advisory services were rendered to improve the capability of the least developed countries to import technology. In 1993, the promotion of greater regional cooperation in science and technology in accordance with the Beijing Declaration on Regional Economic Cooperation, adopted by the Commission at its 1992 session, was given high priority. The third meeting of the Steering Group of the Committee for Regional Economic Cooperation (Tokyo, 1993) formulated an Action Programme for Regional Economic Cooperation in Technological Capability-building for Investment-related Technology Transfer for a five-year period. The programme pays special attention to least developed, island developing and transitional economies.

22. While ESCAP has in the past provided assistance to member countries to promote technology, it is difficult to assess the extent of the impact of such activities on endogenous capability-building. As for future activities, while the advanced group of developing countries will require specialized assistance in new and emerging technology and other areas, for the majority of less developed countries a more comprehensive and focused collective approach to technical assistance is called for in partnership with interested regional partners.

23. ESCAP's work in science and technology has been coordinated with other organizations. System-wide coordination has taken place through working arrangements, working relationships, complementary or joint activities, joint programming, joint review meetings and joint units. There has been cooperative action in the exchange of information and assessment and monitoring of science and technology development globally and regionally through the periodic meetings of the former ACC Task Force on Science and Technology and the mid-term review of the Vienna Programme of Action on Science and Technology for Development. In the view of ESCAP, it may be desirable to establish an arrangement to enable the highlighting of a selected number of priority activities for developing countries (such as endogenous capacity-building, assessment and transfer of new and emerging and environmentally sound technologies, bringing the LDCs into the mainstream of industrial and technological development by carefully designed science and technology activities, etc.) requiring joint action and joint financing from both regular and extrabudgetary sources. For cost-effective use of resources for the implementation of priority activities, decentralization of financial and human resources from central units, where appropriate, should be encouraged.

(g) Economic and Social Commission for Western Asia (ESCWA)

24. As a result of deliberations within ESCWA in 1994, it was decided that special attention be given to priority areas of the region, including water scarcity, desertification, agricultural development and environmentally sound industrial development. In these areas a number of projects are being developed in cooperation with other international organizations (UNEP, FAO) and industrialized countries (Germany). ESCWA activities in building the capacity to assess, select and negotiate technologies address methodologies for technology transfer, adaptation, development and dissemination. Enhancing this capacity is closely related to the vitality and dynamism possessed by R&D capabilities. ESCWA organized, in 1993, a workshop on methodologies for the integration of science and technology in the development planning and management process. A workshop to be held by ESCWA in May 1995 on the revitalization of research and development in the ESCWA region will build on the results of the above meeting by considering the role of local research and development (R&D) institutions in achieving sustainable development.

25. Within its activities aimed at enhancing the capacity to use and disseminate technologies, ESCWA organized, in 1992, an expert group meeting on the implications of new and advanced materials technologies for the economies of selected ESCWA countries. A follow-up meeting is planned for September 1995. ESCWA also laid the groundwork for regional action on phasing out ozone-depleting substances (ODS). In the area of biotechnologies, ESCWA organized, in 1989 and 1993, two regional conferences on perspectives of modern biotechnologies. In 1994-1995, ad hoc expert group meetings were planned on the following subjects: environmental impact assessment; sustainable agriculture and rural development in the region; environmentally sustainable settlements; applications of remote sensing and isotope technologies for water resource exploration and development; solar thermal and photovoltaic systems; management and sustainable development of dry lands.

26. Efforts have been made by ESCWA to establish regional centres and a network for training in and transfer of technology. ESCWA has cooperated with the Office for Outer Space Affairs in the establishment of the Regional Centre for Space Science and Technology Education. Within its efforts to establish a regional water training network, ESCWA organized, in 1993, a regional symposium on water use and conservation. The symposium resulted, *inter alia*, in the initiation of the first regional training network in the water sector in the region. In addition, in 1994-1995 ESCWA will conclude training exercises which are expected to improve the effectiveness of technology transfer and utilization in agricultural project planning and environmental considerations (training of trainers) and in monitoring and evaluation of rural development projects.

27. ESCWA technical assistance to member States includes identifying technological problems in specific industries, assessment of R&D activities, technical assistance to chambers of trade and industry and institutions responsible for overseeing the adoption and implementation of standards and quality assurance measures, assistance and technical advice to enterprises on environmental problems, etc. ESCWA has organized, with the support of the International Development Research Centre (IDRC), UNIDO, the Islamic Foundation for Science and Technology and several national institutions, special courses in technology negotiation and acquisition, as well as in integrating science and technology in the development planning and management process.

28. In the view of ESCWA, to enhance cooperation and coordination of the work in science and technology, the recommendations of the Commission on Sustainable Development (CSD) and the Commission on Science and Technology for Development (CSTD) should be synchronized with the formulation of the programme of work in the UN system so that selected recommendations can be

made the subject of common and coordinated activities. The participation of the regional commissions in the work of CSD, CSTD and the Inter-Agency Committee on Sustainable Development should be supported by the regular budget. The activities of UNCTAD in the field of science and technology for development should be enhanced and coordinated with the regional commissions.

(h) United Nations Centre for Human Settlements (HABITAT)

29. HABITAT is engaged in promoting and facilitating the transfer of environmentally sound technologies and capacity-building through international cooperation within the framework of Agenda 21. Its activities cover research and development, technical cooperation, information dissemination and training. In the energy sector, the Centre's activities are currently focused on conserving energy in human settlements and using renewable low-polluting energy sources, with emphasis on promoting biomass energy technologies to meet the needs of the poor. In the field of low-cost water and sanitation, the Centre has published several technical manuals on appropriate technologies which can be afforded by low-income communities. In the area of waste management, the Centre's efforts in recent years have focused on promoting capacities in developing countries for solid waste management in an environmentally sound manner. The Centre has recently carried out a research project on the promotion of small-scale waste recycling technologies covering five countries in the Asian region. Following this project, the Centre's activities in this field have been extended to Africa and Latin America. Addressing the environmental concerns in the construction sector, the Centre has conducted baseline studies in all developing regions. The Centre has produced a technical publication entitled "Development of National Technological Capacity for Environmentally Sound Construction". The Centre also organized, jointly with UNIDO, the first Global Consultation on the Construction Industry in Tunis in 1993.

30. The strategic objective of HABITAT in the area of endogenous capacity-building is to strengthen the capabilities of capacity-building institutions of developing countries and countries in transition in three key areas: settlements management and development; women in human settlements development; and housing in development, presently changing into action planning for sustainable urban development (localizing Agenda 21). This is done primarily through integrated, demand-based, multi-year capacity-building projects. The main types of tools and activities include regional workshops, high-level policy dialogue/seminars/consultations, training advisory services, development and dissemination of manuals, etc.. Since the initiation of the Habitat's training activities in 1979, several hundred trainers, officials and professionals have improved their capacity in settlements management and development.

31. As for specific activities, HABITAT organized, in 1993-1994 in Zambia and the United Republic of Tanzania, courses for advanced training of trainers in local government management for East and Southern Africa and a subregional workshop on housing in development in Nairobi. In South Asia, the principal activity was the workshop on collaboration of NGOs and capacity-building organizations with local Government in management of local development, held in Bangladesh. In Central and Eastern Europe, the course for training of trainers in local government management was held in Romania in 1993. A workshop on human resource development and training in settlements management in European transition countries was held in Hungary in 1993. The first HABITAT training course in the Russian language on settlements management and development for Eastern European countries was held in Lithuania in April 1994. The second such course, but with emphasis on training of local government officials, was held in Ukraine in November 1994. In Latin America, HABITAT continues to implement capacity-building activities within the framework of the multi-donor programme "Sistema de Apoyo y Capacitación para el Desarrollo Local" (SACDEL).

32. HABITAT emphasizes long-term partnerships with other external support agencies and with development-assistance-oriented training and academic institutions. The main partners in the field are national and local, and occasionally regional, capacity-building institutions. Principal users are national and local operational settlements management and development agencies. The beneficiaries are the communities and population in general, especially those with bad living and working conditions - the poor and other disadvantaged groups. HABITAT collaborates closely with UNDP and the World Bank, as well as with the development assistance agencies of individual countries.

(i) United Nations Conference on Trade and Development (UNCTAD)

33. UNCTAD's work programme in support of the economic development of developing countries is to promote transfer of technology to, and development of technological capabilities in, developing countries. These activities cover work on technology issues in their interrelationship with trade in goods and services, investment, finance and environment, as well as the role of entrepreneurship in the transfer, development and management of technology and related policies, modalities for channelling technology flows to developing countries and the role of intellectual property protection. In UNCTAD technical cooperation activities, priority consideration is given to assessment of developing countries' requirements for building up their capacity to evaluate, select, negotiate, acquire and develop technology; to programmes for human resource training, including training in the formulation of technology policies and the development of technical and managerial capabilities; and to the transfer, adaptation and generation of environmentally sound technologies.

34. UNCTAD's Ad Hoc Working Group on the Interrelationship between Investment and Technology Transfer, at its first session in january 1993, adopted an action-oriented work programme covering: (a) investment flows, transfer of technology and competitiveness; (b) technological capability-building in developing countries, particularly the LDCs, and in countries undergoing the process of transition to a market economy; and (c) transfer and development of environmentally sound technologies. At two subsequent sessions in December 1993 and March 1994, the Working Group analyzed, in particular on the basis of about 20 country case studies, factors that encourage firms to increase investment flows, including the enabling environment in host countries, the level of education and training, R&D potential, and supportive infrastructure. Attention was also given to transfer and development of environmentally sound technologies. For this purpose, a special workshop was organized in cooperation with the Government of Norway in 1993. The main recommendations of the Working Group relate *inter-alia* to activities aimed at technological capacity-building in developing countries, particularly in least developed countries and countries in transition; the organization of a world dialogue on technology cooperation; encouraging technology partnerships between enterprises; and generation and dissemination of environmentally sound technologies.

35. As a result of the recent restructuring of the economic and social sector of the United Nations, UNCTAD has absorbed new responsibilities in the area of science and technology, including servicing the Commission on Science and Technology for Development. The main objectives of the Commission are to promote international cooperation in science and technology and contribute to the elucidation of global science and technology issues. The Commission is also called upon to formulate policy guidelines for the harmonization of policies within the United Nations system, monitor science and technology activities in the United Nations system, and promote mobilization of resources.

36. Within its technical cooperation activities, UNCTAD has in recent years implemented a number of projects, in particular a project on transfer and utilization of technology in least developed countries of Asia and the

Pacific, several projects at regional and country levels on commercialization of research and development (R&D) results, a research project with a technical assistance component on technological dynamism and R&D in exports of manufactures of developing countries, and a project on transfer and development of environmentally sound technologies. Recently efforts have been taken to launch a comprehensive project to enhance entrepreneurial and technological capacity and competitiveness of small and medium-sized enterprises (TRANSTECH).

37. In carrying out the above activities, UNCTAD has established close working relations with many organizations of the United Nations system, including DPCSD, FAO, ILO, UNESCO, UNIDO, UNU (INTECH), WHO, regional commissions and other institutions.

(j) United Nations Environment Programme (UNEP)

38. UNEP's activities in science and technology can be broadly grouped into two categories: (i) those relevant to the state of the environment and environmental mechanisms; and (ii) those contributing to environment and development by way of providing management tools.

39. UNEP has been active in the development and operation of a number of environmental monitoring systems. The Global Environmental Monitoring System, a UN system-wide global collaborative system established by UNEP in the 1970s, collects, synthesizes, collates and disseminates data and information on the environment. The programme activities of UNEP have contributed to the scientific advancement in international recognition and awareness-building in respect of emerging environmental problems and thus to the conclusion of a number of international environmental conventions. In the implementation phase of these conventions, UNEP's contribution has been, and will continue to be, instrumental. In the post-UNCED era, facilitating the application of environment-related knowledge and information is one of the most important mandates of UNEP.

40. In the area of international transfer of environmentally sound technologies, UNEP has been active in: (i) collection and dissemination of environmental information and data; (ii) collection and dissemination of information on cleaner production technologies, in particular though the International Cleaner Production Information Clearinghouse (ICPIC) and the Ozone Action Information Clearinghouse (OAIC), and through various reviews; (iii) support for the direct transfer of technologies through education and training programmes (a programme is being developed jointly with UNIDO to support the establishment of National Cleaner Production Centres aiming at supporting the transfer of environmentally sound technologies); (iv) provision of intergovernmental forums, including the Multilateral Fund for Ozone Layer Protection; and (v) research into the potential barriers hindering technology transfer, and consideration of modalities for the promotion of technology transfer. A number of relevant demonstration projects are being carried out. Research into potential barriers is one of the functions of the newly created UNEP International Environmental Technology Centre in Japan.

41. As a follow-up to UNCED, UNEP has had an overall programme review aimed at ensuring integrated sectoral and cross-cutting programme activities while achieving three priorities, i.e. (a) capacity-building, (b) catalyzing environmental action and (c) sensing the environment.

42. With respect to inter-agency coordination, UNEP is of the view that the questions of science and technology have been considered largely in the context of specific sectoral programmes, resulting in the absence of a UN legislative body which could have a coordinating role. In this regard, technology transfer is covered by one of the thematic clusters of issues to be considered annually by the Commission on Sustainable Development (Task Manager: DPCSD). This could mean that CSD would be able to play a major

coordinating role in the context of the implementation of Agenda 21. However, science and technology for sustainable development should not be considered in the narrow context of industrial technologies, but should include soft technologies (know-how, administrative procedures, policy tools) as well as indigenous technologies. The needs of developing countries and countries in transition should be identified, and international action should be planned to meet such needs.

43. Since this question comprises a wide range of issues, UNEP suggests that the discussion of inter-agency collaboration and coordination for science and technology should be organized around the following: (a) international programme activities supporting the development and implementation of national policies and programmes for promoting the development of science and technology for sustainable development; and (b) international programme activities for promoting the transfer of environmentally sound technologies and their use, including: (i) strengthening national capability to apply the results of scientific research and to use technologies, which would involve impact assessment of applying such results and technologies in the context of the country's socio-economic situation; and (ii) provision of international mechanisms or processes, including international funding to promote transfer of technologies.

44. Obviously, the development of science and use of technologies must take into consideration the needs of the beneficiaries, as well as the contribution of major groups, in particular industry sectors. Industry's potential contribution as regards the development and dissemination of technologies needs to be further elaborated and solicited in UN system-wide activities. The participation of non-governmental organizations in international discussions and an increased contribution from the scientific community should be promoted.

(k) United Nations University (UNU)

45. As far as the areas of science and technology and endogenous capacity-building are concerned, UNU has completed a series of studies on the Japanese technological and industrial experience. In an effort to provide some answers to the question of how Japan was able to industrialize and achieve technological superiority so quickly, the series examines technology and development in Japan from the Meiji period to the present. These studies resulted in the following UNU Press publications: The Japanese Experience in Technology: From Transfer to Self-Reliance (1990); Vocational Education in the Industrialization of Japan (1987); General Trading Companies: A Comparative and Historial Study (1991); The Role of Labour-Intensive Sectors in Japanese Industrialization (1992); and Technological Innovation and the Development of Transportation in Japan (1993).

46. The UNU's Institute for New Technologies (INTECH) is a research and training centre devoted to the economic and social aspects of new technologies. It seeks to improve the understanding of the implications of new technologies for development strategies and industrialization policy, the influential factors in the diffusion of new technologies to developing countries, and the impacts of new technologies on socio-economic variables such as output, trade, employment and distribution of welfare. Besides research and advanced academic training, INTECH's tasks comprise information dissemination.

II. SPECIALIZED AGENCIES

(a) Food and Agriculture Organization of the United Nations (FAO)

47. FAO promotes the further development and practical application of science and technology specifically for productive and sustainable agricultural, forestry and fisheries development. The activities are undertaken under the Organization's regular and field programmes. Through its agricultural education programmes, FAO promotes the development and application of science and technology by means of teaching programmes, research at well established agricultural universities, and outreach or extension programmes for end-users of scientific and technological information and know-how. FAO has conducted round tables on strategy options to improve the effectiveness of agricultural education institutions in eastern, western and southern African countries, in Latin America and the Caribbean, in Asia and in Eastern European countries. Through support for national agricultural extension programmes, FAO promotes the proper application of scientific knowledge and practical technologies by farmers. The focus of assistance is on small farmers who produce most of the food in developing countries.

48. FAO's work in research and technology development has a wide range of objectives: to increase and intensify food production, improve consumption and nutrition, raise the value added of agricultural produce, improve income-earning capacity, and create opportunities for employment in production, processing and marketing of agricultural goods. By means of a number of assistance activities to improve the coverage and effectiveness of agricultural extension systems and programmes, FAO, through its regular and field programmes, works with as many as 80 developing countries every year. It is estimated that there are more than 600,000 extension workers in the world, most of whom are in developing countries. Utilization and application of science and technology in agriculture is also provided through support to group training activities to increase food and agriculture production and improve natural resources management. Every year, FAO, through its field programme, supports more than 1,000 training activities.

49. Technical cooperation among developing countries (TCDC) and economic cooperation among developing countries (ECDC), and in particular South-South transfer of technology, are high priorities in FAO. FAO supports many activities covering inter-country training, exchange of expertise, technology transfer and networking in the field of agriculture, fisheries, forestry, nutrition and rural development. FAO supports about 100 networks in the four developing regions. Major new developments such as changes in world agriculture, advances in science and technology and changes in population and society require the integration of academic learning (human resources development) and development tasks and institutional approaches to decision-making.

50. In the view of FAO, coordination of science and technology activities in the United Nations system is undoubtedly important, and practical arrangements to achieve it should imply collaboration and synergy instead of fragmentation and duplication.

(b) International Atomic Energy Agency (IAEA)

51. In all of its programme areas, IAEA provides technical cooperation for developing countries, with emphasis on capacity-building and development and transfer of technology. Close contact on technical co-operation matters is maintained with UNDP and all other agencies of the United Nations. In particular, the IAEA secretariat has initiated contacts with UNDP with respect to projects in the field of safe and environmentally sound management of radioactive wastes (Agenda 21). Certain activities have been undertaken in connection with Chernobyl. The secretariat has closely followed

developments in and around the Global Environment Facility set up by the World Bank, UNDP and UNEP.

52. It is the view of the IAEA secretariat that the smaller technical agencies of the UN system are affected by the trend towards more national execution of UNDP-financed projects, as well as by an apparent gradual reorientation of UNDP from its traditional role as the central funding mechanism of the UN development system towards more direct support for Governments through its own executing mechanism. This is leading to a shortfall in UNDP support costs, which hitherto had been the main source of financing for the backstopping of technical cooperation activities in some agencies. There is particular concern that, owing to this situation, it will become extremely difficult for these agencies to play a role in the upstream work necessary in connection with project and programme planning. The smaller agencies have repeatedly expressed this concern to UNDP and have stressed the importance of preserving the unique features of the UN system and of ensuring that the expertise available remains accessible to developing countries.

(c) International Civil Aviation Organization (ICAO)

53. ICAO's Technical Cooperation Programme, through the provision of technical experts, training fellowships and assistance in the development of national and subregional civil aviation training institutes, fosters endogenous capacity- building in civil aviation technology. The Interregional TRAINAIR Programme is a global training resource-sharing network which, with ICAO's support, is designed to assist the civil aviation training centres of the developing world to reach academic self-sufficiency. ICAO's whole technical air navigation work programme provides a means by which civil aviation specialists from all Member States can develop their knowledge of civil aviation technology. Through participation in specialized seminars and workshops on the one hand and in world-wide air navigation conferences on the other, civil aviation specialists participate in the review and updating of technical standards and consider related air navigation development.

54. ICAO constantly keeps abreast of developments in air navigation, including studies and trials being conducted in individual States. ICAO cooperates closely with international organizations specializing in various aspects of air navigation technology such as the International Air Transport Association, the International Federation of Air Line Pilots' Associations and the Airports Council International. An important undertaking of ICAO is the development of communications, navigation, surveillance and air traffic management (CNS/ATM) systems using satellite technology. The introduction of the ICAO CNS/ATM systems represents a significant departure from the present air navigation systems and requires an unprecedented cooperative effort between civil aviation administrations, international organizations, service providers and users. The ICAO Council has established a high-level ICAO CNS/ATM Systems Implementation Task Force composed of representatives of States and technical international organizations to advise on how ICAO can best assist States in the timely and cost-effective implementation of the CNS/ATM systems in support of the future global air traffic management system.

55. ICAO has a broad and long-standing working relationship with other technical organizations of the United Nations system, including ITU, the World Meteorological Organization (WMO), IMO, IAEA, UNDP and ECE. ICAO participated regularly in meetings of the ACC Consultative Committee on Programme and Operational Questions.

(d) International Labour Organisation (ILO)

56. ILO has identified strategies for the possible redeployment of part of the third world workforce which is likely to be made redundant by the

introduction of biotechnology-based substitutes for their traditional exports to industrialized countries.

57. ILO studies demonstrate that it is hazardous to generalize on the overall employment effects of the application of microelectronics in both industrialized and developing countries because of the differential impact of its use across sectors and because of various compensating factors, e.g. through the creation of new tasks, processes and products and through business expansion, which partly or fully make up for the jobs lost directly.

58. ILO studies will extend to the effect of technology-driven globalization of production, on the global redistribution of jobs and on the linkages between the internal labour markets of industrialized and developing countries.

59. ILO has produced a special Conditions of Work Digest series on workers' privacy, given the current advances made in data processing technology. This series extends to identifying preventive measures to reduce work stress and to improve the content of jobs associated with new technologies.

60. Chemical safety has been given a high priority in the core programme of ILO in improving working conditions and the environment. Numerous codes of practice have been produced. Practical guides under the ILO Occupational Safety and Health series have been produced to protect workers, mostly women, from the adverse health effects of using visual display units (VDUs).

61. ILO will continue to emphasize community-based skills training approaches to support self-employment, and income generation schemes for rural and urban informal sectors. ILO activities have also shed light on how new technologies can help disabled persons to enter the labour market and compete for jobs.

(e) International Maritime Organization (IMO)

62. The work of IMO is by and large scientific and technological in character. IMO maintains a constant overview of factors having a bearing on the performance of the world's merchant fleet with respect to maritime safety and prevention of marine pollution from ships. Every effort is made to anticipate situations which could place a merchant vessel in jeopardy, and to adopt the necessary measures to ensure that commercial ships and craft are designed, constructed, equipped and manned in such a way as to enable them to survive in all foreseeable circumstances. Nevertheless, as casualties do occur, IMO must also respond by ascertaining the causes and, where necessary, developing new standards to introduce the improvements required.

63. Examples of the work undertaken are the Code of Safety for Dynamically Supported Craft (1977) and the International Code of Safety for High Speed Craft (1994). The adoption in 1993 of a Code for the Safe Carriage of Irradiated Nuclear Fuel, Plutonium and High-level Radioactive Wastes in Flasks on board Ships, and current work on passenger submergibles and wing-in-ground craft are also cases in point.

64. The development of self-reliance through the training of national experts has been and remains one of the cornerstones of IMO's technical cooperation activities. The Organization plays a central role in supplementing national managerial, administrative and technical capacities by providing assistance for either the formulation or the execution of projects in the maritime field. More particularly, the Integrated Technical Cooperation Programme (ITCP) of IMO emphasizes the transfer of maritime expertise and technology through the establishment of training institutions aimed at developing managerial capacities in maritime safety, maritime legislation, marine pollution, and other related aspects of shipping and ports. The ITCP is composed of regional programmes. Under the auspices of IMO, maritime training programmes are offered through the World Maritime

University and the International Maritime Law Institute. Training in various maritime disciplines is offered in the form of individual fellowships either through existing IMO projects or donor fellowships in specific topics. Furthermore, short specialized IMO Model Courses have been developed to complement the course programme at the World Maritime University. The courses are implemented at various maritime training institutes throughout the developing world.

65. Owing to financial constraints experienced by UNDP, individual donors and recipients, funding for the implementation of IMO's technical cooperation activities has decreased. IMO is taking steps to mobilize resources from the private sector in both developed and developing countries.

66. Cooperation with other organizations of the United Nations system is essential to the work of IMO. IMO cooperates closely with ILO, UNCTAD, UNEP, UNESCO, IAEA and ECE. Some other technology-oriented non-governmental organizations are also associated with the work of IMO.

(f) International Telecommunication Union (ITU)

67. The Union's main activity is in the area of telecommunications and related information technologies. The Union's development function has gained increased impetus since the creation of the Telecommunication Development Bureau (BDT) as a new sector which assists developing countries with the development of their telecommunication network. Two major ITU conferences in 1994, namely the World Telecommunication Development Conference in Buenos Aires, in March 1994, and the ITU Plenipotentiary Conference in Kyoto (September-October 1994) recognized that the rapid development and convergence of telecommunications, computer, broadcasting and information technology are redefining the boundaries of the telecommunication industry, giving rise to new product and service opportunities. The Buenos Aires Action Plan approved 12 new complementary programmes which include areas such as human resources management and development, development of maritime radiocommunication services, computer-aided network planning, frequency management, integrated rural development (study of appropriate technologies for rural telecommunications), broadcasting infrastructure, information services, development of telematics and computer networks. The ITU Kyoto Plenipotentiary Conference has set the premises to pave the way to the instauration of a truly global information infrastructure. The adoption for the first time of a Strategic Plan 1995-1999 touched on a number of important trends in the international telecommunication environment, namely on technological convergence, globalization, global information economy and society, geopolitical change and the development gap. In the development domain, the ITU mission is to promote and offer technical assistance to developing countries in the field of telecommunications, promote the mobilization of the human and financial resources needed to develop telecommunications, and promote the extension of the benefits of new telecommunication technologies to people everywhere.

68. With regard to the information economy and society in the twenty-first century, the Strategic Plan has called upon ITU to "establish, in cooperation with international and regional organizations, a vision of the role telecommunications will play in global economic and social development, communicate this vision to other international organizations, and coordinate its activities with them in pursuit of mankind's common goals."

(g) United Nations Educational, Scientific and Cultural Organization(UNESCO)

69. Several UNESCO initiatives are specifically related to science and technology education and education for sustainable development. In January 1994, a major new Project on enhancing Scientific and Technological Literacy for All (Project 2000+) was launched with the aim of paying increased attention in the future to science and technology education at all levels of

schooling. Another initiative is the International Project on Technical and Vocational Education, which represents an effort to match education and employment. The third initiative represents the joint UNESCO-UNEP International Environmental Education Programme which has become an integral part of the new Interdisciplinary and Inter-agency Project on Environment and Population Education and Information for Human Development.

70. Cooperation with developing countries in support of training of scientific and technical manpower for sustainable development is in the focus of UNESCO's activities. The first area in this field covers the basic and engineering sciences. The aim of UNESCO action is to improve, update and strengthen university teaching, particularly at the undergraduate level in the basic and engineering sciences. This programme includes regional and subregional networks in university teaching. The networks are often part of the broader University Twinning (UNITWIN) project and the UNESCO Chair Scheme. The second area of action is in specialized environmental sciences with the objective of helping in developing countries to increase the number of trained personnel in the specialized areas of UNESCO's environmental science undertakings which address specific topical chapters of Agenda 21, in each of which specialized programmes are being implemented. The third domain of UNESCO's capacity-building action addresses other specialized scientific areas which are highly relevant for sustainable development, yet which are not addressed by specific chapters of Agenda 21. A common feature of all three domains of UNESCO action in the field of manpower training is South-South and North-South cooperation through interconnected regional and subregional networks focused on training, research and sharing of knowledge aimed at assessing, adapting and managing environmentally sound technologies.

71. Existing specialized institutions, including R&D institutions, university departments and government agencies are the main working partners and "clients" of UNESCO's scientific, technological and educational programmes. Strengthening these institutions through direct technical and sometimes also financial support is a main goal of these programmes. A third very important means of strengthening existing institutions is the support provided by UNESCO for the establishment and functioning of information and collaborative networks, including support for programmes of cooperation. For example, UNESCO's Intergovernmental Oceanographic Commission, Man and the Biosphere Programme and International Hydrological Programme have established in their respective fields subregional and regional networks for research, training and knowledge sharing. Regional networks have been interconnected to constitute global networks. Considerable importance is attached to fostering through these networks South-South institutional cooperation and North-South partnerships between institutions in developed and developing countries.

72. UNESCO has established close cooperation with other relevant UN organizations, in particular WMO, FAO, UNIDO, WHO, UNEP and UNDP. Joint programmes exist with several of these organizations, in particular in specialized fields of the environmental sciences. UNESCO has been designated Task Manager for organizing UN system-wide cooperation and coordination aimed at implementing Chapter 35 of Agenda 21, "Science for Sustainable Development". Furthermore, UNESCO has established a strategic alliance and close cooperation with the scientific community and its major international bodies, in particular the International Council of Scientific Unions, the International Social Sciences Council, the World Federation of Engineering Organizations, and the Union of International Technical Associations and their member unions and committees.

(h) United Nations Industrial Development Organization (UNIDO)

73. The main objective of the technology programme of UNIDO is to provide technology information, advice and technical assistance which respond to the goals of the technological systems of developing countries. UNIDO has been delivering assistance to developing countries in achieving these goals via an

array of advisory services and technical assistance, including access to the Organization's Industrial and Technological Information Bank and the Information Referral System networks.

74. UNIDO's work related to endogenous capacity-building includes, inter alia: studies identifying key policies in the 1990s, case studies and guidelines; advisory services for surveys and analyses of national-level needs and capacities; assistance in formulating technology policies; establishing or rebuilding institutions of focal points for technology policy; training services and facilities; and linkage with the network of cooperating technology policy institutions and research groups. UNIDO's programme in technology management concentrates on awareness-building, technical advisory services and an integrated approach to education in technology management. An initial group training programme in three parts is offered for joint participation by trainees from governments, institutions and enterprises.

75. In the area of technology acquisition and negotiation, over the past years UNIDO has assisted some 30 developing countries in endogenous capacity-building through such activities as the training of trainers in technology transfer negotiation, the training of officials and entrepreneurs and advisory services.

76. UNIDO has supported the creation and strengthening/revitalization of R&D institutions in some developing countries and the improvement of national capabilities to manage R&D and commercialize R&D results, assisted in an expansion in the supply of technological services, and contributed to the development of engineering, management and marketing consultancy services. UNIDO has assisted selected countries in the development of capabilities in advanced technologies, including generic technologies. UNIDO has also promoted international and regional Centres of Excellence. The International Centre for Science and High Technology is a project the central objective of which is to promote closer cooperation between enterprises and R&D institutions.

77. In the area of biotechnology, UNIDO has undertaken a project to evolve a set of internationally agreed biosafety guidelines for the sound management and uses of biotechnology. As part of the development of the Voluntary Code of Conduct, a recommendation for an enabling mechanism was made in the form of the establishment of an International Biosafety Information Network and Advisory Service. The Informatics Programme emphasizes increased awareness, strengthened national capabilities, regional cooperation, micro-processor application centres, promotion of technology transfer and strengthening or promotion of test facilities, with special emphasis on computer applications in SMEs. The programme on telecommunications pays particular attention to the promotion of local manufacturing of telecommunications equipment, builds awareness on manufacturing opportunities, and provides guidance to software firms in developing countries wishing to enter the telecommunications software industry. In the area of new materials, UNIDO addresses, *inter alia*, policy-oriented issues and long-term capability-building in materials engineering, analyses materials information and monitors technology trends. Specific activities are being undertaken in the field of new energy technologies, marine industrial technologies and manufacturing systems through the launching of special programmes (for example, Advancement of Manufacturing), promotion of international centres, expert group meetings, workshops, etc.

78. Under the programme on appropriate technology for sustainable development, UNIDO identifies and matches up enterprises seeking particular technologies with those in industrialized and other developing countries. Appropriate technologies are promoted through identification and assessment studies, publicity booklets and video tapes, workshops and seminars, exhibitions, technology fairs, etc.

79. Activities of UNIDO aimed at development of technological capabilities at the level of specific industrial subsectors cover agro-based industries, chemical industries and engineering and metallurgical industries. They encompass technical cooperation and advisory services on technological issues, including production engineering, new production processes and equipment; clean production concepts; product design and development; sourcing of raw materials and other production inputs; and technical aspects of pre-investment studies.

80. UNIDO cooperates with UN agencies dealing with technology for development issues in the formulation and implementation of technology programmes. Cooperation has also been established with other concerned bilateral and multilateral institutions. However, UNIDO feels there is need to take appropriate measures to make such cooperation among UN agencies more effective. It is suggested that there should be more regular exchanges of publications, reports and documents among UN agencies, joint participation in programming missions and establishment of ad hoc working groups on complex projects. Technology is not static but a dynamically changing entity. In order to address the ever-changing issues of assessment, transfer and development of technology, the United Nations system's activities, and those of UNIDO as well, should be regularly reviewed and, if necessary, amended, coordinated or readjusted in the light of changes in the global economy and the changing needs of developing countries. Since each United Nations agency involved in science and technology for development has limited resources, it is important to have proper coordination, both at headquarters and in the field, in order to satisfy the needs of developing countries more effectively, avoid duplication and ensure maximum and sustainable impact of limited resources.

(i) World Health Organization (WHO)

81. One of the characteristic features of WHO's programme of work is to deal with a multiplicity of interacting variables and factors determining the health status of populations. The complexity of solutions requires constant reference to research. The 43rd World Health Assembly (1990) adopted a resolution stating that all national health policies should be based on valid scientific evidence and that such evidence requires health research. Accordingly, any WHO technical programme, at either the global or the regional level, contains a research component linked specifically to its area of interest.

82. Biotechnology provides a suitable example of trans-programmatic science and technology development activities. Biotechnology creates the common scientific platform for the majority of research-related programmes. The Advisory Committee on Health Research (ACHR), in developing the WHO health research strategy, included the necessity of reviewing the changes in the health scene resulting from advances in scientific research. A survey was conducted in February 1994 of WHO headquarters' programmes with respect to their application of the technology. Research utilizing biotechnology is supported or stimulated by several programmes.

83. Other research activities in science- and technology-related programmes include human reproduction research (this programme is co-sponsored by UNDP, the United Nations Fund for Population Activities (UNFPA), WHO and the World Bank), tropical disease research, research and development in the field of vaccines, tuberculosis, environmental health (this programme served as a basis for determining the health aspect of Agenda 21), health of the elderly, mental health and health systems research.

84. Technology development, assessment and transfer are essential factors in health service and health promotion. Forecasting technologies and strategic planning for the use of technology in health is an important part of the overall WHO science and technology strategy, which comprises a plan with five main elements: identification; selection; development; deployment;

and monitoring of technology. Significant progress in inter-agency collaboration was made through the convening of a meeting to establish an international network of agencies for health technology assessment (Paris,1993). A second meeting (Alexandria,1993) brought together representatives of several international agencies, as well as senior health officials. WHO is actively involved in the adaptation and application of methods for use in supporting health situation and trend assessment, health policy analysis and formulation and health strategy design and implementation planning.

85. The basic requirements for the conduct of nearly all research are manpower, resources and infrastructures, and the most important of the three is manpower. Research capability strengthening (RCS), particularly in developing countries, is critical for the training of researchers and the building-up of research institutions. The WHO experience has shown that the RCS process ensures utilization of research results (in order to demonstrate its usefulness - the key to obtaining resources) and leads to linkages between scientists in universities, health services and research institutions. Fellowships still remain an important part of the WHO work.

86. In view of the rapid political, socio-economic, environmental and epidemiological transition taking place worldwide, the need for combined efforts in identifying global challenges and in harmonizing the adequate and balanced response emerging from these challenges is evident. A resolution adopted in 1990 urged the Director-General to "promote harmonization of science and research policies in health between WHO, the UN system and other international agencies and organizations".

87. The opportunities of the Vienna Science and Technology Conference (1979) and its recommendations, although still valid, have not been adequately utilized because they have not been supported by appropriate international infrastructure arrangements. Consequently, efforts are being made to promote a coalition of resources for science and technology. In this respect, the identification of actors and themes for a cooperative network will be essential. The conclusions of the 1994 substantive session of ECOSOC reflect adequately on all emerging issues related to science and technology for development. Intersectoral research recently received renewed attention as a strategy with suitable potential for promoting the solution of global health problems. In order to attain the objectives of the coordination process, advance information on intended science and technology initiatives must be available. Moreover, in order for the coordination process to be efficient, the global science and technology policies and strategies of relevant agencies should not only be clearly enunciated but also respected by all parties. An institutionalized mechanism for coordination in science and technology within the UN system set up by ECOSOC with the participation of a number of UN agencies carrying mandatory responsibilities for science and technology could enhance the complementarity of scientific initiatives launched by individual UN agencies on the one hand and support their institutional integrity on the other.