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Implementation of the Programme of Action for the Sustainable Development of Small Island Developing States

Report of the Secretary-General

Addendum

Science and technology in small island developing States*

Contents

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I. Introduction

1. Progress in the integration of science and technology in policy and programmes of small island developing States has permeated different sectors. For example, at primary and secondary levels, the educational performance of small island developing States, except for those that are in the least developed category, has been evolving better compared with that of many other developing countries. A number of small island developing States have made efforts to introduce basic science into school curricula, but progress in science education has been slower than desired. In the area of higher education, small island developing States are increasingly contemplating and implementing the pooling of their resources at the subregional level.

II. International initiatives in science and technology for small island developing States

2. A number of United Nations organizations and agencies have increased their support for programmes and activities in small island developing States which focus on strengthening science and technology in particular sectors. Some highlights of their activities follow.

3. The regional Science Education in Pacific Schools programme of the United Nations Educational, Scientific and Cultural Organization (UNESCO) has pursued basic scientific literacy as its major goal. The Australian National Commission for UNESCO organized the UNESCO Asia-Pacific Regional Science Conference: Science Issues for the Twenty-first Century in Sydney from 1 to 5 December 1998. The objectives of the Conference included the sharing of experience among countries that have well-defined science policy mechanisms; education in countries that lack science policy mechanisms; education on technology choice; and the formulation of required actions to enhance science and technology in island countries. During the biennium 1998–1999, UNESCO is implementing, through its Apia Office in Samoa, a special project entitled "Youth leadership for a culture of peace in the Pacific". This activity brings together young people subregionally and nationally to express their concerns about the major issues affecting their future well-being and peace, including science, technology and environmental issues. The scientific environmental programmes of UNESCO and the Intergovernmental Oceanographic Commission (IOC) have contributed to the advancement of knowledge, capacity-building and the promotion of the application of the best practices in relation to marine and terrestrial resources in small island developing States. The International Hydrological Programme, the International Geological Correlation Programme, the Man and Biosphere Programme, the IOC and the Management of Social Transformations Programme, along with UNESCO's sectors for education, culture and communication, are cooperating on the intersectoral platform provided by the "Environment and development in coastal regions and small islands" initiative. Under this effort, several pilot projects have been established in small island developing States and reinforced, including through UNESCO's "Focus on the Pacific" and "Focus on the Caribbean" events, and are bringing together natural and social science expertise, in combination with indigenous/local knowledge systems. They are providing the basis for elaborating "wise practices" for sustainable coastal and small island development. Under UNESCO's Pacific World Network of Microbiological Resources Centre, activities help to raise knowledge and awareness of how to apply microbial biotechnology, and provide support to the application of tissue culture. The World Solar Programme, 1996–2005, is aiming at improving renewable energy activities in some small island developing States. Two pilot projects in Samoa and Papua New Guinea have been launched for water management in villages. A pilot project on the Jakarta Bay and Pulau Seribu islands is being carried out to prevent the worsening of conditions in coral reefs and islands. The project consists of two components: (a) a Jakarta component to achieve better waste management through both solid and liquid monitoring activities, educational activities for students and local people, community-based waste recycling and composting activities; (b) a Pulau Seribu islands component with coral reef monitoring activities, scientific research, educational activities for local fishermen and alternative income activities for women and fishermen.

4. The United Nations Industrial Development Organization (UNIDO) provides assistance in the development of local capabilities spanning a wide spectrum of technology-related activities. At the policy level, it renders advice on the establishment of national technology management and innovation systems. In this context, Fiji has received assistance for the preparation of a framework for the country's future technology policy. Capacity-building support is also offered to identify and assess technologies as well as to effectively negotiate technology transfer operations. Overall, UNIDO assistance aims to promote the generation, dissemination and management of industrial technology. To this end, the organization helps in the identification, formulation and promotion of specific business opportunities

in investment and technology. This includes training activities to strengthen national capabilities for feasibility studies of industrial projects. The objective of a special programme of the International Centre for High Technology and Science established under UNIDO at Trieste, Italy, is to strengthen national training capabilities and expertise, *inter alia*, in small island developing States with respect to the acquisition and utilization of advanced methodologies and techniques in integrated coastal zone management. UNIDO has prepared guidelines for the development, negotiation and contracting of build-operate-transfer projects, which aim to facilitate the financing of public infrastructure projects involving technology transfer operations. The energy sector in small island developing States is expected to benefit from that scheme. Mauritius is a case in point, where assistance was rendered by UNIDO for the establishment of the legislative and institutional framework required for the promotion of concession projects. To increase awareness of the opportunities for industrial development, UNIDO publishes the *Emerging Technology Series*, which provides information on technological advances of potential interest to developing countries, including islands. To promote regional and interregional cooperation for the development of technological capacity, it has undertaken consultations on the economic, technical and financial feasibility of establishing regional technology centres and their networks in the Caribbean and the Mediterranean.

5. The United Nations Development Programme (UNDP) has taken a number of initiatives in support of science and technology for small island developing States. Examples include (a) a regional programme to support the Pacific islands power sector in developing the capacities of power utilities by promoting their management and technical skills; (b) workshops in rural areas on the operation and maintenance of small electricity-generating systems within the framework of the UNDP programme on diesel operators/mechanics training for Pacific island countries; (c) technical assistance in the form of expert consultancies and training courses in connection with the UNDP training development programme in the Pacific; (d) a programme for small island developing States in the Pacific region on island countries development and training, which has assisted entrepreneurs in Pacific small island developing States to establish linkages for the acquisition of technical guidance and assistance in managing new manufacturing and processing enterprises; (e) assistance to several small island developing States in the Pacific region in establishing boatyard and mechanical workshop facilities for improving national capacities in industrial fisheries. As regards traditional knowledge, a number of projects within the World Decade for Cultural Development focus on the link between culture and resource use. Several activities of the Food and Agriculture Organization of the United Nations focus on local knowledge and natural resources, including programmes on community forestry and non-wood forest products. Traditional medicine is promoted through the programmes of the World Health Organization.

6. Through its marine environment laboratory in Monaco, the International Atomic Energy Agency (IAEA) is involved in pilot monitoring programmes on micropollutants, as well as in capacity-building and quality assurance activities in island States of the Caribbean and East African region. IAEA supports projects involving isotope and nuclear techniques for studying retrospective conditions (climate, sea level, pollution) and to provide time-scales for small island evolution. In the framework of its five-year research project on worldwide marine radioactivity, IAEA has conducted the Pacific Ocean Expedition, which provides inputs for oceanographic, marine resources and natural disasters. In collaboration with IOC, IAEA has been active in the International Mussel Watch project. The Committee on Science and Technology in Developing Countries of the International Council for Science proposes to identify ways in which science and science communication can be strengthened in small States on the basis of their own knowledge, natural resources and needs.

7. The World Meteorological Organization (WMO) has been assisting small island developing States to apply the sciences of meteorology and operational hydrology towards the achievement of sustainable development. The main thrust has been aimed at the strengthening of their national meteorological services and their participation, in a coordinated way, in cooperative global and subregional programmes. These services now participate in the collection and exchange of scientific information and in the maintenance and operation of telecommunication networks through which they may obtain data from surface platforms and satellites. On this basis, they are able to provide services to support the development of agriculture, tourism, industry and other sectors of the economy, and also provide warning for natural disasters. Under the International Decade for Natural Disaster Reduction, WMO is furthering the strengthening of warning services for small island developing States and the response to warnings at the national and community levels, for more effective disaster prevention and mitigation, particularly from tropical cyclones. In the field of meteorology, emphasis is being placed on the training of scientists through the organization of workshops and the provision of fellowships. Projects have been conducted with major donors in the implementation of new technologies. Hence in the past few

years, WMO has organized several workshops on training participants from the national meteorological facilities of small island developing States to upgrade their national technical capabilities. The organization has also awarded fellowships for studies and/or training in meteorology and operational hydrology to more than 20 small island developing States.

8. Other ongoing efforts include the production of National Environmental Management Strategies (NEMS) throughout the Pacific region. In this context, the work of NEMS national task teams has served to identify many technology and applied research needs. For example, the Marshall Islands NEMS contain a strategy to establish a groundwater assessment programme, while the Samoa NEMS include strategies to develop knowledge in almost every sectoral area. Overall, NEMS provide the best starting point for identifying science and technology needs and enhancing these capabilities in Pacific island countries. At the regional level, the South Pacific Forum secretariat represents its island member countries on the Pacific Economic Cooperation Council (PECC), a business/ government/research body that often provides input to Asia-Pacific Economic Cooperation (APEC). The Forum was responsible for submitting a Pacific Island Nation entry to the Pacific science and technology profile published jointly by PECC and APEC.

III. Success stories

9. The UNESCO Project on Environment and Development in Coastal Regions and in Small Islands, launched in 1996, has successfully fostered the joint planning and implementation of activities, which capitalize on science and technology to address sustainable development in specific sectors. The following illustrate such activities: water management studies in Kiribati in the South Pacific; education for sustainable village living in Samoa (Saanapu/Sataoa villages) and Papua New Guinea (the Motu/Koitabu villages). UNESCO has also initiated a pilot study in a secondary school in Samoa for teaching science and technology in product design, making and marketing. The students have so far identified a number of craft products to be made from local materials, aimed at the Christmas market. They have also set up a small business structure to support the project and learn about running a business.

10. Based on a subregional cooperative programme under which, as a core feature, advisory services are provided by a regional specialized meteorological centre in Nadi, Fiji, designated in 1995 as a WMO Tropical Cyclone Warning Centre, services on tropical cyclone detection, monitoring and forecasting are now being provided to the national meteorological services for all the South Pacific. In the Caribbean, a satellite-based telecommunications system with computerized downlink terminals, in operation since 1996, has replaced the former terrestrial communication links, resulting in substantial enhancement of exchange of scientific data and processed products and improved hurricane warning services throughout the region. In both cases, WMO has made significant contributions to the sustainable development of small island developing States through reduction in loss of life and damage to property and the natural environment caused by tropical cyclones.

IV. Constraints encountered

11. Taking into account the progress already made in international and subregional cooperation and coordination to make the most effective use of existing facilities, it should be noted that the major constraints for small island developing States are not so much the lack of scientific knowledge and technology as the shortage of financial and human resources — more specifically, the lack of a critical mass of qualified scientists and associated institutions. Current reward systems in island countries do not encourage enhanced engagement by individuals in science. Limited availability of funds for training and research in specialized fields of science has further hampered the development of scientific projects. The brain drain adds to the scarcity of skills and expertise. This is evident in the high proportion of expatriate personnel in island institutions and in aid programmes heavily weighted towards technical assistance. Because science and technology-related curricula have often been produced under the auspices of foreign consultants and experts and funded with foreign monies, the general bias is towards adopting curricula recognized as appropriate in the West — “modern” methods of doing things. In higher education, knowledge and ability in these areas often follows disciplinary lines when it is important to develop and promote interdisciplinary knowledge and ability. Constraints are often encountered in the lack of support for the acquisition and operation of scientific observation networks, telecommunication links and data-processing facilities and for the training of scientific staff and maintenance technicians.

12. Any strategy for enhancing progress in endogenous scientific and technological capacity-building in small island developing States must take into account the fact that these countries are constrained by small manpower and inadequate infrastructure. Frequent contacts between scientists from small island developing States and those from industrialized

and relatively advanced developing countries would serve as an efficient modality for rapidly disseminating and applying new scientific and technological methods. At relatively low cost, much could be achieved in practical terms by establishing funds for scientific visits and meetings, electronic communication, access to data banks and so on.

13. Coordination arrangements for science and technology vary from country to country. A few countries include science in a portfolio linked to education. In a number of countries there appears to be no effective coordination mechanism. In addition, participatory approaches linking scientific research and technology development are often non-existent.

V. Persistent problems

14. The economic, ecological, social and cultural systems of small island developing States are fragile and highly sensitive to external environmental, social and economic change. Less apparent, but more profound, is the social and economic change resulting from the advancement of science and from external technological change and the transfer of technology. Most small island developing States do not possess economies of sufficient scale to allow for a national scientific infrastructure of the scope required to address many national needs. They also suffer a serious lack of resources and qualified personnel. Small island developing States are therefore not in a position to absorb, assimilate and carry out the necessary scientific work and to apply the science needed for addressing their environment and development problems. The ability to grasp science and to adapt technology in those States is limited by the lack of wide exposure to science and, in many of them, by the lack of a critical mass of qualified scientists and scientific institutions. The brain drain, both internal and external, will continue to be a major problem.

15. Small size and other circumstances in these countries restrict their ability to develop endogenous technologies. They are therefore heavily dependent on imported technologies. They thus risk exporters dumping inappropriate and/or substandard products on their markets. Because of the lack of trained personnel and appropriate management infrastructure, much of the technology introduced remains unassessed and untried. Moreover, there is a lack of formal education in traditional science for large segments of the population in numerous island States, who pursue their traditional work and attitudes. In addition, participatory approaches linking scientific research and technology development are often non-existent. Regarding the financing of science, there is limited availability of funds for research assistance and training in specialized scientific fields.

16. Despite the importance small island developing States accord to indigenous knowledge and its application, this knowledge is under threat in societies increasingly driven to adopt global technologies and scientific understanding. The rationale underlying traditional and sustainable environmental management practices over the past 100 years has been systematically reviled and degraded to the point that students in small island developing States now learn only about the high-tech practices currently in vogue in industrial States. Even their grandparents say little about the old ways, which are fast dying and being replaced almost entirely by non-sustainable practices.

VI. Priorities of small island developing States for the future

17. Enhancing the advancement and application of knowledge in small island developing States is achieved to the extent that the building-up of science and technology capability that is endogenous and respectful of traditions is pursued, and in a manner that directly serves the productive sectors. Intensive and appropriate use of the powers of science and technology in these countries helps to attain sustainable development. When a sound science and technology infrastructure exists, external technological assistance acts as a powerful catalyst. It can be assimilated and judiciously used. Conversely without such an absorptive capacity within a country, most of such assistance is ineffectual.

18. An integral part of development and environment planning in small island developing States should therefore be the provision for capacity-building in science (manpower and institutions) and the enhancement of communication and application of science. Most small island developing States would derive tremendous benefits from the introduction of environmentally sustainable technological innovations in the areas of the development of renewable energy, freshwater and marine resources; telecommunications and information technology; waste management and natural disaster mitigation; and sustainable land resources management. Effective utilization of technological innovations is predicated on the building of technical skills commensurate with needs, which in turn depends on the level of scientific education. Emphasis must be put on curriculum development, education and training, improved information and access to information, institutional cooperation and networking. At the same time, there is a need to promote the understanding of science and technology issues among leaders and policy makers at all levels, as well as the understanding of the science and

technology information and know-how needed for policy-making, operational functions and investment.

19. Since most small island developing States do not possess economies of sufficient scale to allow for a national scientific infrastructure of the scope required to address many national needs, one solution to the problem is for them to cooperate at subregional or regional levels to share institutions of higher learning and advanced research and development facilities. Pooling the resources of countries with similar problems, agreeing on common programmes and building synergies are evidently more cost-effective than developing national institutions. Given the serious lack of resources and qualified personnel in small island developing States, a realistic short-to-medium term strategy for building scientific and technological capacity to manage the effective transition to sustainable development would be to concentrate on subregional measures, wherever feasible. Subregions usually tend to share several common characteristics which facilitate a more rational and efficient use of resources, including qualified staff. Subregional efforts also have greater potential for creating local capacity in the short to medium term than continental and international programmes. It should be stressed that the most pressing needs are often for support for the acquisition and operation of scientific observation networks, telecommunication links and data-processing facilities and for training scientific staff and maintenance technicians.

VII. Policy recommendation for future action

20. Intensive development and appropriate use of science and technology in small island developing States are essential for attaining sustainable development goals. Governments of small island developing States are encouraged to (a) make greater efforts to improve science education in all phases of formal and informal education; (b) promote a more fully integrated approach to small island resource management and sustainable development, by bringing together from the earliest stages of management/development action, expertise from the natural and sociocultural sciences, indigenous/local knowledge, education and communication, and in this manner develop a more effective and coherent response to complex small island issues; (c) establish a network of scientists to work in schools and in the public and private sectors; (d) undertake national or regional assessments of needs for capacity-building in science; (e) promote strong linkages between universities and research institutions on the one hand, and national industries, agriculture and other economic sectors on the other, so that scientific knowledge and information find their way into the productive sectors, and make every effort to induce the private sector of national economies to invest more in the development of science; (f) provide incentives to venture capital and explore other modalities for meeting the required financing needs of environmentally sound technology firms; (g) provide fiscal and other policy incentives to encourage domestic and foreign investment in the industrial sector; (h) promote the establishment of appropriate regional institutions for the collection and synthesis of data and information on innovative industrial technologies for the sustainable development of small island developing States, and on the impacts of industrial innovation on their economies, including their marine and coastal systems; (i) develop regional mechanisms to further promote ventures for financing new technology-based firms.

21. Relevant regional organizations and international organizations, with donor assistance, could collaborate in assisting small island developing States to (a) implement programmes to improve the teaching of basic science within the context of the local environment and culture; in Pacific small island developing States, use could be made of the regional Science Education in Pacific Schools programme of UNESCO; (b) better educate present and future leaders of civil society on key scientific issues affecting a sustainable future, through schools, youth work and community awareness activities; (c) enhance international cooperation in the development and promotion of technological innovations relevant for small island developing States as components of international or regional investment projects; (d) provide improved access to financial and technical resources to assist small island developing States in establishing regional centres for capacity-building, including training in the management of innovative technologies, technology negotiations and technology transfer; (e) enhance efforts in environmental and global change research programmes relevant to the specific situation and problems of small island developing States; (f) prepare science-based guidelines for national sustainable development action in small island developing States; (g) better apply science and technology to sustainable development at the community level through participatory projects; and (h) share information on best practices and successful methods.