World Conference on Science

Budapest Hungary, June 26 - July 1, 1999

Science for the Twenty-first Century

A New Commitment

DECLARATION ON SCIENCE ANDTHE USE OF SCIENTIFIC KNOWLEDGE

SCIENCE AGENDA – FRAMEWORK FOR ACTION

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PREFACE

The World Conference on Science for the Twenty-first Century: a New Commitment (June 26 – July 1, 1999, Budapest, Hungary), held by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council for Science (ICSU), provided a rare opportunity for analyzing where natural sciences stand today, where they are heading, what their social impact has been and what society expects of them. The Conference established what efforts should be made so science will advance as a response to both social expectations and the challenges posed by human and social development. In other words, it proposed a new 'social contract' for science as we reach the 21st century.

The path leading to Budapest was marked by a rich preparatory process involving wide-ranging consultation. Several meetings were held in order to provide input to the Conference.

Some 1,800 delegates representing 155 countries, 28 intergovernmental organizations (IGOs) and more than 60 international scientific non-governmental organizations (NGOs) took part in the Conference, including 80 Ministers of Science, Technology, Research and Education or individuals that held positions equivalent to those.

The Conference discussed the intimate interrelationship between science and technology, their role in socio-economic development and their effect on the environment. What is more appropriate for developing countries? The conclusions reached at the Conference are that capacity building is essential for endogenous development and that each country should develop scientific knowledge in the fields that are most suitable so its own priorities will be addressed.

The results of discussions in Budapest are outlined in the two main documents drafted as a result of the Conference:

- the *Declaration on Science and the Use of Scientific Knowledge*, which underscores the political commitment to the scientific endeavor and to the search for solutions to issues related to the interface between science and society;

- the *Science Agenda - Framework for Action*, which contains specific commitments and recommendations with regard to capacity-building in science and the use of science for sustainable development.

After the Conference, both documents were endorsed by ICSU and UNESCO governing bodies. The present booklet contains these two texts, which map out the way to guarantee follow-up to the Conference on the part of all partners and stakeholders in the area of science, including the research community, government agencies, IGOs, NGOs and the industrial sector. An Introductory Note to the Science Agenda prepared by the Conference Secretariat is also included. In addition, a note on page 48 of this booklet summarizes ICSU's position regarding the contribution traditional knowledge might make to science.

During the Conference, a number of initiatives designed to boost regional cooperation in the field of science were launched. It is essential now to maintain the momentum reached in Budapest both at the international and at the national level. Different stakeholders may quickly locate the paragraphs in the Science Agenda that are of particular relevance to them by consulting the enclosed table outlining the Basis for Follow-up Activities.

Each partner will, of course, be responsible for the development of its own follow-up initiatives to the World Conference on Science, but UNESCO will act as a center for all activities in

cooperation with ICSU. For this purpose, all partners are encouraged to keep UNESCO abreast of their follow-up actions. In turn, UNESCO and ICSU will develop – together with relevant United Nations organizations and donor bodies - concrete initiatives guided towards strengthening international cooperation in the field of science.

The Conference was but one step in a global process which concerns us all, for we are all stakeholders in our own and in our children's future. We all have a moral obligation to pass on a healthy environment and decent living standards to future generations. Achieving this goal will call for resolute political will on the one hand and responsible scientific research and development on the other.

Government, civil society and scientific community representatives, I urge you to do what you can - in your area of responsibility – to make a difference.

Paris, January 2000

Maurizio Iaccarino
Secretary-General
World Conference on Science

DECLARATION ON SCIENCE ANDTHE USE OF SCIENTIFIC KNOWLEDGE

PREAMBLE

1. We all live on the same planet and are part of the biosphere. We have come to recognize that we are in a situation of increasing interdependence and that our future is intrinsically linked to the preservation of global life-support systems and to the survival of all forms of life. The nations and scientists of the world are called upon to acknowledge the urgency of using knowledge from all fields of science in a responsible manner to address human needs and aspirations without misusing this knowledge. We seek active collaboration in all fields of scientific development. This includes natural sciences such as physical, earth and biological sciences, biomedicine and genetic engineering, and social and human sciences. While the Framework for Action emphasizes the promising nature and the dynamism of natural sciences and their potential adverse effects, as well as the need to understand their impact on and their relations with society, the commitment to science, including the challenges and the responsibilities set out in this Declaration, is valid for all of its fields of the sciences. All cultures can contribute with valuable scientific knowledge. The sciences should be at the service of humanity as a whole and should contribute to providing everyone with a deeper understanding of nature and society, better quality of life and a sustainable and healthy environment for present and future generations.

2. Scientific knowledge has led to remarkable innovations that have been of great use to humanity. Life expectancy has

increased strikingly, and the cure for many illnesses has been found. Agricultural production has significantly increased in many parts of the world to meet growing population needs. Technological development and the use of new energy sources have created the opportunity to free humankind from arduous labor. They have also made the creation of a comprehensive and complex range of industrial products and processes possible. Technologies based on new means of communication, information handling and computer science have brought about unprecedented opportunities and challenges for scientific development and for society. The steady increase in scientific knowledge concerning the origin, the functions and the evolution of the universe and of life provides humankind with conceptual and practical approaches that profoundly influence its conduct and prospects.

3. In addition to their demonstrable benefits, the applications of scientific advances and the development and expansion of human activity have also led to environmental degradation and technological disasters and have contributed to social imbalance and exclusion. One example is the fact that scientific progress has made it possible for sophisticated weapons to be produced. This includes conventional weapons and weapons of mass destruction. There is now an opportunity to call for a reduction of the amount of financial resources used for the development and production of new weapons and to encourage the conversion, even if only partial, of military production and research facilities into installations for civilian use. The United Nations General Assembly has proclaimed the year 2000 as the International Year for the Culture of Peace and the year 2001 as the United Nations Year of Dialogue among Civilizations as steps towards long-lasting peace; the scientific community, together with other sectors of society, can and should play an essential role in this process.

4. Today, whilst unprecedented advances in the different fields of science are foreseen, there is a need for a vigorous and informed democratic debate on the production and use of scientific knowledge. The scientific community and decision-makers should seek the strengthening of public trust and support for science through this debate. Greater interdisciplinary efforts involving both natural and social sciences are a prerequisite for dealing with ethical, social, cultural, environmental, gender, economic and health issues. Enhancing the role of science for a more equitable, prosperous and sustainable world requires the long-term commitment of all stakeholders, public and private, through greater investment, the appropriate revision of investment priorities and the sharing of scientific knowledge.

5. Most of the benefits brought about by science are unevenly distributed as a result of structural inequalities among countries, regions and social groups and between the sexes. Just as scientific knowledge has become a crucial factor in the production of wealth, its distribution has become more inequitable. What distinguishes the poor (be it people or countries) from the rich is not only that they have fewer assets, but also that they are largely excluded from the creation and benefits of scientific knowledge.

6. We, participants in the World Conference on Science for the Twenty-first Century: a New Commitment, gathered in Budapest, Hungary, from June 26 to July 1, 1999 under the aegis of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council for Science (ICSU):

Considering:

7. where natural sciences stand today and where they are heading, what their social impact has been and what society expects from them,

8. that in the twenty-first century science must become a shared asset benefiting all peoples on a basis of solidarity, that science is a powerful resource for understanding natural and social phenomena, and that its role promises to be even greater in the future as the growing complexity of the relationship between society and the environment is better understood.

9. the ever-increasing need for scientific knowledge in public and private decision-making, including notably the influential role to be played by science in the formulation of policy and regulatory decisions,

10. that access to scientific knowledge for peaceful purposes from a very early age is part of all men and women's right to education and that science education is essential for human development, for creating endogenous scientific capacity and for having active and informed citizens,

11. that scientific research and its applications may yield significant returns towards economic growth and sustainable human development, including poverty reduction, and that the future of humanity will become more dependent on the equitable production, distribution and use of knowledge than ever before,

12. that scientific research is a major driving force in the field of health and social aid and that better use of scientific knowledge would considerably improve human health,

13. the current process of globalization and the strategic role played by scientific and technological knowledge within this process,

14. the urgent need to reduce the gap between developing and developed countries by improving scientific capacity and infrastructure in developing countries,

15. that the information and communication revolution offers new and more effective means of exchanging scientific knowledge and advancing education and research,

16. the importance of total, unrestricted access to scientific research and education and to information and data,

17. the role played by the social sciences in the analysis of social transformations related to scientific and technological developments and the search for solutions to the problems that result from this process,

18. the recommendations of major conferences held by United Nations organizations and other agencies and those of meetings associated with the World Conference on Science,

19. that scientific research and the use of scientific knowledge should respect human rights and the dignity of human beings, in accordance with the Universal Declaration of Human Rights and in the light of the Universal Declaration on the Human Genome and Human Rights,

20. that some applications of science can be detrimental to individuals and society, the environment and human health, possibly even threatening the continuing existence of the human species, and that the contribution of science is indispensable to the cause of peace and development and to global safety and security,

21. that scientists with other major participants have a special responsibility to prevent uses of science which are ethically incorrect or have an adverse impact,

22. the need to practice and apply sciences according to appropriate ethical requirements defined based on comprehensive public debate,

23. that the pursuit of science and the use of scientific knowledge should respect and maintain life in all its diversity, as well as the life-support systems of our planet,

24. that there is a historical imbalance in the participation of men and women in all science-related activities,

25. that there are barriers which have prevented the unrestricted participation of social groups such as women, disabled individuals, indigenous peoples and ethnic minorities, hereinafter referred to as disadvantaged groups,

26. that traditional and local knowledge systems, as dynamic expressions of perceiving and understanding the world, can make, and historically have made, a valuable contribution to science and technology, and that there is a need to preserve, protect, research and promote this cultural heritage and empirical knowledge,

27. that a new relationship between science and society is necessary to cope with such pressing global problems as poverty, environmental degradation, inadequate public health, and food and water security, particularly those associated with population growth,

28. the need for a significant commitment to science on the part of governments, civil society and the productive sector, as well as an equally strong commitment on the part of scientists to the well-being of society,

Proclaim the following:

I. Science for knowledge; knowledge for progress

29. The inherent function of the scientific endeavor is to carry out a comprehensive and thorough inquiry into nature and

society, leading to new knowledge. This new knowledge provides educational, cultural and intellectual enrichment and leads to technological advances and economic benefits. Promoting fundamental and problem-oriented research is essential for achieving endogenous development and progress.

30. Governments should act as catalysts to facilitate interactions and communication between stakeholders through national science policies. They should recognize the key role played by scientific research in the acquisition of knowledge, in the training of scientists and in the education of the population. Scientific research funded by the private sector has become a crucial factor for socio-economic development, but this does not cancel out the need for government-funded research. Both sectors should work in close collaboration and in a complementary manner in financing scientific research in order to achieve long-term goals.

2. Science for peace

31. The essence of scientific thinking is the ability to examine problems from different perspectives and seek explanations for natural and social phenomena. Scientific reasoning is constantly subjected to critical analysis. Science thus relies on critical and freethinking, which is essential in a democratic world. The scientific community, sharing a long-standing tradition that transcends nations, religions and ethnicity, should promote, as stated in UNESCO's constitution, the 'intellectual and moral solidarity of mankind', which is the basis of a culture of peace. Worldwide cooperation among scientists makes a valuable and constructive contribution to global security and to the development of peaceful interactions between different nations, societies and cultures, and could encourage further steps towards disarmament, including nuclear disarmament.

32. Governments and society at large should be aware of the need to use natural and social sciences and technology as tools to address the root causes and impacts of conflict. Investment in scientific research which addresses these issues should be increased.

3. Science for development

33. Today, more than ever, science and its applications are indispensable for development. All levels of government and the private sector should lend support for the development of adequate and evenly distributed scientific and technological capacity. This should take place through appropriate education and research programs as an indispensable foundation for economic, social, cultural and environmentally sound development. This is particularly urgent for developing countries. Technological development requires a solid scientific basis and needs to be resolutely directed towards safe and clean production processes, greater efficiency in the use of resources and the creation of environmentally friendly products. Science and technology should also be resolutely directed towards prospects for better employment, improving competitiveness and social justice. Investment in science and technology aimed both at these objectives and at a better understanding and safeguarding of the planet's natural resource base, biodiversity and life-support systems must be increased. The objective should be the development of sustainable development strategies through the integration of economic, social, cultural and environmental aspects.

34. Science education, in the broad sense of the term, without discrimination and encompassing all levels and modalities, is a fundamental prerequisite for democracy and for ensuring sustainable development. In recent years, measures have been undertaken all over the world to promote basic education for

all. It is essential that the fundamental role played by women in the application of scientific development to food production and health care be fully recognized and that efforts be made to strengthen their understanding of scientific advances in these areas. It is based on this that science education, communication and popularization need to be developed. Special attention still needs to be given to marginalized groups. Now, more than ever, it is necessary to develop and expand science literacy in all cultures and all sectors of society. It is also necessary to develop reasoning abilities and skills and an appreciation of ethical values so as to improve public participation in decision-making regarding the use of new knowledge. Progress in science makes the role of universities particularly important in the promotion and modernization of science teaching and its coordination at all levels of education. In all countries, particularly in developing countries, there is a need to strengthen scientific research in higher education, including postgraduate programs, taking national priorities into account.

35. The construction of scientific capacity should be supported by regional and international cooperation to ensure both equitable development and the distribution and utilization of human creativity with no discrimination of any kind against countries, groups or individuals. Cooperation between developed and developing countries should take place in conformity with the principles of total and unrestricted access to information, equity and mutual benefit. In all efforts of cooperation, differences in traditions and cultures should be given due consideration. The developed world has a responsibility to enhance partnership activities in science with developing countries and transition countries. Helping to create a critical mass of national research in the sciences through regional and international cooperation is especially important for small States and least developed countries. Scientific

structures such as universities are essential for personnel to be trained in their own country so they can later have a career there. Through these and other efforts, conditions that lead to the reversal of current trends or to the reduction of their effects should be created. However, no measures should be adopted to restrict scientists' right to come and go as they please.

36. Progress in science requires various types of cooperation at and between intergovernmental, governmental and non-governmental levels, such as: multilateral projects; research networks, including South-South networking; partnerships involving scientific communities of developed and developing countries to meet the needs of all countries and facilitate progress; fellowships and grants and the promotion of joint research; programs to facilitate the exchange of knowledge; the development of internationally recognized scientific research centers, particularly in developing countries; international agreements for the joint promotion, evaluation and funding of mega-projects and broad access to them; international panels for the scientific assessment of complex issues; and international arrangements for the promotion of postgraduate training. New initiatives are required for interdisciplinary collaboration. The international character of fundamental research should be strengthened by significantly increasing support for long-term research projects and for international collaborative projects, especially those of global interest. In this respect, particular attention should be given to the need for continuity of support to research. Access to these conditions for scientists from developing countries should be actively supported and open to all on the basis of scientific merit. The use of information and communication technology, particularly through the creation of networks, should be expanded as a means of promoting the free flow of knowledge. At the same time, care must be taken to ensure that the use of these technologies does not lead to the denial or restriction of the richness of the various cultures and means of expression.

37. In the first place, so that all countries can achieve the objectives set out in this Declaration national strategies, institutional arrangements and financing systems need to be developed in conjunction with international initiatives. They need to be set up or revised to enhance the role of sciences in sustainable development within the new context. In particular, they should include: a long-term national policy on science to be developed together with society and private actors; support to science education and scientific research; the development of cooperation between R&D institutions, universities and industry as part of national innovation systems; the creation and maintenance of national institutions for risk assessment and management, vulnerability reduction, safety and health; and incentives for investment, research and innovation. Parliaments and governments should be invited to provide a legal, institutional and economic basis for enhancing scientific and technological capacity in the public and private sectors and facilitate their interaction. Decision-making and priority setting in the field of science should be made an integral part of overall development planning and the formulation of sustainable development strategies. In this context, the recent initiative of G8 creditor countries to take part in the process of reducing the debt load of certain developing countries will be conducive to a joint effort on the part of developing and developed countries towards the establishment of appropriate mechanisms for funding science. This will be done in order to strengthen national and regional scientific and technological research systems.

38. Intellectual property rights need to be appropriately protected all over the world, and access to data and information is essential for undertaking scientific work and for translating the results of scientific research into tangible benefits for society. Mutually supportive measures should be taken to enhance the relationship between the protection of intellectual property rights and the

distribution of scientific knowledge. There is a need to consider the scope, extent and application of intellectual property rights in relation to the equitable production, distribution and use of knowledge. There is also a need to develop appropriate national legal frameworks further so they will include the specific requirements of developing countries. These frameworks should also accommodate traditional knowledge and its sources and products, whose recognition and adequate protection should be ensured based on informed decisions made by the customary or traditional owners of this knowledge.

4. Science in society and science for society

39. The practice of scientific research and the use of knowledge that results from this research should always have the welfare of humanity as its objective. This includes reducing poverty, respecting the dignity and rights of human beings and of the global environment and taking full responsibility for present and future generations. There should be a new commitment to these important principles on the part of all parties concerned.

40. The unrestricted flow of information on all possible uses and consequences of new discoveries and newly developed technologies should be secured so that ethical issues can be debated in an appropriate way. Each country should establish suitable measures to address the ethics related to practicing science and to the use and applications of scientific knowledge. These should include procedures for dealing with dissent and dissenters in a fair and responsive manner. UNESCO's World Commission on the Ethics of Scientific Knowledge and Technology of UNESCO could provide a means of interaction in this respect.

41. All scientists should commit themselves to high ethical standards and a code of ethics based on relevant norms enshrined in international human rights instruments should be established for

scientific professions. The social responsibility of scientists requires that they maintain high standards of scientific integrity and quality control, share their knowledge, communicate with the public and educate the younger generation. Political authorities should respect this action taken by scientists. Science curricula should include science ethics, as well as training in regards to the history and philosophy of science and its cultural impact.

42. Equal access to science is not only a social and ethical requirement for human development; it is also essential for realizing the full potential of scientific communities worldwide and for guiding scientific progress towards meeting the needs of humanity. The difficulties encountered by women, who account for over half of the worlds' population, in starting, pursuing and advancing in a career in the field of science and in participating in decision-making processes concerning science and technology should be addressed urgently. There is an equally urgent need to address the difficulties faced by disadvantaged groups which prevent their full and effective participation.

43. Governments and scientists of the world should address the complex problems related to poor health and to the increasing level of inequality in health conditions between different countries and between different communities within the same country. The objective is to achieve an improved, equitable standard of health and a better provision of quality health care for all. This should be achieved through education, through scientific and technological advances, through the development of robust long-term partnerships between all stakeholders and through the creation of programs to meet this objective.

* * *

44. We, participants in the World Conference on Science for the Twenty-first Century: a New Commitment, commit ourselves

to making every effort to promote dialogue between the scientific community and society, to remove all discrimination with respect to education for and the benefits of science, to act ethically and cooperatively within our own spheres of responsibility, to strengthen scientific culture and its peaceful application throughout the world, and to promote the use of scientific knowledge for the well-being of populations and for sustainable peace and development, taking into account the social and ethical principles illustrated above.

45. We consider that the Conference document Science Agenda – Framework for Action gives practical expression to a new commitment to science and can serve as a strategic guide for partnership within the United Nations system and between all stakeholders in the scientific endeavor in the years to come.

46. We therefore adopt this Declaration on Science and the Use of Scientific Knowledge and agree upon the Science Agenda – Framework for Action as a means of achieving the goals set forth in the Declaration, and call upon UNESCO and ICSU to submit both documents to the General Conference of UNESCO and to the General Assembly of ICSU. These documents will also be submitted to the United Nations General Assembly. The purpose is to enable both UNESCO and ICSU to identify and implement follow-up action in their respective programs and to mobilize the support of all partners, particularly those in the United Nations system, in order to reinforce international coordination and cooperation in the field of science.

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INTRODUCTORY NOTE
TO THE SCIENCE AGENDA – FRAMEWORK FOR ACTION

The present document, prepared by the World Conference on Science Secretariat, was not submitted for formal approval. Its objective was to facilitate the understanding of the draft of the Science Agenda – Framework for Action. It is reproduced here for the same reason.

THE NEW CONTEXT

1. Several major factors have transformed, and will continue to affect, the relationships between science and society as they have developed during the second half of the century.

    a) Scientific research is increasing our knowledge and ability to understand complex systems and processes in an ever-growing range of scales in space and time. The natural sciences are enjoying a highly creative phase whose roots are the breakthroughs and advances in various fields, from molecular biology, biochemistry, quantum physics and material science to planetary sciences and astronomy. The emergence of new disciplines and of interactions among them, increasingly powerful computational tools, the rapid accumulation of scientific knowledge and the need to bring natural and social sciences together in joint agendas all have significant implications on scientific research and education.

    b) The conditions for the production and sharing of scientific knowledge are changing as a consequence of the increasing

intensity of communication, the growing interface between disciplines and closer interactions between science and technology, universities and industry, laboratories and factories. Major economic and social implications are arising from the closer contacts between scientific discoveries and their application, technological know-how and commercial exploitation. Information and communication technologies are causing changes on all fronts that are as profound as those brought about when print was first developed.

c) Linked to the changes occurring in science and technology are the globalization of trade and business, the increasingly important role played by transnational companies and the reduction in the capacity of governments to regulate economic activity and its repercussions on society. Within a framework that is increasingly subjected to transnational challenges and short-term requirements, competitive businesses are often those that can capture information flows and apply them quickly, rather than produce discoveries and inventions themselves.

d) The end of the Cold War has resulted in a significant reorientation of investment in science and technology in some countries. For the more industrialized countries, resources used for research in the area of military defense during this period had represented a major part of public R&D expenditures. Unfortunately, in recent years, the percentage of the Gross National Product devoted to international cooperation, particularly in developing countries, has – with certain exceptions – stagnated or decreased. This fact, combined with economic difficulties, has resulted in little or no growth worldwide in government funding for fundamental research, and private R&D has declined in some sectors as a natural consequence of the

stagnation of the global economy. At the same time, research programs, especially comprehensive ones designed to address global problems, are have had to face an increase in costs.

e) The world is affected by growing inequalities. This contributes to new tensions and conflicts. The patterns of disparities are now more complex and more contrasting. One of many cases that illustrate this situation on a global scale is the fact that 20 percent of the world's population is responsible for 86 percent of the total private consumption. Within and between countries the benefits of education, culture, health services and other factors of human and social well-being are now more unequally distributed than ever. The big picture is that, while more industrially developed nations have developed a great capacity for scientific research and technological innovation, most countries have yet to solve problems related to the basic needs of their populations. Less developed countries are struggling for survival. The varying degrees to which countries and regions adapt to scientific and technological changes threaten to further accentuate inequalities in access to and in the production of scientific knowledge and technical know-how.

f) Another major factor is the increase in the number of environmental problems that can have an effect on the future of our planet. In addition to the phenomena of population growth and increasing urbanization, industrial, agricultural and transport activities are bringing about a major transformation in the global environment. This change seriously affects human health and the productivity of ecosystems. Human action has even started to affect the operation of global life support systems such as the weather. The need to adopt the precautionary principle,

initiate anticipatory research, take preventive action, and indeed make sustainability an essential ingredient in any model of development has become more evident at a time when societies, cultures, economies and environments are becoming increasingly interdependent.

g) The need to take into account ethical consequences when discussing the future of science has become more urgent over the last few years, requiring an open discussion within the scientific community and society as a whole. In this context, scientists themselves have started to play an active role in defining and accepting their ethical responsibilities. Public understanding and awareness of science are important factors in the establishment of appropriate ethical guidelines and procedures.

h) A feature of our times is the emergence of organized sectors of society. These sectors have demanded that they take part in democratic debates and decision-making, as well as transparency on all public issues. Alongside traditional actors, such as trade unions and political parties, strong new groups are coming to the fore, including the communication media, citizen movements, and a variety of non-governmental organizations, such as associations of parliamentarians, industrial professions and entrepreneurs. Many of these are concerned with the environmental issues and other subjects that the sciences are expected to address. Some reflect a lay disenchantment and disregard for science, and a fear of the unforeseen or unknown consequences of some of its applications. The confusion about who speaks for science amongst the many sectors, and whose science can be trusted, adds to this public mistrust.

i) Women, as the largest population group in the world, are asking to play a more important role in all activities,

particularly in science and technology. Significant institutional and cultural barriers that prevent women from making progress in the areas of science education and research and from taking on responsibilities on a par with men still need to dealt with. Achieving greater gender equality in scientific activities, this itself being a strong desideratum for reasons of equity, also implies that the approach, and even the content, of scientific advances should change so it will focus more on the needs and aspirations of humanity.

2. There is currently an accumulation of discoveries, applications and know-how that constitute an unprecedented source of knowledge, information and power. Never have discoveries and innovations promised a greater increase in material progress than today, but neither has the productive – or destructive – capacity of humankind left so many uncertainties unresolved. The major challenge of the coming century lies in the ground between the power which humankind has at its disposal and the wisdom which it is capable of showing in using it.

3. Guided by the conviction that it is both urgent and possible to take up this challenge, the participants to the Conference are determined to concentrate efforts on the production and sharing of knowledge, know-how and techniques to address the major problems ahead – whether local, regional or global. It is evident to everyone today, however, that it is not science alone that will solve these problems. A new relationship needs to be created between those who develop and use scientific knowledge, those who support and finance it, and those concerned with its applications and impacts; such is the essence and the spirit of the new commitment.

4. In considering the practical expressions of this commitment, it must be recognized that the relationship between scientific

research, education, technological innovation and practical benefits is much more diverse and complex today than it ever was in the past. Other people frequently play a part in the process in addition to researchers. The progress of science cannot be justified purely in terms of search for knowledge. It must be defended – and increasingly so, in view of budgetary restrictions – through its relevance and effectiveness in addressing the needs and expectations of our societies.

5. Democratic decision-making on scientific matters requires the participation of all groups of society It also needs consideration and respect for national diversity within a spirit of solidarity and cooperation. If only one sector of the population or a single group of nations has an active role in science and its applications, it is likely that there will be an imbalance, and gaps and disparities tend to increase. Therefore, in defining and carrying out the multilateral commitment to science it is not only important that each and every country be able to make its own informed and articulate contribution, but also that all actors – the public sector, the media, scientists, educators, industrialists, politicians and decision-makers – be involved in the process.

THE NEW COMMITMENT

6. In the process leading to the World Conference on Science and to the drafting of the Declaration on Science and the Use of Scientific Knowledge and the Science Agenda – Framework for Action, numerous reflections and enlightening debates have taken place. Among the wide variety of concerns and proposals expressed, there are clear signals of convergence with regard to some central issues. These are listed here as general guidelines to facilitate the identification of the new commitment.

a) The need for drastic changes in attitude and in the manner in which problems related to development are approached, especially in terms of their social, human and environmental dimensions. The sciences must be put to work for sustainable peace and development in a progressively responsive and democratic framework; scientists, as all other stakeholders, must correspondingly recognize their ethical, social and political responsibilities.

b) The need to improve, strengthen and diversify science education, formal and non-formal, at all levels and for all sectors, and to integrate science into the general culture, emphasizing its contribution to the formation of open and critical thinking as well as to the improvement of people's ability to meet the challenges of modem society. Any discriminatory barrier to equitable participation in science must be combated and positive efforts have to be made to fully integrate women into the sciences.

c) The need to strengthen the national S&T base, reorganizing national science policies, increasing scientific personnel and ensuring a stable and supportive research context, especially in areas that are locally and globally relevant. In developing countries, more resources for S&T are necessary considering local capacities and priorities, and this funding should be increased through similar commitments made by partners in developed nations.

d) The need to break traditional barriers between natural and the social sciences and to adopt interdisciplinarity as a common practice. Moreover, since the processes underlying present global problems and challenges need the concurrence of all scientific disciplines, it is imperative to attain proper balance in order to support them.

e) The need to open scientific matters to public debate and democratic participation so as to reach consensus and concerted action. The scientific community is expected to open itself to a permanent dialogue with society. Relationships with other forms of knowledge and expressions of culture are particularly relevant.

f) The need to reinforce and broaden scientific cooperation, both at a regional and at an international level, through the creation of networks and the establishment of institutional arrangements with IGOs, NGOs and research and education centers. In this regard, UNESCO and ICSU programs must be strengthened, in particular through cooperation between them and with other United Nations organizations. It is a challenge to improve the coordination of the various efforts of these partners while respecting their different roles and stimulating synergy between them.

BASIS FOR ACTION

The following text includes all sections of the draft Science Agenda – Framework for Action and attempts to show the general ideas behind the guidelines for action listed therein.

I. Science for knowledge; knowledge for progress

I.1 The Role Played by Fundamental Research

7. The sciences are expected to continue to fulfill their intrinsic role, which is the acquisition of knowledge and understanding benefiting from the creativity of scientists around the world. This is the central argument for continuing to develop fundamental research and education in all subjects related to science.

8. Public authorities, private companies, universities, research laboratories and institutes each have their own dynamics and spheres of action. In order to relate to all such different partners, scientific research must cope with the underlying diversity of contexts and adopt a coherent agenda, establishing balance between immediate and long-term objectives.

9. In designing international policies and programs for science, the multiplicity of conditions for scientific research, the perceptions of science and also of problems and the needs and possibilities to apply scientific knowledge must be borne in mind. International science is ideally built upon the plurality and diversity of contributions that all nations can make to scientific development considering their own capacities, needs and interests.

1.2 The Public Sector and the Private Sector

10. Fundamental research requires sustained public support as it represents an 'off-market' public asset with uncertain short-term profitability The returns and applications that result from it provide, in turn, new additions to the entire research system while at the same time contributing to the solution of specific problems and the development of technological capacity.

11. New funding mechanisms must be sought for science considering the current context. In most industrialized countries, private investment in S&T research surpasses public sector funding for the area, and a number of public institutions have been or are being privatized. Agencies awarding grants tend to give preference to research with short-term goals, and the accountability of results is increasingly based on technological applications and patents rather than on basic knowledge acquisition. In most developing countries, on the other hand, most scientific

research is funded by the government. Even in countries that have managed to train a considerable number of scientists, the private sector gives preference to research with short-term goals or does not invest in research at all; the scientific system is weakly linked to the productive system and local industry does not benefit from the opportunities created by science; as a result, S&T contributes little to the creation of national wealth in these countries.

1.3 Sharing scientific information and knowledge

12. New communication and information technologies have become an important factor for change, giving rise to new directions, methodologies and scenarios for scientific work and new ways of producing, accessing and using information. The growing impact and potential of new technologies make it necessary for scientists and institutions to adapt themselves in order to fully benefit from the advantages this reality can bring about. In this regard, it is essential that they be developed and used to provide equal opportunities for scientists in different regions of the world, to facilitate the wide-ranging distribution of and access to information, and to promote a truly international scientific dialogue. Computation and information systems that reflect the diverse cultures, languages, technical resources, habits and needs of people around the world need to be designed.

13. True and comprehensive sharing of scientific knowledge cannot be accomplished by electronic means alone. Regional and international networks for research and training, partnerships involving communities in developed and developing countries, and specific programs for the exchange and transference of scientific knowledge and skills have proved to be important mechanisms and should be fostered and implemented more widely.

2. Science for peace and development

2.1 Science for basic human needs

14. Food, water, shelter and access to health care, social security and education are the cornerstones of human well-being. The poverty and dependence that affect a number of countries can only be escaped through social and economic transformation and political determination, a comprehensive and upgraded education system, and the appropriate development and use of science and technology. Scientific knowledge needs to be applied in order to find ways to reduce the inequality, injustice and lack of resources that affect especially the marginalized sectors of society and poorer countries in the world.

15. Science is today a currency in the hierarchy of nations. Developing countries need to enhance S&T capacities in areas that are relevant to the problems that affect their own populations and their national development. It should not be overlooked, however, that these countries have very diverse characteristics, some being in various ways closer to the industrialized world than to their fellow countries. It is essential for each country to have the capacity and take on the responsibility to define its priorities and areas of relevance and to establish the manner to address them.

16. It is against this background that a case for supporting S&T in developing countries is made. Developing countries will benefit from this effort in solving their current problems and achieving a healthier, more sustainable sort of development. In essence, this will be a global benefit since there are more than 120 developing countries and three fourths of the population of the world lives in these countries. As long as they are not effectively involved in science, can we talk of 'world science'?

17. There is a need for urgency here. Comprehensive, far-reaching and long-lasting development is a universal challenge and is not restricted to a particular group of countries. It requires coherent, plural and multifaceted action, to which the international community has much to contribute.

2.2 Science, environment and sustainable development

18. One of the greatest challenges for the world community in the next century will be the attainment of sustainable development. This will call for balanced interrelated policies aimed at economic growth, poverty reduction, human well-being, social equity and the protection of the Earth's resources and life-support systems. It is increasingly perceived that the sustainable management and use of resources and sustainable production and consumption patterns in general are the only pathways that lead to meeting the developmental and environmental needs of present and future generations. We must develop and harness our scientific capabilities to develop sustainability.

19. Considering the 'Program for the Further Implementation of Agenda 21' adopted by the United Nations General Assembly in 1997, the Agenda's guidelines for action are expected to address the following key objectives: to strengthen capacity and capability in science for sustainable development, emphasizing the needs of developing countries in particular; to reduce scientific uncertainty and improve the long-term prediction capacity for the prudent management of environment-development interactions; to foster international scientific cooperation and the transfer and sharing of scientific knowledge; to bridge the gap between science, production sectors, decision-makers and major groups in order to broaden and strengthen the application of science.

2.3 Science and technology

20. Science, technology and engineering are among the principal drivers of industrial and economic development. The difference in the abilities of countries to use S&T through the process of innovation has increasingly contributed to differences in economic performance and to the widening income gap between industrialized and developing countries.

21. Innovation in all sectors is increasingly characterized by bi-directional feedback between the basic research system and technology development and diffusion. This is changing the requirements for successful technology transfer and for upgrading innovation capabilities in developing countries. This has implications on domestic policies and international cooperation. One of the main priorities must now be to promote the development of national scientific and technological infrastructures and of the corresponding human resources.

2.4 Science education

22. There is an urgent need to renew, expand and diversify basic science education for all, emphasizing scientific and technological knowledge and the skills necessary for meaningful participation in the society of the future. The rapid advancement of scientific knowledge means that the established education system cannot alone cope with the changing needs of the population at the various levels; Formal education must be increasingly complemented through non-formal channels. Communication media and technologies can play an important role in this regard. On a broader scale, an increasingly scientifically oriented society needs science popularization in its widest sense to promote an improved understanding of science and adequately guide public perceptions and attitudes about science and its applications.

23. It is today widely recognized that, without adequate higher S&T education and research institutions providing a critical mass of skilled scientists, no country can ensure genuine development. It is further agreed that action at national level should aim to enforce the links between higher education and research institutions, taking into account that education and research are closely related elements in the establishment of knowledge.

2.5 Science for peace and conflict resolution

24. There can be no lasting peace as long as essential problems related to development are not properly attended to; there can be no proper development as long as the culture and the practice of peace are not universally adopted. Were science always geared towards peaceful purposes, it certainly would make a greater contribution to the well-being of humanity.

25. Constructing the defenses of peace in the minds of individuals, as recommended in the Preamble of UNESCO's Constitution, implies grasping the tools of scientific knowledge to reveal, understand and at the same time prevent the root causes of conflict. This field of research requires the concerted effort of a large number of scientific disciplines, involving as it does issues such as social inequality, poverty, food provision, justice and democracy, education for all, health care and environmental degradation. In other words, it involves every aspect of economic, social or political life that engenders violence.

26. The contribution to the construction of the defenses of peace entails a great deal of responsibility on the part of all professionals that act in the areas of science and technology. The principles of universality, freedom and critical thinking that are dear to science constitute a common bond for a constructive dialogue between parts in conflict and serve to

fight intolerance and ideological and social barriers. Scientists have demonstrated the role that they can play in addressing conflicts and preparing peaceful agreements; this role must continue to be played with the support of governments and independent institutions.

2.6 Science and policy

27. Each country needs to have the capacity to design and implement its own science policy with responsibility within the global context, and to confront the dilemmas of priorities and competition for resources from the particular phase of economic development and industrialization in which it finds itself. A balanced development of a science base suitable for the country's needs requires an elaborate infrastructure and stable institutional support, as well as the existence of an appropriate legal and regulatory framework. Regional and international networking and cooperation can facilitate the exchange of national experiences and the design of more coherent science policies. The legal issues and regulations that guide international research and development in strategic areas such as information and communication technologies, biodiversity and biotechnology require special attention. Cooperation among international organizations is necessary to improve the measurement and understanding of intangible assets and recognition of their importance and to protect the output of intangible investments in areas such as intellectual property rights. An internationally accepted framework should foster the protection of intellectual property rights, recognizing the provisions in existing frameworks that allow for different approaches.

28. In view of the increasing complexity of decision-making in the contemporary world, scientists should be more proactive in their contribution to national policy-making. The role of

science in society and governance has never been more important. Science has an overriding responsibility to help societies make a transition to a dynamically stable and sustainable ecological and economic system. In this transition, an alliance between modern technical science and the holistic wisdom of traditional societies and philosophers from all cultures can be very important.

3. Science in society and science for society

3.1 Social requirements and human dignity

29. Science should be at the service of humanity as a whole and contribute to improving the quality of life of every member of present and future generations. Fields that promise to address issues of social interest need therefore to be placed high on the agenda. When dealing with science-society benefits, long-term vision in scientific planning is necessary. Intermediate objectives must be defined so that appropriate evaluation can be conducted. The needs and requirements of different individuals, sectors or groups can have vary widely according to parameters such as the following: age, education, health, gender, cultural background, professional training, economic status, where they work and where they live. Identifying these diverse needs and finding possible ways to address and fulfill them requires the joint effort of scientists from different areas. The new reciprocal commitment between science and society will require not only that the scientific community take account of these challenges but also that cooperation mechanisms be resolute in promoting a strategy to meet them.

30. The scientific community, governments, and all relevant institutions are urged to commit themselves to unrestricted respect for social and human dignity. In compliance with an

essential social and moral duty, scientists should always work for the democratic principles of dignity, equality and respect of individuals and against ignorance, prejudice and the exploitation of human beings.

3.2 Ethical issues

31. The new discoveries and applications of science, while raising enormous hopes and expectations, also give rise to a variety of ethical problems; scientists, therefore, can no longer overlook the ethical implications of scientific work. Ethics is a subject for permanent debate, choices and commitments – at both the individual and the social level – that transcends juridical prescriptions and adapts itself to a diversity of evolving situations.

32. The full and free exercise of science, with its own values, should not be seen to conflict with the recognition of spiritual, cultural, philosophical and religious values; an open dialogue needs to be maintained with these value systems to facilitate mutual understanding. In order to foster the development of a comprehensive discussion on ethics in science as well as that of a code of universal values, it is necessary to recognize the many ethical frameworks of civilizations around the world.

3.3 Increased participation in science

33. All human beings have the right to participate in scientific development. Equity in entering and pursuing a career in science is one of the social and ethical requirements for human development; there should be no discrimination in science against any sector or individual. The increasing participation or involvement of all sectors of society in scientific development entails a systemic revision of science; it is clear that the decision-making and normative mechanisms of the institution of science are inevitably affected. In particular, any

kind of central monitoring, whether political, ethical or economic, needs to take into account the increasingly diverse actors that are part of the social organization of science.

34. It is urgent that women's participation in the planning, guidance and assessment of scientific research and education activities be increased so these areas will benefit from their perspective on science and their contribution to it; only in this way can the best use be made of the intellectual potential of humankind as a whole and the optimal contribution to human and social well-being be ensured.

3.4 Modern science and other systems of knowledge

35. Modern science does not constitute the only form of knowledge, and closer links need to be established between this and other forms, systems and approaches to knowledge for their mutual enrichment and benefit. A constructive intercultural debate is in order to help find ways of better linking modern science to the broader knowledge heritage of humankind.

36. Traditional societies, many of them with strong cultural roots, have nurtured and refined systems of knowledge of their own, relating to such diverse fields as astronomy, meteorology, geology, ecology, botany, agriculture, physiology, psychology and health. These knowledge systems represent enormous wealth. Not only do they harbor information which is yet unknown to modern science, they are also expressions of other ways of living in the world, other relationships between society and nature, and other approaches to the acquisition and construction of knowledge. Special action must be taken to preserve and cultivate this fragile and diverse world heritage in the face of globalization and the growing dominance of a single view of the natural world as espoused by science. A closer relationship between science and other knowledge systems is expected to bring important advantages to both sides.

ANNEX. LIST OF RELATED CONFERENCES

The Declaration on Science and the Use of Scientific Knowledge and the Science Agenda – Framework for Action have taken into account the decisions, recommendations and reports of a number of recent major intergovernmental or non-governmental conferences. These documents are listed below, as are the reports produced as a result of meetings organized within the framework of the World Conference on Science.

- Recommendation on the Status of Scientific Researchers, adopted by the UNESCO General Conference, Paris, 1974
- Vienna Program of Action on Science and Technology for Development (UNCSTD), UN, New York, 1979
- ICSU/ICASE/UNESCO International Conference on Science Education, Bangalore, 1985
- ICSU Statement on Freedom in the Conduct of Science, Paris, 1989
- World Conference on Education for All: Meeting Basic Learning Needs (Final Report), Jomtien, 1990
- WMO/UNEP/UNESCOKSU Second World Climate Conference, Geneva, 1990
- Statement of the International Conference on an Agenda of Science for Environment and Development into the 2lst Century (ASCEND 211, Vienna, 1991
- Agenda 21 of the United Nations Conference on Environment and Development, Rio de Janeiro, 1992
- Conference on Academic Freedom and University Autonomy, Sinaia, 1992
- ICSU Statement on Gene Patenting, Paris, 1992
- World Conference on Human Rights, Vienna, 1993

- Report of the Global Conference on the Sustainable Development of Small Island Developing States, Bridgetown, Barbados, 1994

- Agenda for Development adopted by the Group of 77 in New York, 18 April 1995

- World Summit for Social Development, Copenhagen, Denmark, 1995

- Report of the Gender Working Group on Gender Implications of Science and Technology for the Benefit of Developing Countries' of the United Nations Commission on Science and Technology, 1995

- Fourth World Conference on Women, Beijing, 1995

- International Congress on Education and Informatics, Moscow, 1996

- ICSU Statement on Animal Research, Pans, 1996

- World Food Summit, Rome, 1996

- Program for the Further Implementation of Agenda 21, UN General Assembly, New York, 1997.

- World Congress on Higher Education and Human Resources Development for the Twenty-First Century, Manila, 1997

- Universal Declaration on the Human Genome and Human Rights, adopted by the UNESCO General Conference, Paris, 1997

- World Declaration on Higher Education for the Twenty-First Century: Vision and Action. UNESCO, Pans, 1998

- Framework for Priority Action for Change and Development of Higher Education, UNESCO, Paris, 1998.

SCIENCE AGENDA – FRAMEWORK FOR ACTION

PREAMBLE

1. We, participants in the World Conference on Science for the Twenty-first Century: a New Commitment, gathered in Budapest, Hungary, from June 26 to July 1, 1999 under the aegis of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the International Council for Science (ICSU), state the following:

2. Advancing the objectives of international peace and the common welfare of humankind is one of the highest and most noble goals of our societies. The creation of UNESCO and of ICSU, more than half a century ago, was a symbol of the international determination to make progress in relation to these objectives through scientific, educational and cultural relations among the peoples of the world.

3. The above objectives are as valid now as they were 50 years ago. However, while the means of achieving them have developed considerably over this half-century through scientific and technological progress, so have the means of threatening and compromising them. In the meantime, the political, economic, social, cultural and environmental context has also changed profoundly, and the role of sciences (natural sciences such as physical, earth and biological sciences, biomedicine and genetic engineering and social and human sciences) in this altered context needs to be collectively defined and pursued: hence the grounds for a new commitment.

Having adopted the Declaration on Science and the Use of Scientific Knowledge, and inspired by the Introductory Note to the Science Agenda – Framework for Action,

4. We agree, by common consent, to the present Science Agenda – Framework for Action, as guidelines and instruments for action to achieve the goals proclaimed in the Declaration.

5. We consider that the guidelines for action formulated hereinafter provide a framework for dealing with the problems, challenges and opportunities confronting scientific research and for taking existing and new partnerships further. This is true both in terms of national and international partnerships and in relation to all participants in the scientific endeavor. Such research efforts and partnerships must be consistent with the needs, aspirations and values of humankind and respect for nature and future generations, in the pursuit of lasting peace, equity and sustainable development.

I. Science for knowledge; knowledge for progress

6. We commit ourselves to the advancement of knowledge. We want this knowledge to be at the service of humanity as a whole and to result in better quality of life for present and future generations.

1.1 The Role of Fundamental Research

7. Each country should aim at having high-quality scientific institutions capable of providing research and training facilities in areas of specific interest. In cases in which countries are unable to create these institutions, the necessary support should be granted by the international community through partnership and cooperation.

8. The development of scientific research should be supported by appropriate legal frameworks at the national and international level. Freedom of opinion and protection of intellectual rights are particularly important in this respect.

9. Research groups and institutions and relevant non-governmental organizations should strengthen their regional and international cooperation activities, with a view to: facilitating scientific training; sharing expensive facilities; promoting the distribution of scientific information; exchanging scientific knowledge and data, notably between developed and developing countries; and jointly addressing problems of global concern.

10. Universities should ensure that their programs in all fields of science focus both on education and research and on the relationships between the two and introduce research as part of science education. Communication skills and exposure to social sciences should also be a part of the education of scientists.

11. In the new context of increased globalization and international networking, universities are faced not only with new opportunities but also with challenges. For example, universities play an increasingly important role in the innovation system. Universities are responsible for educating a highly skilled workforce for the future and for providing their students with the capabilities necessary for them to deal with global issues. They should also be flexible and regularly update their knowledge. Universities in developed and developing countries should intensify their cooperation through partnerships, for example. UNESCO could act as a center and facilitator.

12. Donor countries and United Nations agencies are encouraged to foster cooperation in order to improve the quality and

efficiency of their support to research in developing countries. Their joint effort should focus on strengthening national research systems, taking national priorities and science policies into account.

13. Professional organizations of scientists such as national and international academies, scientific unions and learning societies have an important role to play in the promotion of research, for which they should be given wide recognition and public support. These organizations should be encouraged to further international collaboration on questions of universal concern. They should also be encouraged to act as the advocates of freedom for scientists to express their opinions.

1.2 The public and private sectors

14. Through participatory mechanisms involving all relevant sectors and stakeholders, governments should identify the needs of the nation and give priority to support for the public research necessary for the achievement of progress in the various fields of science. They should ensure stable funding for this purpose. Governments should adopt corresponding measures and levels of budget appropriation.

15. Governments and the private sector should achieve an adequate balance between the various mechanisms for funding scientific research, and new funding possibilities should be explored or promoted through appropriate regulation and incentive schemes. This should occur through the establishment of public-private partnerships based on flexible schemes. Governments should guarantee accessibility to the knowledge produced.

16. There should be close dialogue between donors and recipients of S&T funding. Universities, research institutes and industry

should develop closer cooperation; funding for S&T projects should be promoted as a means of increasing knowledge and strengthening the scientific industry.

1.3 Sharing scientific information and knowledge

17. Scientists, research institutions, scientific learning societies and other relevant non-governmental organizations should commit themselves to increasing international collaboration, including the exchange of knowledge and expertise. Initiatives to facilitate access to scientific information sources by scientists and institutions in developing countries should be especially encouraged and supported. Initiatives to fully incorporate women scientists and other disadvantaged groups from the South and North into scientific networks should be implemented. In this context efforts should be made to ensure that results of publicly funded research will be made accessible.

18. Countries that have the necessary expertise should promote the sharing and exchange of knowledge, particularly through support to specific programs set up for the training of scientists worldwide.

19. The publication and wider distribution of the results of scientific research carried out in developing countries should be facilitated. This should occur with the support of developed countries through training, the exchange of information and the development of bibliographic services and information systems that better serve the needs of scientific communities around the world.

20. Research and education institutions should take account of the new information and communication technologies, assess their impact and promote their use. This could take place, for instance, through the development of electronic publishing

and the establishment of virtual research and teaching environments or digital libraries. Science curricula should be adapted to take the impact of these new technologies on scientific work into account. The establishment of an international program on Internet-enabled science and vocational education and teaching, alongside the conventional system, should be considered in order to redress the limitations of educational infrastructure and to bring high-quality science education to remote locations.

21. The research community should be involved in regular discussion with the publishing, library and information technology communities to ensure that the authenticity and integrity of scientific literature are not lost with the evolution of the electronic information system. The distribution and the sharing of scientific knowledge are an essential part of the research process, and governments and funding agencies should therefore ensure that relevant infrastructure and other costs are adequately covered in research budgets. Appropriate legal frameworks are necessary as well.

2. Science for peace and development

22. Today, more than ever, natural and social sciences and their applications are indispensable to development. Worldwide cooperation among scientists is a valuable and constructive contribution to global security and to the development of peaceful interactions among different nations, societies and cultures.

2.1 Science for basic human needs

23. Research specifically aimed at addressing the basic needs of the population should be a permanent chapter in every country's development agenda. In defining research priorities,

developing countries and transition countries should consider not only their needs and weaknesses in terms of scientific capacity and information but also their own strengths in terms of local knowledge, know-how and human and natural resources.

24. For a country to have the capacity to provide for the basic needs of its population, S&T education is a strategic necessity As part of this education, students should learn to solve specific problems and to address the needs of society by utilizing scientific and technological knowledge and skills.

25. Industrialized countries should cooperate with developing countries through jointly defined S&T projects that respond to the basic problems of the population in terms of science and technology. Careful impact studies should be conducted to ensure better planning and the implementation of development projects. Personnel engaged in these projects should be appropriately trained to perform their duties.

26. All countries should share scientific knowledge and cooperate to reduce the incidence of avoidable health problems throughout the world. Each country should assess and identify the health improvement priorities that are best suited to their own circumstances. National and regional research programs aimed at reducing variations in health conditions among communities should be developed. These include collecting valid epidemiological and other statistical data and passing on appropriate practices to those who can make use of them.

27. Innovative and cost-effective mechanisms for funding science and gathering resources and efforts for S&T in different nations should be examined with a view to their implementation by relevant institutions at the regional and international level. Both North-South and South-South networks for exchanging

human resources should be set up. These networks should be designed so as to encourage scientists to use their expertise to the benefit of their own countries.

28. Donor countries, non-governmental and intergovernmental organizations and United Nations agencies should strengthen their scientific programs in order to address pressing developmental problems as indicated in this Science Agenda. High quality standards should be maintained.

2.2 Science, environment and sustainable development

29. National, regional and global environmental research programs should be strengthened or developed, as appropriate, by governments, United Nations agencies, the scientific community and private and public research funding institutions. These research programs should include training projects. Areas that require special attention include issues related to the availability of fresh water, to the hydrological cycle, weather variations and changes in climate patterns, oceans, coastal areas, polar regions, biodiversity, desertification, deforestation, biogeochemical cycles and natural hazards. The goals of existing international global environmental research programs should be vigorously pursued within the framework of Agenda 21 and the action plans developed at global conferences. Cooperation between neighboring countries or among countries whose ecological conditions are similar must be supported so the solution to common environmental problems may be found.

30. All components of the earth's system must be monitored systematically on a long-term basis; this requires increased support on the part of governments and the private sector for the further development of global environmental monitoring systems. The effectiveness of monitoring programs crucially depends on availability of comprehensive monitoring data.

31. Interdisciplinary research involving both natural and social sciences must be vigorously carried out by all major participants concerned, including the private sector. This should be done in order to address the human dimension of changes in the global environment, including health impacts, and to improve the understanding of sustainability as conditioned by natural systems. Insights related to the concept of sustainable use also demand the interaction of natural sciences with social and political scientists, economists and demographers.

32. Modern scientific knowledge and traditional knowledge should be brought closer together in interdisciplinary projects that deal with the relationships between culture, environment and development in areas such as biological diversity conservation, natural resource management and the understanding and reduction of the impact of natural hazards. Local communities and other relevant participants should be involved in these projects. Individual scientists and the scientific community have a responsibility to provide accessible scientific explanations for these issues and to explain the ways in which science can play a key role in addressing them.

33. Governments, in cooperation with universities and higher education institutions and with the help of relevant United Nations organizations, should extend and improve education, training and facilities for the development of human resources in environment-related sciences. Both traditional and local knowledge should be used. Special efforts in this respect have to be made in developing countries with the cooperation of the international community.

34. All countries should encourage training in the following areas: vulnerability and risk assessment, early detection of both short-term natural disasters and long-term hazards brought about by environmental changes, better preparation,

adaptation, impact reduction and the integration of disaster management into national development planning. It is important, however, to bear in mind that we live in a complex world where uncertainty about long-term trends is a reality. Decision-makers must take this into account and therefore encourage the development of new forecasting and monitoring strategies. The precautionary principle is an important guiding principle in handling inevitable scientific uncertainty, especially in situations of potentially irreversible or catastrophic impact.

35. S&T research on clean and sustainable technologies, recycling, renewable energy resources and on the efficient use of energy should be strongly supported by the public and private sectors at national and international levels. Competent international organizations, including UNESCO and the United Nations Industrial Development Organization (UNIDO), should promote the establishment of an accessible virtual library on sustainable technologies.

2.3 Science and technology

36. National authorities and the private sector should support university-industry partnerships involving research institutes and medium, small and micro-enterprises. This should be done in order to promote innovation, thus accelerating returns from science and generating benefits for all of those who take part in the process.

37. Curricula related to science and technology should encourage a scientific approach to problem-solving. University-industry cooperation should be promoted to assist engineering education and continuing vocational education and to enhance responsiveness to the needs of the industry and the support lent by the industry to the education sector.

38. Countries should adopt the practices for seeking progress that best suit their needs and resources. Innovation is no longer a linear process that stems from a single advance in science; it requires a systematic approach involving partnerships, links between many areas of knowledge and constant feedback between the various participants. Possible initiatives include the creation of cooperative research centers and networks, technology 'incubators' and research parks and advisory agencies for small and medium enterprises. Specific policy-making tools, including initiatives to encourage national innovation systems to address science-technology links, should be developed considering the global economic and technological changes. Policies related to science should promote the incorporation of knowledge into social and productive activities. It is imperative to tackle the issue of the endogenous generation of technologies starting with the issues faced by developing countries. This implies that resources should be made available to these countries so they can generate technologies.

39. The transference of technology should take place at a more rapid pace in order to promote industrial, economic and social development. This should be supported through the exchange of professionals between universities and the industry and between countries, as well as through research networks and inter-institutional partnerships.

40. Greater emphasis should be placed by governments and institutions of higher education and lifelong learning in the areas of engineering and technological and vocational education. One of the ways in which this can occur is through international cooperation. New curriculum profiles which meet the requirements of employers and are attractive to youths should be defined. In order to reduce the adverse impact of the asymmetric migration of trained personnel from developing to the developed countries and also to sustain

high-quality education and research in developing countries, UNESCO could serve as a catalyst for a more equal, closer interaction among S&T personnel across the world and for the establishment of world-class education and research infrastructure in developing countries.

2.4 Science education

41. Governments should consider the improvement of science education at all levels a priority. Special attention should be paid to the elimination of the effects of gender bias and prejudice against disadvantaged groups, raising public awareness in relation to science and fostering its popularization. Steps need to be taken to promote the professional development of teachers and educators in the face of change, and special efforts should be made to address the lack of appropriately trained science teachers and educators, especially in developing countries.

42. Science teachers at all levels of schooling and personnel involved in informal science education should have access to continuous training so they can update their knowledge and therefore perform better in their task as educators.

43. New curricula, teaching methodologies and resources that take gender and cultural diversity into account should be developed by national education systems in response to the changing educational needs of societies. Research in science and technology education needs to be furthered at a national and at an international level through the establishment of networks of specialized centers around the world with the cooperation of UNESCO and other relevant international organizations.

44. Educational institutions should encourage students' contributions to decision-making processes concerning education and research.

45. Governments should lend increased support to regional and international programs in the area of higher education and to the creation of networks of graduate and postgraduate institutions. Special emphasis should be placed on North-South and South-South cooperation since these are important means of helping all countries, especially the smallest or least developed among them, to strengthen their scientific and technological resource base.

46. Non-governmental organizations should play an important role in sharing experiences in science teaching and education.

47. Educational institutions should provide basic science education to students in areas other than science. They should also provide opportunities for lifelong learning in the different fields of science.

48. Governments, international organizations and relevant professional institutions should improve or develop programs for training scientific journalists, communicators and all other participants who are involved in increasing public awareness in relation to science. An international program for the promotion of scientific literacy and culture accessible to all should be considered in order to provide appropriate and easily understandable technology and scientific inputs which are conducive to the development of local communities.

49. National authorities and funding institutions should promote the role of science museums and centers as important elements in science education. Limitations in the amount of resources available in developing countries should be recognized and distance education should be used extensively to complement existing formal and non-formal education.

2.5 Science for peace and conflict resolution

50. The basic principles of peace and coexistence should be a part of education at all levels. Science students should also be made aware of their specific responsibility not to apply scientific knowledge and skills to activities which threaten peace and security.

51. Governmental and private funding agencies should strengthen or develop research institutions that carry out interdisciplinary research in the areas of peace and the peaceful applications of S&T. Each country should ensure its involvement in this work, whether at the national level or through participation in international activities. Public and private support for research on the causes and consequences of wars and on conflict prevention and resolution should be increased.

52. Governments and the private sector should invest in sectors of science and technology that directly deal with issues that are at the root of potential conflicts, such as energy use, competition for resources and the pollution of air, soil and water.

53. Military and civil sectors, including scientists and engineers, should collaborate in the search for solutions to problems caused by accumulated weapon stocks and landmines.

54. Dialogue should be promoted between government representatives, civil society and scientists in order to reduce military spending and the use of science for military purposes.

2.6 Science and policies

55. National policies that establish consistent and long-term support for S&T should be adopted in order to ensure the strengthening of the human resource base, the creation of

scientific institutions, the improvement and upgrading of science education, the integration of science into the national culture, the development of infrastructure and the promotion of technology and innovation capacities.

56. S&T policies that explicitly consider social relevance, peace, cultural diversity and gender differences should be implemented. Adequate participatory mechanisms should be instituted to facilitate democratic debate on science policy choices. Women should actively participate in the creation of these policies.

57. All countries should systematically carry out analyses and studies regarding policies related to science and technology taking the opinions of all relevant sectors of society, including those of young people, into account. This should be done in order to define short-term and long-term strategies that will lead to sound and equitable socio-economic development. A World Technology Report as an addition to the present UNESCO World Science Report should be considered in order to provide a balanced worldwide opinion on the impact of technology on social systems and culture.

58. Governments should support graduate programs on S&T-related policies and on the social aspects of science. Training in legal and ethical issues and regulations guiding international R&D in strategic areas such as information and communication technologies, biodiversity and biotechnology should be developed for the scientists and professionals concerned. Science managers and decision-makers should have regular access to training and updating so they can cope with the changing needs of modern society in the areas of S&T.

59. Governments should promote the development or establishment of national statistical services capable of

providing sound data, separated by gender and disadvantaged groups, on science education and R&D activities. This is necessary for the effective creation of S&T policies. Developing countries should be assisted in this respect by the international community, and the technical expertise of UNESCO and other international organizations should be used for this purpose.

60. Governments in developing and transition countries should enhance the status of scientific, educational and technical careers, increase their capacity to retain trained scientists and make a conscious effort to improve working conditions in these areas. They should also promote the creation of new careers in S&T areas. Programs should also be set up or promoted to establish collaboration with scientists, engineers and technologists who have emigrated from these countries to developed countries.

61. Governments should make an effort to use scientific expertise more systematically in the creation of policies to address the process of economic and technological transformation. The contribution made by scientists should be an integral part of programs supporting either innovation or measures aimed at industrial restructuring or development.

62. Scientific advice is an increasingly necessary factor for informed policy-making in a complex world. Therefore, scientists and scientific organizations should consider it an important responsibility to provide independent advice to the best of their knowledge.

63. All levels of government should establish and regularly review mechanisms which ensure timely access to the best available advice from the scientific community drawing on a sufficiently wide range of the best expert sources. These mechanisms should

be open, objective and transparent. Governments should publish this scientific advice in media accessible to the great public.

64. Governments, in cooperation with United Nations agencies and international scientific organizations, should strengthen international scientific advisory processes as a necessary contribution to intergovernmental policy consensus-building at regional and global levels and to the implementation of regional and international conventions.

65. All countries should protect intellectual property rights but at the same time recognize that access to data and information is essential for scientific progress. For the development of an appropriate international legal framework, the World Intellectual Property Organization (WIPO), in cooperation with relevant international organizations, should constantly address the question of knowledge monopolies. The World Trade Organization (WTO), during new negotiations concerning the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), should incorporate tools aimed at financing the development of science in the South with full involvement on the part of the scientific community. In this regard, the international programs developed by ICSU and the five intergovernmental scientific programs developed by UNESCO should play a catalytic role by improving the compatibility of data collection and processing and facilitating access to scientific knowledge.

3. Science in society and science for society

66. The practice of scientific research and the use of scientific knowledge should always have the welfare of humanity as an objective. It must respect the dignity of human beings and their fundamental rights and take our shared responsibility in relation to future generations fully into account.

3.1 Social requirements and human dignity

67. Governments, international organizations and research institutions should foster interdisciplinary research aimed specifically at identifying, understanding and solving pressing human or social problems, according to each country's priorities.

68. All countries should encourage and support social science research to better understand and manage the tensions that characterize the relations between science and technology and the different societies and their institutions. Technology transferences should be monitored through the analysis of their possible impact on populations and society.

69. The structure of educational institutions and that of their curricula should be open and flexible so as to adjust to the emerging needs of societies. Young scientists should be provided with knowledge on and an understanding of social issues, as well as a capacity to move outside their specific field of specialization.

70. University curricula for science students should include field work that relates their studies to social needs and realities.

3.2 Ethical issues

71. Ethics and responsibility in science should be an integral part of the education and training of all scientists. It is important to instill a positive attitude towards reflection in students, as well as alertness and awareness of the ethical dilemmas they may encounter in their professional lives. Young scientists should be appropriately encouraged to respect and adhere to the basic ethical principles and responsibilities of science. UNESCO's World Commission on the Ethics of Scientific

Knowledge and Technology (COMEST), in cooperation with ICSU's Standing Committee on Responsibility and Ethics of Sciences (SCRES), has a special responsibility to follow up on this issue.

72. Research institutions should foster the study of ethical aspects of scientific work. Special interdisciplinary research programs are necessary to analyze and monitor the ethical implications and regulatory means of scientific work.

73. The international scientific community, in cooperation with other participants, should foster discussion, including public debate, to promote environmental ethics and environmental codes of conduct.

74. Scientific institutions are urged to comply with ethical norms and to respect the freedom of scientists to express themselves on ethical issues and to denounce misuse or abuse of scientific or technological advances.

75. Governments and non-governmental organizations, particularly scientific and scholarly organizations, should organize discussions, including public discussions, on the ethical implications of scientific work. Scientists and scientific and scholarly organizations should be adequately represented at relevant regulating and decision-making agencies. These activities should be institutionally fostered and recognized as part of scientists' work and responsibility. Scientific associations should define a code of ethics for their members.

76. Governments should encourage the establishment of adequate mechanisms to address ethical issues concerning the use of scientific knowledge and its applications. These mechanisms should be established where they do not yet exist. Non-governmental organizations and scientific institutions should

promote the establishment of ethics committees within their field of competence.

77. UNESCO Member-States are encouraged to strengthen the activities developed by the International Bioethics Committee and by the World Commission on the Ethics of Scientific Knowledge and Technology and to ensure appropriate representation.

3.3 Increasing participation in science

78. Government agencies, international organizations and universities and research institutions should ensure the participation of women in the planning, guidance, development and assessment of research activities. It is necessary that women participate actively in shaping the agenda for the future of scientific research.

79. The participation of disadvantaged groups in all aspects of research activities, including the development of policies, also has to be ensured.

80. All countries should contribute to the collection of reliable data in an internationally standardized manner for the generation of gender-disaggregated statistics on S&T, in cooperation with UNESCO and other relevant international organizations.

81. Starting from early learning stages, governments and educational institutions should identify and eliminate educational practices that have a discriminatory effect so as to increase the successful participation of individuals from all sectors of society, including disadvantaged groups, in science.

82. Every effort should be made to eliminate open or covert discriminatory practices in research activities. More flexible

and permeable structures should be set up to facilitate the access of young scientists to careers in science. Measures aimed at attaining social equity in all scientific and technological activities, including equal working conditions, should be designed, implemented and monitored.

3.4 Modern science and other knowledge systems

83. Governments are called upon to formulate national policies that allow a more comprehensive use of the applications of traditional forms of learning and knowledge while at the same time ensuring that their commercialization is properly rewarded.

84. Increased support for activities developed at national and international levels on traditional and local knowledge systems should be considered.

85. The countries should promote a better understanding and use of traditional knowledge systems instead of focusing only on extracting elements for their perceived utility to the S&T system. Knowledge should flow simultaneously to and from rural communities.

86. Governmental and non-governmental organizations should sustain traditional knowledge systems. This should occur through active support to societies that are the keepers and developers of this knowledge, their ways of life, their languages, their social organization and the environments in which they live. The contribution made by women should be recognized as a replenishing force for a great part of traditional knowledge.

87. Governments should support cooperation between the holders of traditional knowledge and scientists to explore the relationships between different knowledge systems and to foster interrelationships for mutual benefit.

FOLLOW-UP

88. We, participants in the World Conference on Science, are prepared to act with determination to attain the goals proclaimed in the Declaration on Science and the Use of Scientific Knowledge and uphold the recommendations for follow-up set out hereinafter.

89. All participants in the Conference consider the Agenda a framework for action and encourage other partners to adhere to it. In so doing, governments, the United Nations and all other stakeholders should use the Agenda, or relevant parts of it, when planning and implementing concrete measures and activities which embrace science or its applications. In this way, a truly multilateral and multifaceted program of action will be developed and carried out. We are also convinced that young scientists should play an important role in the follow-up of this Framework for Action.

90. Considering the outcome of the six regional forums on women and science sponsored by UNESCO, the Conference stresses that special efforts should be made by governments, educational institutions, scientific communities, non-governmental organizations and civil society, with the support of bilateral and international agencies, to ensure the unrestricted participation of women and girls in all aspects of science and technology and, in order to reach this objective, to:

    - promote the access of girls and women to scientific education at all levels of the education system;

    - improve the conditions for recruitment, retention and progress in all fields of research;

- launch, in collaboration with UNESCO and the United Nations Development Fund for Women (UNIFEM), national, regional and global campaigns to raise awareness in relation to the contributions made by women to science and technology. This should be done in order to overcome existing gender stereotypes among scientists, policy-makers and the community in general;

- carry out research, supported by the collection and analysis of gender-disaggregated data, documenting constraints and progress in expanding the role of women in science and technology;

- monitor the implementation of and document best practices and lessons learned through impact assessment and evaluations;

- ensure that women are appropriately represented in national, regional and international policy- and decision-making agencies and forums;

- establish an international network of women scientists;

- continue to document the contributions of women in science and technology. To sustain these initiatives, governments should create appropriate mechanisms where these do not yet exist to propose and monitor the introduction of necessary policy changes in support of the attainment of these goals.

91. Special efforts also need to be made to ensure the full participation of disadvantaged groups in science and technology, and they should include:

- removing barriers in the education system;

- removing barriers in the research system;

- raising awareness of the contribution of these groups to science and technology in order to overcome existing stereotypes;

- carrying out research, supported by the collection of data, documenting limitations;

- monitoring the implementation of and documenting best practices;

- ensuring representation in policy-making agencies and forums.

92. Although the follow-up to the Conference will be carried out by many partners who will be responsible for their own action, UNESCO, in co-operation with ICSU – its partner in holding the Conference – should act as a clearing house. For this purpose, all the partners should send UNESCO information about their follow- up initiatives and activities. In this context, UNESCO and ICSU should develop concrete initiatives for international scientific cooperation together with relevant United Nations organizations and bilateral donors, particularly on a regional basis.

93. UNESCO and ICSU should submit the Declaration on Science and the Use of Scientific Knowledge and Science Agenda – Framework for Action to their General Conference and General Assembly respectively, with a view to enabling both organizations to identify and envisage follow-up action in their respective programs and provide enhanced support for that purpose. The other partner organizations should do likewise vis-a-vis their governing bodies; the United Nations General Assembly should also be presented with the outcome of the World Conference on Science.

94. The international community should support the efforts of developing countries in implementing this Science Agenda.

95. The Director-General of UNESCO and the President of ICSU shall ensure that the outcome of the Conference is distributed as widely as possible. This includes transmitting the Declaration and the Science Agenda – Framework for Action to all countries, to relevant international and regional organizations and to multilateral institutions. All participants are encouraged to contribute to this distribution.

96. We plead for increased partnership between all stakeholders in the area of science and recommend that UNESCO, in cooperation with other partners, prepare and conduct a regular revision of the follow-up to the World Conference on Science. In particular, no later than 2001, UNESCO and ICSU shall jointly prepare an analytical report to be submitted to governments and international partners on the results on the Conference, the execution of follow-up activities and further action to be taken.

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Principles and commitments contained in the documents of the World Conference on Science

BASIS FOR FOLLOW-UP ACTIVITIES

Upon the adoption of the Declaration and the Science Agenda – Framework for Action after substantial revision by all participants, the Budapest Conference established a basis for alliances between science and society to be established in the coming century. It also defined guidelines to guide the action of the different partners involved. A summary of the basic principles and commitments contained in these documents is presented below as a practical guide. Conference participants have committed to these principles and actions, and UNESCO and ICSU will actively promote their implementation.

Main principles contained in the *Declaration:*

- There is an urgent need to use scientific knowledge from all fields in a responsible manner to address human needs and aspirations. The practice and use of science should always have the welfare of humanity, present and future generations, as its objective.

- Fundamental and problem-oriented research is essential for the achievement of endogenous development

- Appropriate education and research programs in S&T, especially in developing countries, need continuous support from governments and from the private sector

- Science education at all levels without discrimination is a fundamental requirement for democracy

- Equality in access to science is not only a social and ethical requirement: it is a necessity for reaching the full human intellectual potential

- Expanded science literacy, ability and skills and an appreciation of ethical values are necessary for the improvement of public decision-making processes regarding science issues

- Enhanced regional and international cooperation is necessary to support scientific training, especially in smaller, less developed countries

- New initiatives are required for interdisciplinary collaboration and for co-operation between the different sectors involved in the production and use of scientific knowledge.

- The objective should be to create sustainable development strategies through the integration of economic, social, cultural and environmental dimensions

- The use of information and communication technologies for the unrestricted distribution of knowledge should be expanded, with due respect for the diversity of cultures and plurality of expression

- Intellectual property rights need to be protected on a global basis. Legal frameworks should meet the specific requirements of developing countries and traditional knowledge, its sources and products.

Commitment to support of promote	Main commitments and activities found on the part of governments
Research and new funding sources	7,14,15
Research and teaching related to social needs	23, 26, 52, 67
Research to solve environmental problems	29, 30, 35
Interdisciplinary research and education	67
Research on the impact of technology on society	57, 61, 68
Science education	24, 41, 42, 43, 45
Engineering education	24, 40
Science communication and popularization	48, 49
Women's participation in science	41, 43, 78, 80, 81, 90
Involvement of students in decision-making	
Environmental education and ethics	33
Training in impact reduction	34
University-industry partnerships	36, 38, 39
Scientific ethics	8, 75, 76, 77
Science for peaceful purposes	51, 52, 53, 54
Science for development	23, 28
Science and technology policies	8, 38, 55, 56, 57, 58, 59
Scientific advice for policy makers and the public sector	61, 63, 64
National research systems in developing countries	12, 60
International cooperation	7, 26, 27, 29, 45
Scientific collaboration with developing countries	12, 18, 19, 25
Knowledge sharing and access to scientific information	15, 18
Scientific publishing; electronic publishing	19, 21
Protection of intellectual property rights	8, 65
Understanding the use of traditional knowledge	33, 83, 84, 85, 86, 87
Participation of disadvantaged groups	41, 81, 91

in the Science Agenda (paragraph numbers)			
on the part of universities and research institutions	on the part of scientists and the scientific community	on the part of the private sector and funding sources	on the part of NGOs and society in general
10		15, 16	
67, 69, 70		52	
29	29	29, 30, 35	
10, 31, 67	31	31	
9, 10, 11, 20, 42, 43, 44, 47	9		46
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10, 48		49	48
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	65		
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17, 79, 81, 82, 91	17, 91		91

NOTE

After the World Conference on Science, both the Declaration and the Framework for Action were fully endorsed by ICSU and UNESCO governing bodies: the 26th ICSU General Assembly, which took place in Cairo in September 1999, and the 30th Session of the UNESCO General Conference, held in Paris in October/ November 1999.

Although it endorsed both the Declaration and the Framework, the ICSU General Assembly expressed concern over the use of the phrase 'traditional and local knowledge systems' in the texts.

It acknowledged the importance of empirical knowledge gathered over generations based on practical evidence, but it considered that this knowledge had to be distinguished from approaches that seek to promote anti-science and pseudo-science and degrade the values of science as understood by the ICSU community.

The Assembly reaffirmed its support for the values and methods of verifiable science. It recognized the relation between traditional knowledge and modem science to be both important and a highly complex political and sociological question, and requested that the ICSU Executive Board carry out a critical study on the issue.

At the subsequent 30th Session of the UNESCO General Conference, representatives of Member States expressed their agreement with this view and requested that UNESCO take part in this study.