SCIENCE AND TECHNOLOGY IN THE INTERNATIONAL DEVELOPMENT STRATEGY FOR THE FOURTH UNITED NATIONS DEVELOPMENT DECADE

A Contribution of the United Nations Advisory Committee on Science and Technology for Development to the Preparation of the International Development Strategy for the 1990s.

I. INTRODUCTION

The world enters the last decade of the 20th century with an extraordinary and potentially explosive combination of hope and despair. A vastly improved international political climate, major social and institutional changes in the direction of greater political and economic freedom, steady economic growth in most of the developed and a few developing countries, and significant advances in science and technology coexist with growing disparities between the rich and the poor, both between and within countries, with increasing social demands throughout the developing regions, with a slowdown in economic growth aggravated by the crushing burden of debt in the Third World, and with ominous threats to the environment at the global and regional levels.

The combination of "danger" and "opportunity" that characterize the word "crisis" in chinese ideograms has never seemed more appropriate to describe the present international situation. The momentous changes in Eastern Europe and in East/West relations are but one of the many manifestations of a

turbulent and uncertain world full of surprises. New opportunities to pursue development strategies have emerged as a result of changes in the political, military, economic, social, cultural, environmental and technological arenas, giving rise to fresh hopes for the 1990s.

However, most developing countries in Africa, Latin America and Asia face this new context with apprehension, concern and even despair. For these countries, the 1980s --the period of the Third United Nations International Development Strategy-- has been a "lost decade", for incomes per capita at the end of the eighties stood at the same or lower level as at the beginning. Moreover, if present trends were to continue, the nineties could be an equally difficult period for development efforts.

Three decades of exploration and dialogue in evolving international and national strategies have left valuable lessons regarding the scope for active intervention in promoting development. The United Nations international development strategies for the Second (1970s) and Third (1980s) United Nations Development Decades emphasized targets for economic growth, such as annual rate of growth of gross domestic product (GDP), increases in GDP per capita, and sectoral production increases. In addition, in 1971 the United Nations Advisory Committee on the Application of Science and Technology for Development (ACAST) proposed a series of complementary measures and targets

specifically related to science and technology for development.

The adoption by the General Assembly of the Vienna Programme of Action on Science and Technology for Development in 1980, at the beginning of the Third United Nations Development Decade, constitutes an important landmark. This Programme of Action provides guidelines for national and international actions aimed at creating endogenous science and technology capacities in developing countries, at restructuring international S&T relations, and at improving the effectiveness of the United Nations system in achieving the two preceding goals. Furthermore, the Vienna Programme of Action suggested mechanisms to provide additional financial resources to support international cooperation in science and technology for development. However, for a variety of reasons, many of the recommendations of the Vienna programme, mainly those at the international level, were not put into practice during the 1980s.

It has become increasingly clear that scientific and technological advances play a major role in creating the new opportunities and problems that the international community faces, particularly as the last decade of the 20th century begins. These advances facilitate enormously the free flow and exchange of ideas and information; alter the patterns of world economic interdependence, particularly in trade and finance; and provide the means to satisfy food, housing, education and other social demands.

Indeed, the nations that prospered during the 1980s did so in large measure because of their willingness, political determination and social capacity and ability to harness the potential offered by advances in science and technology.

Considering the new context of development crisis with its accompanying dangers and opportunities, the proposed structure of the International Development Strategy for the Fourth United Nations Development Decade focusses on: development for people, by people, seeking to mobilize the inventiveness and resourcefulness of individuals; achieving environmentally and socially sustainable development; unblocking and integrating the world economy, overcoming the debt crisis and exploring new roles for trade and finance in the development process; and promoting joint and mutual interests in cooperation.

Each of these themes incorporates implicitly significant elements of science and technology policies and capabilities. These notes suggest the way in which the Fourth United Nations International Development Strategy (IDS) could be enriched by considering an S&T dimension in each of its components, and also proposes that the new and enhanced role that science and technology play in the process of development be explicitly recognized in the IDS.

II. A CHANGED CONTEXT FOR DEVELOPMENT EFFORTS IN THE 1990s.

The rapid changes in the world scene during the 1980s have occurred against the background of major population increases, most of it in the developing countries, which are placing acute strains on resources such as energy, water and food, and generate additional demands for employment, education, housing, transport and communication. The dramatic developments of the eighties have exacerbated the disparities between developed and developing countries, whose most obvious manifestations are the crippling Third World debt, the emergence of a "two track" world economy in which most developing regions are increasingly marginal.

Increases in military expenditures in a sizable number of developing countries have made the scarcity of financial resources even more acute, further jeopardizing the capacity of these countries to provide basic services to their growing populations. This has also made it exceedingly difficult to allocate resources for the long-term task of developing endogenous scientific and technological capabilities in the Third World.

The deterioration in standards of living for a large proportion of poor people in developing countries --added to the wasteful consumption habits of resulting from the underpricing of environmental resources in the developed countries-- has also given rise to new stresses on the environment and to possible serious

threats to the global commons. There is now greater awareness of the limits on human activities imposed by the regenerative capacity of natural ecosystems, as well as of the dangers resulting from the uncontrolled exploitation of environmental resources (e.g. deforestation), and from overloading the capacity of the earth to absorb waste (e.g. toxic chemicals). Moreover, the 1980s have witnessed the emergence of truly global problems such as marine pollution, climate change, and the depletion of the ozone layer that pose threats to all people of the world. However, the scientific and technological knowledge necessary to identify, monitor and deal with these threats is now largely available and could be effectively used if the necessary local, national, regional and international political will could be mobilized.

The clash between rising aspirations and the realities of the omnipresent poverty, largely triggered by a growing awareness of the lifestyles of the affluent, has become a source of social tension, dogmatism and violence --heightened by political, ethnic and ideological differences. To a certain extent these are the result of unprecedented advances in the application of information and communication technologies, which have created a dense flow of images and messages that transcend all boundaries.

Development efforts during the 1990s will confront increasingly diverse circumstances, both within and between countries. Generalized prescriptions do not work any more. Since

not all developing countries face the same sets of problems, nor do problems of similar nature affect each of them to the same degree, development policies and strategies will have to be more differentiated and tailored to the economic, social, resource and environmental circumstances of each country. In turn, this will place additional demands on policy analysis, design and implementation capabilities that have to be applied locally.

The uncertain and turbulent decade ahead will demand an extraordinary degree of flexibility, adaptability and preparedness in the part of world leaders, particularly in the developing countries and in the international community. The political, social, economic, environmental, cultural, scientific and technological challenges that will be faced require bold institutional innovations that could enable all countries to respond to these challenges under adverse conditions. Economic restructuring, decentralization of decision-making, a new balance between market forces and centralized planning, new arrangements for international cooperation, and new values to steer joint international efforts are becoming imperative as the world moves towards the 21st century.

III. NEW DIRECTIONS FOR SCIENCE AND TECHNOLOGY

Advances in science and technology have played the principal role in creating conditions for the emergence of this vastly changed context for development efforts. One of the most critical elements of the capacity to respond to the anticipated changes and surprises is the development of endogenous scientific and technological capabilities. The development success stories of the last two decades can be largely attributed to the capacity of a few developing countries to absorb and adapt technologies and integrate them fully into their productive and service activities, thus improving productivity, increasing competitiveness, raising living standards, and reducing poverty.

The close relationship between technological capacity and development underscores the need for developing countries to make effective use of the opportunities created by the expanding array of technology options -- a task that requires the flexibility, resiliency and responsiveness that endogenous science and technology capabilities can provide. Therefore, the development of such capabilities should be one of the centerpieces of the International Development Strategy for the Fourth United Nations Development Decade. The aim is to direct scientific knowledge and technological mastery in such a way as to enhance the opportunities and reduce the threats these capabilities create.

One of the salient characteristics of modern science and

technology is the extraordinary degree to which they permeate all social and economic activities: they have become a strong and pervasive force in shaping human affairs and conditioning the rate and direction of progress in all countries. A particularly clear example is that of microelectronics and information technologies, whose influence is now felt across all facets of economic, social, political and cultural life. Scientific advances and technological innovations are now rapidly incorporated and disseminated throughout the world economy, making scientific and technological knowledge an increasingly important factor of production. It thus becomes necessary to treat science and technology issues as integral components of development strategies in all areas of socioeconomic activity.

At the same time, modern science and technology exhibit certain distinct characteristics that make them a specific target for development policy. While they need to be fully integrated into all aspects of economic and social development strategies, it is also important to acknowledge that science and technology policies have an identity of their own. The processes of technology acquisition and dissemination, innovation and adaptation in different areas of human activity have many common features and should be the subject of specific measures regarding technology imports, venture capital, tax incentives, patents, etc. The management of research, development and innovation across all sectors of socioeconomic activity demands similar skills and

capabilities. Scientific and technological services (information, extension, technical norms and standards, quality control, etc) play a similar role in all industrial branches, and also in agriculture, mining and the service sectors. Thus, approaches to the complex and long-term task of building endogenous scientific and technological capabilities in different fields are, in essence, rather similar.

In short, the pervasive but distinct role that science and technology play in the development process at the end of the 20th century requires a dual treatment of scientific and technological issues in development strategies, both at the national and international levels: they should be fully integrated into other components of the overall development effort, but they should also be the subject of specific policies and action.

As most developing countries will face severe financial constraints during the 1990s, and as science and technology capabilities become a more important determinant of socioeconomic progress, managing the process of building endogenous S&T capabilities under conditions of scarcity will become an extraordinarily difficult task. Among other conditions for success in this enterprise, it is necessary to avoid the fragmentation of human, financial and institutional resources; to focus efforts on a few priority areas; to marshall an effective coalition of

resources of all types, seeking to involve as many actors as possible in the task of building endogenous S&T capabilities; to carefully design a strategy that allows for priority shifts over time and organizes a sequence of policy interventions; to establish criteria to evaluate progress over time and introduce the required mid-course policy corrections; and to foster cooperative arrangements at all levels to make the most effective use of scarce resources.

In the uncertain and turbulent context of the 1990s, developing countries will have to make hard and even cruel choices: the use of scarce resources to deal with short-term basic needs, social demands and critical problems will have to be weighted against the allocation of some fraction of those limited resources to the relatively long-term task of building endogenous S&T capabilities, an essential precondition to ensure that short-term crises will not recur time and again in the future. As the scientific and technological gap between developed and developing country widens, the necessary short-term sacrifices acquire an urgency and poignancy that challenges the foresight and resolve of policy makers, both in developing countries and in the international development community.

IV. STRATEGIC DIRECTIONS IN SCIENCE AND TECHNOLOGY FOR DEVELOPMENT

Because the building of endogenous S&T capacity is a slow, cumulative process, it must take into account not only today's challenges but also the circumstances that may develop many decades in the future. This is a task that requires political will and commitment --particularly when facing resource constraints. Visionary leadership, willingness to make hard choices, and an active interest in international cooperation are necessary to reap the benefits that science and technology can offer to the developing countries. Nehru's view that "... poor nations cannot afford not to invest in their science and technology development ..." never seemed more appropriate.

The rapidly evolving global context of the 1990s may offer historical opportunities for national actions and broader international cooperation in science and technology. World scientific discoveries and technological innovations are creating new options for development that contrast sharply with the limited scientific and technological capabilities that exist in most developing countries. This contrast could become a source of discouragement or a stimulus for action both at national and international levels.

In addition, after four decades of antagonism and mistrust, the bipolar divisions of the world -- East/West and North/South -

- are giving way to a more pluralistic international environment. This creates a unique opportunity for more equitable and pragmatic distribution of the costs and benefits of scientific and technological progress, casting aside the ideological dogmatism that constrained the visions of statesmen for nearly half a century. For example, industrialized countries -- which are responsible for most of the world's carbon dioxide and chlorofluorcarbon emissions -- could make special efforts to transfer environmentally benign technologies to developing countries, possibly covering the additional cost involved in adopting such technologies. The enormous and increasing stock of scientific knowledge and technological skills can thus become a key resource for easing international tensions.

The International Development Strategy for the Fourth United Nations Development Decade provides a setting within which these issues can be raised, discussed and widely disseminated. Several ideas and lines of action should be incorporated into the Fourth International Development Strategy for it to deal adequately with science and technology issues at the national and at the regional and international levels:

National Level

The Critical Role of Endogenous Capacity

- Because of the pervasive and distinctive role that science and technology play in the process of development, developing countries must integrate explicit policies, designed to influence directly the growth of scientific and technological capabilities, with other development policies -- both macroeconomic and sectoral. Coherent explicit and implicit policies, as well as judicious priority choices, are necessary to make the most of scarce resources in the difficult task of developing endogenous scientific and technological capabilities.

Balancing Markets and Planning

- An appropriate balance between State intervention (promotion, infrastructure, education) and the role of market forces (incentives, competition, entrepreneurship) must be achieved to efficiently develop and utilize scientific and technological capabilities. Public sector interventions have a most important role to play in ensuring distributional equity, a task for which market forces are not well suited. As a counterpart to these macro level issues, the management of technology acquires paramount importance at the productive and service unit level, for they are the key means for increasing

productivity, enhancing competitiveness, and improving delivery.

Coalition of Resources for Long Term

- Financial resources should be allocated to the long-term task of building endogenous scientific and technological capabilities, even in the face of resource scarcities and pressing short-term needs. A coalition of resources should be marshalled to this end involving government agencies, private firms, research centers, financial institutions and international organizations.

Regional and International level

Universal Access to S&T Knowledge

- A broad new strategy to ensure increasingly widely distributed access to modern scientific and technological knowledge essential to alleviating poverty, reducing population pressures, achieving minimum standards of health and nutrition, improving educational opportunities, ensuring environmental sustainability and promoting economic growth has become essential at the international level. Without sacrificing the incentives for individual creativity and practical imagination, there is the need to evolve a shared view that scientific and technological progress should directly foster global equity, both within and between generations.

International Cooperation and Capacity Building

- The international community should undertake as its primary goal the building of the human and institutional capacities developing countries needed to make independent decisions on the critical science and technology issues that will confront them. International cooperation can play a major role in this essential task, particularly because of the huge and growing disparities in scientific and technological capabilities between the industrialized and the developing countries.

  A special effort should be made to ensure that the smaller developing countries, which cannot afford an extensive and broad science and technology infrastructure, will have access to the scientific and technological knowledge that could contribute to their development efforts.

Partnership for Sustainability

- There is a need to forge new international partnerships to achieve environmentally sustainable development. The times when humanity could act on the physical and biological environment with impunity --blindly trusting in the regenerative powers of ecosystems-- are forever gone. New approaches in which humanity and nature enhance each other's capacities are imperative, and this

underscores the need for developing and disseminating environmentally sound technologies. It is also clear that preservation of the environment to ensure sustainable development demands concerted actions by both developed and developing countries.

Increased resource flows required

- A special effort is required to increase the flow of international funds to support the build up of scientific and technological capabilities in the developing countries. These should complement national efforts and involve multilateral, regional, bilateral and private channels. In addition, as the gap between North and South increases, a new role is likely to be found for South/South cooperation between developing countries to share views, approaches and solutions to similar problems.

The United Nations system has played a key leading role in mobilizing science and technology for development. Its support has been acknowledged by developing countries to be most valuable, primarily because of the flexible and catalytic role played by the financial support and technical assistance provided by the various UN agencies and bodies.

Science and technology will continue to pervade the activities of the United Nations system. However, the volume and diversity of demands made on the UN system to support scientific and technological development during the 1990s is likely to grow -- without a corresponding increase in available resources. This imposes the need for coordination, for achieving greater coherence, and for evolving a shared view of the tasks faced by the various UN agencies and bodies in this field.

The prospects for success of the International Development Strategy for the Fourth United Nations Development Decade will hinge, to a very large extent, on the ability and willingness of the national and international communities to bring about major social and institutional innovations in a climate of openness and participation. In particular, the effective mobilization of science and technology for development will require innovative approaches to bilateral, regional and global cooperation. The adoption of an International Development Strategy for the 1990s provides a unique opportunity to raise and reach agreement on these issues as the 20th century draws to an end.