THE FORUM ON SOUTH-SOUTH COOPERATION IN SCIENCE AND TECHNOLOGY

AN OVERVIEW DOCUMENT

SEOUL, REPUBLIC OF KOREA

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PREFACE

This background paper was prepared to assist the deliberations of the participants at The Forum on South-South Co-operation in Science and Technology (FOSAT), hosted by the Government of the Republic of Korea (ROK) and organised by the Special Unit for Technical Co-operation among Developing Countries (SU/TCDC) of the UNDP.

In planning for this meeting, it was our view, and that of the UNDP, that the maximum effort must be made to elicit the views of the participants, given their rich experience in the issues of Science and Technology for Development in general, and their specific expertise in particular sectors and applications of relevance. For this reason, all participants were invited to share their views and knowledge in advance of the conference, and almost half of the conference schedule was left open for relatively unstructured discussions in small working groups on issues of importance.

It was felt that an overview document outlining some of the key issues pertaining to such a conference would be useful in facilitating the process of discussions and deliberations, and in generating an efficient process for arriving at final conclusions and recommendations. Based on responses received from some of the invited participants, and discussions with the UNDP, the issues that are covered in this document became gradually established.

The first question that came to mind for this conference was whether there is a real need and a role for South-South co-operation in science and technology. Is this an idea whose raison d'etre has passed, or does it have special relevance in the twenty-first century? If the answer to this question is the latter, it leads to two further questions: What have been the efforts and achievements in effecting increased South-South co-operation, both in general and in science and technology in particular? What have been the challenges and difficulties faced in such co-operation? The answers to these questions can lead us further towards determining specific areas and actions of priority. All of this must be simultaneously placed within the larger context of the role of science and technology in promoting development, its changing and evolving character, and also in the wider national, regional and global context of social, economic and political changes.

As the broad set of questions for this overview became established, it also became clear that almost all of the participants at the conference were well aware of the increasing evidence regarding the importance and contributions of science and technology, or knowledge and innovations, for development. Most have been involved in this sphere as researchers, policymakers and scientists for a sufficient period to also be very knowledgeable about some of the emerging trends and challenges which confront the world, and developing countries in particular, in the new millennium. But in

contrast, the knowledge among the participants of the current status of technical co-operation between countries in the South is much more spotty and uneven. Many individual participants were aware of specific projects and networks in which they have been involved, and others were well aware of their own national programs for co-operation in science and technology. However, very few were aware of many of the developments in other fields, other regions and other countries. This, and the gap in knowledge about some of the achievements, left many participants somewhat despondent about the possibility of achieving much that is useful, but curious to take a fresh look at the logic and need for any emphasis on South-South co-operation in science and technology.

To clarify these issues, we began a literature review. We found that there is a surprising lack of systematic information in published sources on the state of South-South co-operation in general and particularly in science and technology. More commonly available are declarations made at different forums of the importance of such co-operation and the need to strengthen co-operation in more areas and in more ways. This leads to a general pessimism that many of these ideas are only good for making stirring declarations but they lack merit, commitment, or resources for follow-up, and so are not really worthy of serious consideration.

However, further searches, and discussions with UNDP staff and national science and technology groups, suggested that while much information is unsystematic and poorly organised, there are strands of evidence that South-South co-operation in science and technology remains an important and useful concept in the twenty-first century. There have been important and notable actions taken in this direction at national, regional and global levels and many of these have delivered significant and useful results. The above statement is not to deny that declarations of good intentions have been much more abundant than follow-up action and that many more useful actions are possible. Also, the fraction of resources devoted to such co-operation is woefully small, and many of the stakeholders in the process do not exhibit a large degree of conviction of its value.

For the above reasons, we felt that an important objective of this background document would be to provide a brief overview of some of the developments in South-South co-operation, and some of the achievements and failures, in a way that could assist the participants in deliberating their recommendations with regard to the future of such co-operation. The document also looks at the emerging issues of science and technology for development and the new social, political and economic context, but in a more superficial manner. This final version incorporates some of the points that emerged at the conference.

The meeting at Seoul was very positive with considerable support for the overall framework presented here. The experts have supported most of the recommendations made here and were able to elaborate and expand on them. The Seoul Accord, which was drafted with the input of many of the participants, was warmly endorsed at the Forum. Many of the ideas emerging in Seoul have found support in the final communications of the Group of 77 at the South Summit in Havana, Cuba. We suppose that the participation of many of the delegates at Seoul, in particular the Chairman of the G77, the Honourable Chief Arthur C.I. Mbanefo, allowed for a carry-over of the discussions at Seoul to the larger meeting in Havana. The final documents of the South Summit can be found at http://www.g77.org/summit/summit.htm.

A number of participants had requested that we make available a copy of our final report, together with a summary of the deliberations in Seoul. For this purpose, we are presenting the full text of the report, a summary of the discussions, the participant list and the Seoul Accord on our website at http://www.pri.on.ca/seoul/.

For the present time, our role at Policy Research International in this effort has come to an end. We are confident that over the coming year the TCDC Unit of the UNDP, the G77, many of the participants and their governments, and the Government of the Republic of Korea will follow up with concrete programs of action to implement some of the very useful ideas and recommendations emerging from the Forum.

We thank all of the participants for their co-operation during the preparation for the conference and in Seoul. We also wish to acknowledge the inputs from the following persons who contributed their thoughts and suggestions to the preparation of this document and some who sent papers and documents related to the conference topic. These include Carlos Abeledo, Ilesanmi Adesida, Jorge Ahumada-Barona, Naushad Forbes, Frederick Kayanja, Atiqur Rehman Khan, Thomas Risley Odhiambo, Samuel Okonkwo, Ashok Parthasarathi, Carlota Perez, Guilherme Ary Plonski, Francisco Sagasti, and Jose Vargas. A few of these contributors were unable to participate at the forum due to scheduling conflicts.

We thank the UNDP for providing us the opportunity to be involved in this important deliberation. We also thank all the staff of the UNDP's SU/TCDC, and in particular Mr. Y.P. Zhou, for their unstinting co-operation in providing us with various inputs and documents, both formal and informal, which enriched our information. We thank the Government of the Republic of Korea for taking the initiative to host this conference and for their hospitality.

Finally, we wish to make it absolutely clear that this is not an official report of any of the organisations listed here and that none of the above are in any way responsible for any comments, criticism and conclusions drawn here. Any errors and omissions are entirely the responsibility of the authors.

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ABBREVIATIONS

ALADI	Latin American Integration Association *(Asociación Latinoamericana de Integración)*
ASEAN	Association of South East Asian Nations
BAPA	Buenos Aires Plan of Action
CACM	Central American Common Market
CEAO	West African Economic Community *(Communauté économique de l'Afrique occidentale)*
CIS	Commonwealth of Independent States
CNM	Capacity and Needs Matching
ECDC	economic cooperation among developing countries
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organisation
FDI	foreign direct investment
G77	Group of 77
GDP	gross domestic product
GNP	gross national product
GSTP	Global System of Trade Preferences
ICT	information and communication technology
ILO	International Labour Organisation
INRES	Information Referral Services
IPF	indicative planning figures
IPR	intellectual property rights
ITEC	Indian Technical and Economic Co-operation Programme
MERCOSUR	Southern Cone Common Market (includes Argentina, Brazil, Paraguay, Uruguay)
NAM	Non-Aligned Movement
NICs	newly industrialised countries
NGO	non-governmental organisation
OPEC	Organisation of Petroleum Exporting Countries
R&D	research and development
S&T	science and technology
SELA	Latin American Economic System
SIDS	Small Island Developing States
SMEs	small and medium enterprises
SU/TCDC	Special Unit for Technical Cooperation among Developing
TCDC	Countries
TNC	Technical Cooperation among Developing Countries
TRIPs	transnational corporation
TWAS	trade-related intellectual property rights
UNCTAD	Third World Academy of Sciences
UNDP	United Nations Conference on Trade and Development
UNESCO	United Nations Development Programme
UNFPA	United Nations Educational, Scientific and Cultural Organisation
UNIDO	United Nations Population Fund
WHO	United Nations Industrial Development Organisation
	World Health Organisation

I. INTRODUCTION

At the beginning of the twenty-first century, it is almost a cliché to state that science and technology have become the most important drivers of economic growth, and have brought about changes which confront all countries with new opportunities and challenges. Most of us relied on the recent advances in communications and internet technologies to organize for the meeting in Seoul and to begin our discussions of some of the priority issues. While some of the same communications would have taken place in the past through telex, phones and faxes, the increase in communications capacity and dramatic decreases in costs brought about through computer-based internet technologies have allowed for a much greater exchange of ideas than would have been attempted in the recent past.

As we deliberated in Seoul on strategies for developing countries to make better use of science and technology for achieving their development objectives, there were certain issues and conclusions which have remained unchanged over the past 10, 15 or 50 years, while other assumptions, ways of thinking and the context of our actions have undergone a massive shift. Any observer of international development issues from fifty years ago would have felt very comfortable in the Seoul forum to agree that one of the main distinctions between developing countries of the South and richer Northern countries is the diverse capabilities in scientific and technological knowledge, skilled persons, and institutions and resources devoted to their generation and application. They would recognize the aspirations of the developing countries to harness the potential of this increasingly powerful body of knowledge for the improvement of living standards of the majority of people living there. Such an observer would not be surprised to learn that in many countries, for many people, the basic needs of survival – food, shelter, health services, clean water, education – are as yet unmet.

However, the same observer is also likely to be astonished at the changes that have occurred. Countries that were poor are no longer so; many developing countries now have large and growing pools of scientifically trained people; many of these newly trained people are involved in the most high technology sectors, and many scientific and technological developments have taken place that were unimaginable even ten or twenty years ago. From the perspective of such an observer of the efforts of the countries of the South to '*catch up*', to *harness science and technology* for development and to increase cooperation amongst themselves, it would be useful to summarize some of the important lessons and trends from the past.

'Science' is only one component of codified and organised knowledge and such knowledge has existed in all societies at all times. Similarly, technologies, which means the mix of knowledge, organization, procedures, standards, machinery and equipment and human skills which are combined together appropriately to produce socially desired products, have also existed in all societies in all times. What is new, and of growing

importance, is the systematic pursuit of scientific knowledge and its rapid application to social and economic purposes, which has led to an accelerated rate of innovation, all of which provide developing countries with previously unimagined opportunities and challenges.

II. A REVIEW OF SOUTH-SOUTH CO-OPERATION

ORIGINS

During the liberation and anti-colonial movements and particularly after the Second World War, developing countries, many emerging from colonial rule, began questioning the basis of the management of international economic relations and the global division of labour. They began to jointly advance proposals for changes to the structure and management of the international economic system and for assistance from Northern industrialised countries and multilateral institutions in overcoming poverty and making economic progress. This early period of collective action by the South was marked by the successful formation of the Non-Aligned Movement in 1961 and the Group of 77 in 1964[1].

Initial activities of co-operation, during the 1960s, centred largely on the establishment of regional and sub-regional arrangements for increased economic integration, trade, communications, and co-operation on political matters vis-à-vis the richer countries. The Latin American and Caribbean countries led the way in putting in place arrangements such as the Latin American Free Trade Agreement (1960), the Central American Common Market (1960), the Caribbean Free Trade Association (1967), and the Andean Sub-Regional Integration Agreement (1969). Regional institutions for economic co-operation were also established in other regions, including the Association of South East Asian Nations (1967) and the Central African Customs and Economic Union (1966). Such arrangements were designed to expand market sizes and generate scale economies to support a strategy of accelerated industrialisation, as well as to lay the foundations for a more systematic integration of production structures across national boundaries (Benn 1996).

However, despite the awareness of a need for such co-operation both within the regions and between countries of different regions, the arrangements of the 1960s did not prove very successful in achieving the degrees of industrial and economic co-operation that had been envisaged. Among the many barriers to their success, which included the lack of appropriate transport and communications linkages, one of the most important was the fact that most countries of the South were mainly producing primary products during this period, and groups of developing countries within one region had too many similarities in their resource endowments and in their export basket. Trade relations were largely the exchange of primary products of the South for capital goods and manufactures from the North, which were required for industrialisation programs.

[1] The membership of both have grown since their founding and the G77 now has over 130 members, which suggests the value of these groups. However, with the disappearance of the Cold War, it is not clear whether there remains a great deal of value to having two almost overlapping groupings of the countries of the South.

Thus, from the beginning, the call for South-South co-operation had a larger political and ideological agenda than a technical one.

The early examples of South-South co-operation in the regional and international fora provided the basis for further articulation of the concept and demonstrated the need for strengthening such relationships in the 1970s. This decade was marked by considerable optimism about South-South co-operation and the ability of the South to reshape the international structure of power and economic relations in a more equitable direction. The increased activism of the Group of 77 and the Non-Aligned Movement during this period led to the adoption by the United Nations General Assembly of the resolution on the New International Economic Order and on new forms for technology transfer between countries, as well as the establishment of UNCTAD for assisting the South in improved trading regimes, a special fund for the promotion of S&T (UNFSTD) and the UN Commission for Science and Technology.

Among such initiatives were also calls for increased co-operation among the South in achieving their development goals. In 1972, the General Assembly of the United Nations established a Working Group to examine ways of promoting an intensified programme of technical co-operation among developing countries. Among the main recommendations of this Working Group was to establish a Special Unit for Technical Co-operation among Developing Countries (SU/TCDC) within the United Nations Development Programme to promote TCDC. This unit was in place by June of 1974. Possibly the high point reached in deliberations on the applications of Science and Technology for development was the organisation by the UN of the 1979 conference by the same name in Vienna.

The 1980s proved to be more difficult and challenging. The earlier period of economic growth was halted and in many cases reversed. Many developing countries and their economies were battered by the high costs of debt, leading to reduced and often negative growth rates; this period has been described by some as the "lost decade". In retrospect, it is accepted by most countries of the South that there were many policy and implementation errors in their chosen development paths. However, the catalyst for the global changes is often identified to be the changes in US macro-economic policy to arrest inflation and reduce public sector deficits, which were then followed by most OECD countries. These policies led to large jumps in the cost of capital, and thereby magnified and made unsustainable the debts of many developing countries. The 1980s also saw a reversal in what the South thought it had achieved in terms of financial assistance and reshaping of the global agenda and structures. It also saw the demise of many of the special initiatives to promote S&T under UN auspices, such as the Fund for S&T, which could not generate sufficient resources, and the reduction of the role of the UN Commission for S&T. The resources of the UNDP were squeezed, and the funds available for TCDC activities from the UN system were insufficient to maintain sufficient visibility of these efforts. Thus, the decade ended with a

period of disarray in developing country thinking, and their dependence on the North was brought into sharp focus.

The late 1980s and 1990s have led to tremendous changes in the global economic, political and technological environment. The dissolution of the Soviet Union, the new aspirations of the countries within that bloc, the re-examination of the role of the State in almost all countries, the growing forces of globalisation, and the phenomenal growth of large and multinational firms have all contributed to a lowered expectation of the capabilities of governments, and the South, to respond to these changes. The reigning paradigm for some years has been for the State to "wither away," that the "end of history" has been reached, and that the future was one where capitalism, and Western countries which have embraced it more fully, have triumphed. The implicit corollary of this view is that the only hope for the laggards is to imitate the most successful countries as quickly as possible and to abandon all ideas of alternative approaches, solutions and visions.

It is our view that if one accepts completely this vision of the end of history, there is probably not much value or relevance to promoting South-South co-operation in general and even less so in science and technology. We plan, in the following sections, to elaborate our view that even though there has been, in the past, more rhetoric than action to South-South co-operation, it has nevertheless been a useful approach, and has generated many of the anticipated benefits, although in keeping with the modest inputs, the outputs are small.

We also argue that there are many important reasons to improve and expand on such co-operation, and that certain areas and applications of science and technology provide unique opportunities for the South. We emphasize that South-South co-operation in science and technology is in no way a replacement for North-South co-operation, nor for independent national efforts, but that all three avenues are necessary and complementary. Before we discuss these directions for the future, however, it will be useful to briefly review some of the past efforts, their successes, and the many challenges and difficulties that have been encountered.

SOUTH-SOUTH CO-OPERATION AND BAPA

The principles of South-South Co-operation have been comprehensively defined in three important forums: the Non-Aligned Action Programme for Economic Co-operation among Developing Countries, adopted at the Conference of Non-Aligned Foreign Ministers in 1972; the Buenos Aires Plan of Action (BAPA) adopted at the UN Conference on TCDC in 1978; and the Caracas Programme of Action, adopted by the Group of 77 in 1981. As the three documents contain many similarities, for convenience we have referred here to only one of them, namely the BAPA.

The 1978 Buenos Aires Plan of Action (BAPA) for Promoting and Implementing TCDC provided the international community with a set of guiding principles and a framework for solving the problems of development in a post-colonial context. The Plan described the TCDC modality as a *"vital force for initiating, designing, organising and promoting co-operation among developing countries so that they can create, acquire, adapt, transfer and pool knowledge and experience for their mutual benefit and for achieving national and collective self-reliance, which are essential for their social and economic development.*" (SU/TCDC 1994, p.6)

It identified the basic objectives of TCDC as:

- fostering the self-reliance of developing countries by enhancing their creative capacity to find solutions to development problems in keeping with their own values and needs;
- promoting and strengthening collective self-reliance among developing countries through the sharing of experiences and resources and the development of their complementary capabilities;
- increasing the quantity and quality of international co-operation and improving the effectiveness of the resources devoted to technical co-operation through the pooling of capacities;
- strengthening existing technological capabilities and creating new ones through the transfer of technology and skills;
- improving communications among developing countries;
- improving the capacity of developing countries for absorption and adaptation of technology and skills;
- recognition of the problems of the least developed, land-locked, island developing and most seriously affected countries; and
- enabling developing countries to increase their participation in international economic activity.

The Plan emphasised that the spirit of TCDC must permeate the entire United Nations development system, and all its organisations should play a prominent role as promoters and catalysts of TCDC. However, the role assigned to the United Nations is to support the efforts of developing countries themselves, who are expected to take primary responsibility for organising, managing and financing TCDC activities.

The Plan goes on to identify a number of recommendations aimed at strengthening and supporting co-operation among developing countries. These recommended actions were categorised according to the level of authority at which they should be taken:

National Level:

- national programming for TCDC
- adoption of favourable legal, regulatory and administrative framework
- strengthening of national information systems

- improvement of existing national institutions
- promotion of national research and training centres with multinational scope
- promotion of greater national and collective technological economic and social self-reliance
- sharing of policy experiences with respect to science and technology
- encouragement of TCDC through national professional and technical associations and through public and private enterprises and institutions
- national information and education programmes
- expansion of bilateral links

Regional and Sub-regional Levels:

- identification of needs and development and implementation of TCDC initiatives
- promotion of complementary industrial and agricultural projects
- strengthening of regional information systems
- improvement of existing regional and sub-regional institutions
- encouragement of TCDC through regional and sub-regional professional and technical associations

Interregional levels

- development/strengthening of interregional co-operation

Global Level:

- exchange of development experience
- control of 'brain drain' from developing countries
- strengthening of transport and communications among developing countries
- maximising use of developing countries' capabilities
- strengthening capacity of UNDP for promotion and support of TCDC
- financial and technical support by developed countries for TCDC initiatives
- harmonisation of development assistance with TCDC
- financial arrangements for TCDC

We note that the framework laid out was fairly comprehensive in terms of the logic for such co-operation and the actions that need to be taken to promote it effectively. Technical co-operation among countries can be broadly defined as *any activity that increases human and institutional capabilities in order to promote social and economic development of the countries. It will always involve the development, adaptation and transfer of knowledge, experience, skills and technologies*. At the same time, however, it can be seen that the emphases within BAPA on science and technology specifically are few and very generic. At the Caracas meeting of the G77, held a few years later, there was an increase in the attention paid to science and technology[2].

[2] The Caracas Programme outlines the opportunities ECDC offers for developing countries to take full advantage of existing and potential complementarities in technology, food and agriculture, energy, raw materials, finance, industrialization, and technical co-operation (Group of 77, 1981). Many of the same areas remain important today.

It would be fair to conclude that in much of the earlier period, for many leaders of developing countries, science and technology were seen as activities that were too remote and expensive for their countries, and the only action required from the developing countries was to simply transfer the relevant know-how and technology to their own country (South Commission 1990). Thus, even though the documents from the South did, off and on, refer to co-operation in science and technology, the small number of references, the low level of details provided on what and how, and the paucity of organised information on the subject demonstrate its low priority for the South as a whole, if not in rhetoric then certainly by the actions undertaken, though this is not true for all countries.

EVOLUTION: THE PAST 20 YEARS IN SOUTH-SOUTH CO-OPERATION

As we take a brief look at the developments and results of South-South co-operation, and specifically those related to science and technology, it will be useful to avoid the most narrow meaning given to these words. Too often these words refer only to the most recent areas of breakthroughs, of radical technologies, and work that is only done at very large expense at the most prestigious research centres. We would use these words in their wider and correct sense that science is *one form of systematised knowledge* and that a given technology involves *the whole bundle of goods, which include not just a piece of machinery but also the skills of workers and technicians, standards, raw materials, designs, drawings, specifications, and tacit knowledge that is not specified in written form but comes from experience*. Defined in this way, all socially useful activities embody within themselves larger or smaller, more or less advanced, sets of knowledge and techniques, and thus science and technology. This begins to suggest that technology co-operation does not begin and end in a standard form which includes only people and institutions involved with R&D, though they are certainly one component. But viewing science and technology solely through the lens of R&D sees only the tip of the proverbial iceberg.

Viewed from the wider perspective, most educational activities are important inputs to science and technology, and elements of technological transfer occur through investments, imports of capital goods, and various types of exports. Further, investments and trade provide the economic basis for additional co-operation in science and technology both more narrowly and broadly defined, and exchanges of scientific and technical personnel and training abroad increases the human relations development necessary for future co-operation.

As we have looked at the evidence available to us, severely limited though it is, it is apparent that South-South co-operation has received its first practical impetus from the motivations of increased trade and investments. It is useful to note that there have been a number of positive developments in this area and these are discussed subsequently. Closely related to the economic aspirations and efforts have been the fairly large number of regional groupings and organisations which have been formed to promote economic relations.

After economic relations, the next priority given by a number of countries, particularly the larger ones and those with well-developed education and research systems, is the provision of scholarships, facilities and other mechanisms for the education and training of people from other countries of the South. This again is a natural development, and many commentators and policy makers (see the South Commission Report for example) have been urging more such co-operation. We suggest that the efforts so far have remained bilateral and not widely known. It would be useful for countries to prepare a study of the extent, value and impact of this activity in the South. We also feel that with

the continued need for wider co-operation in skills and training it should be possible for the South to develop new mechanisms or strengthen existing mechanisms for more globally administered scholarships for Southern citizens in the South.

The next area that has received considerable attention is the exchange of experiences and policies in different areas of economic development, public sector management, trade and foreign relations, and sometimes health and environment. This is a natural outgrowth of the increased and differential experiences within the South. We strongly recommend that there is even greater need for such co-operation now than in the past. Some of the new areas for co-operation have arisen from the new global processes such as trade negotiations, environmental policies and restrictions. Others stem directly from the changing context of science and technology, as experienced in Montreal in January 2000, where 130 countries have agreed to certain standards regarding trade in genetically modified organisms (GMOs). As we review the experiences next, we conclude that there has been insufficient support for the more scientific and technological areas and that these provide new and important opportunities for co-operation.

Linkages and Groupings

Clearly, there exists a much greater potential for co-operation among countries in close proximity to each other and encompassing common political, economic and socio-political interests. It is thus not surprising that regional and sub-regional groupings have in the past been a popular and effective mechanism for South-South co-operation. Table 1 lists numerous examples of regional groupings and organisations within the South, some of which also include Northern members.

Table 1: Selected Regional Organisations and Groupings

Organisation	Member States	Focus Area
AFRICA		
CEAO (Communauté Economique de l'Afrique de l'Ouest)	Benin, Burkina Faso, Cote d'Ivoire, Mali, Mauritania, Senegal	Economic Co-operation
CEPGL (Communauté Economique des Pays des Grand Lacs)	Burundi, Rwanda, Zaire	Economic Co-operation
COMESA (Common Market of Eastern and Southern Africa)	Angola, Burundi, Comoros, Congo, Eritrea, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe	Common Market
ECOWAS (Economic Community of West African States)	Benin, Burkina Faso, Cote d'Ivoire, Gambia, Ghana, Guinea, Liberia, Mali, Mauritania, Niger, Togo	Economic Co-operation
IOC (Indian Ocean Commission)	Comoros, France, Madagascar, Mauritius, Seychelles	Regional Integration
MRU (Mano River Union)	Guinea, Liberia, Sierra Leone	Customs Union
PTA (Preferential Trade Area for Eastern and Southern Africa)	Angola, Burundi, Comoros, Djibouti, Ethiopia, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Rwanda, Somalia, Sudan, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe	Preferential Trade Agreement
SACU (Southern Africa Customs Union)	Botswana, Lesotho, South Africa, Swaziland	Customs Union
SADC (South African Development Community)	Angola, Botswana, Lesotho, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, Zimbabwe	Common Market
UDEAC (Union Douanière et Economique de l'Afrique Centrale)	Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea, Gabon	Customs Union
ARAB STATES		
GCC (Gulf Co-operation Council)	Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates	Economic Co-operation
OAPEC (Organisation of Arab Petroleum Exporting Countries)	Algeria, Bahrain, Egypt, Iraq, Kuwait, Libya, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates	Economic Co-operation
OPEC (Organisation of Petroleum Exporting Countries)	Algeria, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates (Seat of Secretariat is in Austria)	Economic Co-operation

ASIA		
APEC (Asia-Pacific Economic Co-operation)	Australia, Brunei, Canada, China, Hong Kong, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Philippines, Singapore, Thailand, Unites States	Economic Co-operation
ASEAN (Association of South East Asian Nations)	Brunei, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, Vietnam	Economic Co-operation
ECO (Economic Co-operation Organisation)	Afghanistan, Azerbaijan, Iran, Kazakstan, Kyrgyzstan, Pakistan, Tajikistan, Turkey, Turkmenistan, Uzbekistan	Economic Co-operation
SAARC (South Asia Association for Regional Co-operation)	Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka	Economic Co-operation
LATIN AMERICA AND THE CARIBBEAN		
ANDEAN Group	Bolivia, Colombia, Ecuador, Venezuela	Regional Co-operation
CARICOM (Caribbean Community and Common Market)	Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, St. Kitts, St. Lucia, St. Vincent, Suriname, Trinidad and Tobago	Common Market
LAFTA/LAI (Latin American Integration Association)	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela	Preferential Trade Agreement
MERCOSUR (Common Market of the South)	Argentina, Brazil, Paraguay, Uruguay	Common Market
SELA (Latin American Economic System)	Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad and Tobago, Uruguay, Venezuela	Economic Co-operation

Source: Browne 1998, p.93-5

The past performance of such groupings in the South has been varied, but several success stories exist. OPEC stands as the largest source of intra-South development assistance, with contributions from its member countries totalling approximately 100 billion US dollars up to 1990. Historically over half of OPEC's lending commitments have been to the least developed countries, with high priority given to projects in the fields of education and public health (Abdulai 1993).

Success has also been achieved within Latin America and the Caribbean, which has "strengthened and invigorated the processes of sub-regional integration and regional co-operation…The region has succeeded in taking up co-ordinated positions, in a consistent manner, on key international subjects…thereby positioning itself in the vanguard in the South" (Pérez del Castillo 1993, p.205). Brazil's position as the leading trade partner of several Latin American countries demonstrates what can be achieved when a large and relatively powerful country is present in a regional group and takes positive steps towards regional co-operation.

ASEAN has now been in existence for over 15 years and has grown in depth and breadth since its inception. The five founding members – Indonesia, Malaysia, the Philippines, Singapore and Thailand – were brought together by politics and security considerations with the signing of the Bangkok agreement in 1967. The founding countries were joined by Brunei in 1984, Vietnam in 1995, Laos and Myanmar in 1997, and Cambodia as an observer state in 1998. ASEAN's overall activities are determined through more than twelve sets of regular ministerial meetings on different themes and sectors and a total of over 300 meetings per year (Browne 1998). Trade and economic co-operation are a main focus of ASEAN's activities, but it also incorporates social, cultural, and educational dimensions, as well as technical co-operation in S&T covering agriculture, industry, transportation, and communications. The ASEAN Committee on Science and Technology coordinates co-operative activities in this area, focussing on knowledge networking, the inclusion of the private sector, public awareness of the importance of science and technology for development, and improving co-operation between ASEAN and the international community (UNESCO 1998).

African countries have established several organisations for economic co-operation and have launched initiatives such as the Lagos Plan of Action and the S&T protocol of the African Economic Community, aimed at bringing science and technology to bear on Africa's development problems. However, the results of such co-operation efforts have so far been limited. Although steps are being taken to place various regional groupings in Africa on a firmer footing, regional co-operation alone is unlikely to be sufficient given the overall lack of resources in the region (Abdulai 1993). Africa has the poorest capacity to contribute to science and technology co-operation. African countries account for only 0.36% of the world's total scientists and engineers, 0.4% of total R&D and 0.8% of total global scientific publications, and its world share of patents is close to zero (UNESCO 1998). The majority of this scientific capacity is located in South Africa. Overall, the experiences within Africa illustrate the more limited potential for co-operation among resource-poor countries. Furthermore, armed conflicts in the regions do not promote regional co-operation.

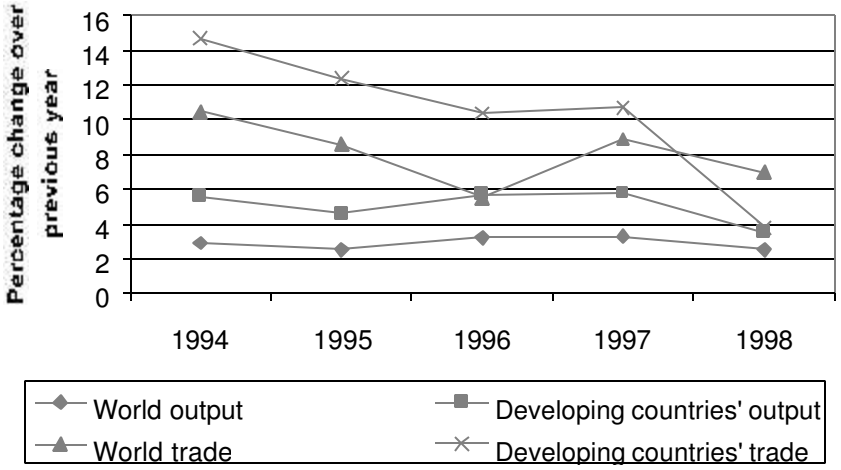
Despite the variable performance of regional groupings so far, the South Commission Report (1990) recognised the importance of revitalizing regional and sub-regional co-operation as part of its overall strategy. Such groupings represent a basis for co-operation in functional areas, emerging from and closely linked to perceived regional needs and interests, and as such could provide an increasingly firm basis and structure for South-South co-operation through progressive widening of existing regional and sub-regional arrangements. In the past, the regional groupings have largely emphasized trade and economic co-operation (see Table 1). However, there is a growing set of regional co-operation activities concerned with science and technology.

Trade

The regional and sub-regional economic co-operation agreements established in the 1960s and 1970s have continued to grow, increasing from 39 such arrangements in 1970 to 82 in the late 1990s (UN General Assembly 1999b). Such schemes have played a prominent role in stimulating South-South trade growth over the past two decades.

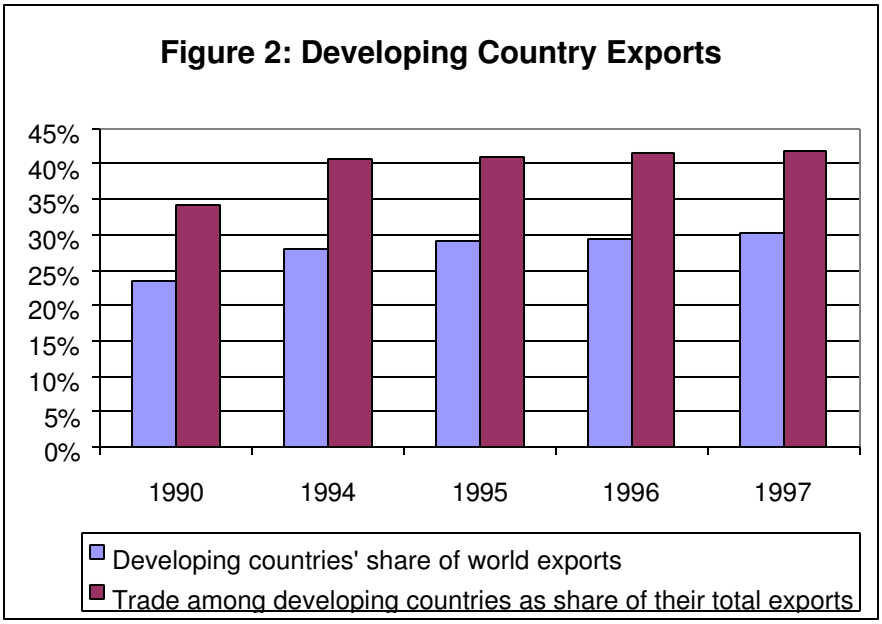
South-South trade nearly doubled its share in total world trade (excluding fuels) in the 1970s, but was negatively affected by the development crisis in the early 1980s (Benn 1996). Since the 1990s, trade has again grown significantly in the South. While world trade is growing faster than world output, the developing countries' trade grew more rapidly than overall world trade throughout most of the 1990s (Figure 1). Furthermore, trade among developing countries is growing faster than their total exports.

Figure 1: World Output and Trade



Source: United Nations General Assembly 1999b.

Figure 2 shows the growth of both developing countries' share of world exports and South-South trade during the 1990s. In 1997, 42% of the exports of Southern countries were directed to other Southern countries compared to 32% in 1990. This increase in South-South trade can be partially attributed to the increased differentiation among the economies of the South and their resulting growing complementarity (UN General Assembly 1999b). The newly industrialising Asian economies, as well as some Latin American countries, have played an important role in expanding South-South trade. The technological achievements in these countries have further allowed the South to increase its export of manufactured goods rather than just primary commodities. Manufactures accounted for over 60% of exports from the South in 1998, compared to only 40% in the late 1980s.



Source: United Nations General Assembly 1999b

The most significant advances in South-South trade have occurred at the regional and sub-regional levels. Intra-regional trade in Asia accounted for 52% of the region's total merchandise exports in 1996, up from approximately 30% in 1987. Indonesia, Malaysia, the Philippines, the Republic of Korea, and Thailand have all become important players in Asia, with 25-45% of their exports going to partner countries in the region. Similarly, trade among MERCOSUR member States grew 19.4% annually in the 1990s compared to a total trade growth rate of 9.7% for the region (UN General Assembly 1999b). Trade within Africa, however, has not shown similar growth rates, with less than 5% of all trade within the Economic Community of West African States (ECOWAS) carried on between member states in the early 1990s (Abdulai 1993).

While regional trade growth is the largest component in the growth of South-South trade, interregional trade among developing countries has also grown, albeit slowly. Latin America exports approximately 16% of its agricultural products and 13% of mining products to Asia, while the Middle East exports 57% of its mining products to this region. Although 20% of Africa's agricultural products and 13% of its mining products are sold in Asia, interregional trade in Africa is limited to a greater degree than other regions by weaknesses in transport and communication links, limited growth in output, and a heavy debt burden (UN General Assembly 1999b).

Investment and Finance

In recent decades, foreign direct investment (FDI) has grown in importance for all countries. Table 2 shows the inflow and outflow of foreign direct investment for selected years. Developing countries as a group have increased their share of FDI inflows by a factor of almost five between 1986 and 1997. More interesting, however, is the six-fold increase, though from a lower base, in developing country participation as providers of FDI during this period. These outward flows originate largely in Asia.

It is worthwhile to note that within this larger global context, flows of FDI between developing countries are also on the rise. Table 3 shows the outflow of FDI directed to other developing countries from Asia and Latin America. Chile, China, Indonesia, Malaysia, Paraguay, Sri Lanka, and Uruguay were all major recipients of investment from developing countries in the 1990s (UN General Assembly 1999b). FDI from South-East and South Asia to developing countries has increased from approximately 60% of total outflows in 1987 to roughly 90% in 1997. In Latin America and the Caribbean, the share of developing countries in outward FDI stocks increased from approximately 30% in the mid-1980s to 50% in the early 1990s.

Table 2: Annual inflow and outflow of foreign direct investment (billions of US$)

	1986-1991	1994	1995	1996	1997
INFLOW					
World	159	243	331	338	400
Developing Countries	29	96	106	129	149
Africa	2.9	5.7	5.1	4.8	4.7
West Asia	1.3	1.5	-0.7	0.3	1.8
East, South-East and South Asia	15.1	58.3	66.6	77.6	82.4
Commonwealth of Independent States	0.66	5.9	14.2	12.3	18.4
Latin America and the Caribbean	9.4	28.7	31.9	43.7	56.1
OUTFLOW					
World	181	284	352	334	423
Developing Countries	11.3	42.5	45.6	49.2	61.1
Africa	1.0	0.658	0.591	0.297	1.1
West Asia	0.66	1.1	0.825	-0.871	0.505
East, South-East and South Asia	8.3	35.6	41.8	47.4	50.1
Commonwealth of Independent States	0.25	0.268	0.408	0.993	3.3
Latin America and the Caribbean	1.3	5.2	2.3	2.3	9.0

Source: UNCTAD, World Investment Report 1998

Table 3: Outward FDI directed from South, East and South-East Asia and Latin America to other developing countries (Millions of US dollars)

	Flows				Stocks			
	South, East and South-East Asia[a]		Latin America[b]		South, East and South-East Asia		Latin America	
Host region	1987	1997	1986	1992	1987	1997	1986	1992
Africa	43	182	-	-	154	923	16	33
Latin America and the Caribbean	50	1712	89	1457	92	6376	1139	4177
South, East and South-East Asia	2833	40008	0.2	2	21107	319777	16	19
Developing countries, total	3040	42144	91	1459	21732	327954	1199	4253

Source: UNCTAD 1999, Table I.4

[a] Includes China, Hong Kong (China), India, Malaysia, Pakistan, Philippines, Republic of Korea, Singapore, Taiwan Province of China and Thailand

[b] Includes Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela

The distribution of FDI outflows from developing countries is also highly regional. In 1997, 28% of total outflows from Malaysia, 38% from Thailand and 72% from Singapore went to other ASEAN members (UNCTAD 1999). Intra-regional flows are even more important in Latin America and the Caribbean, where they account for over 90% of FDI outflows to other developing countries. Two-way flows of FDI between Argentina and Brazil are growing because of MERCOSUR. The total cumulative value of registered foreign investment projects between these two countries increased tenfold between 1980 and 1997. MERCOSUR has been instrumental not only in fostering collaboration in trade and investment between these two countries, but also in expanding the investments of the two in other countries of the region in a wide variety of sectors, such as telecommunications, food industries, petrochemicals, and machinery.

In the past decade, Latin America and the Caribbean have emerged as important host regions for investment from Asia, particularly in garments and other labour intensive industries. FDI outflows from South, East and South-East Asia to this region were more than thirty times greater in 1997 than in 1987 (UNCTAD 1999). For Taiwan, FDI outflow to Latin America and the Caribbean in 1997 was greater than that within Asia, although a large part of its investment in the former region is concentrated in tax-haven economies such as Panama and the Virgin Islands. Although there is a small degree of Brazilian investment in Singapore and Macao, flows of investment from Latin America and the Caribbean to developing Asia are negligible compared to those from the latter to the former. FDI from developing Asia to Africa is growing, while there is no noteworthy FDI recorded between Latin America and Africa (UNCTAD 1999). FDI outflow from Africa is minimal and consists of a few small investments, but is positive nonetheless (UNCTAD 1999).

Developing countries are increasingly viewing bilateral investment treaties as a means of enhancing South-South co-operation and promoting flows of foreign direct investment. Sixty-six bilateral investment treaties between developing countries were concluded in 1998. In January 1999, the Group of 15, sponsored by UNCTAD, concurrently held eight sets of bilateral negotiations between seven member countries (UNCTAD 1999).

Efforts are also being made to assist small and medium enterprises (SMEs) in developing countries to enter into subcontracts and partnership exchange programmes for the global market. Forty-five such exchanges have been set up in thirty countries, initially with UNIDO assistance but now functioning independently (UN General Assembly 1999b).

To conclude, it appears that the emerging situation of South-South co-operation in trade and investment is a little less pessimistic than the South Commission concluded in 1990:

> On economic issues there has been a wide gap between, on the one hand, the rhetoric of solidarity, the ambitious objectives in international resolutions, and the many programmes set out in intergovernmental agreements, and, on the other hand, the action that has ensued. (p.149)

Possibly, increased co-operation requires both – rhetoric as well as objective conditions. Our brief review suggests that as the objective conditions are changing and providing new opportunities for South-South co-operation, such co-operation has in fact increased. There remains a need for a more careful and detailed look at the above in order to be able to draw more useful conclusions on their impacts and the continuing barriers and new opportunities.

CO-OPERATION IN KNOWLEDGE AND INNOVATION

We have argued earlier that too often science and technology are defined much too narrowly. Ultimately, we are interested in the increased availability of knowledge to all individuals, institutions and societies and in the greater and more effective application of knowledge to economic and social activities. Knowledge both grows out from and contributes to the daily productive activities of people, and to that extent, it is futile to attempt to disentangle knowledge flows from trade and investments (Rath and Herbert-Copley 1993).

Of course, there is a subset of knowledge activities which grow out of more systematic efforts at generation, codification and transfer of knowledge, normally undertaken in educational and R&D institutions. Often it is only the latter type of institutions and their work which are counted as legitimate activities of science and technology. But there has been much useful and practical knowledge generated in the South, within the experiments and experiences of particular countries, that needs to be shared, and this is much larger than the body of knowledge formally declared as science. This includes traditional knowledge of medicines, ecosystems, social formations, and the sustainable use of resources, which cannot always be ignored as outdated and superceded by improved knowledge systems. It also includes the knowledge gained from more modern social experiments, such as large scale vaccination or health delivery programs; extension programs to improve literacy or agricultural productivity; the experience in Chile in stabilising the flows of portfolio investments and in designing social insurance schemes; the recent experiences in a number of Asian countries, and Brazil and Mexico, of better and worse ways of dealing with shocks to the financial system; and the various experiences of promotion of trade, negotiations in WTO, in changing IPR regimes, and in promoting domestic capacity in education, science and technology.

We must also repeat here the fact that science is necessary but not sufficient for technology, and similarly R&D efforts are necessary but not sufficient for innovation (Anandakrishnan 1998). Even in the developing countries which have emphasised the supply side of the science and technology equation, such as building up educational and research facilities and increasing the supplies of trained manpower and resources for technology development, the weakness of the demand for this output from the production units has resulted in poor utilisation. Innovation requires linkages between the producers of knowledge and the users and is no longer seen as a linear process where inputs to science lead to technology development and the new technologies are in turn embedded in the production process as innovations. Rather, it is seen as a more complex, interactive system in which a number of traditional inputs are necessary but not sufficient.

With this background, if we are to take a look at South-South co-operation for knowledge and innovation, we should attempt to map the resources available, the different actors engaged in the process, and the different types of activities, from training and capacity building to research, knowledge sharing, technology co-operation and innovation. Unfortunately, the information we have been able to gather is much too sketchy and lacks relevant details of the inputs, outputs and impacts. We present next a brief overview of some of the principal actors, namely the UN system and the role of some of the more active countries of the South. We find in our review many positive and other less positive instances of action and follow-up, though the rhetoric has rarely changed.

The UN System

It is noteworthy that the continued validity of South-South co-operation laid out in the Buenos Aires Plan has been repeatedly reaffirmed by the United Nations General Assembly and the Economic and Social Council, among others. In 1992, the Economic and Social Council called on all parties in the development partnership to give "first consideration" to TCDC and to review their policies and practices to facilitate the use of TCDC in the design, formulation, implementation and evaluation of the programmes and projects they support (UNDP 1997). We see in this the continued dichotomy of many actions of the South – the efforts to maintain the continued call for co-operation is indeed heartening but would be more valuable if it was backed up equally with resources and action.

UNDP and SU/TCDC

The Special Unit for TCDC (SU/TCDC) was established within UNDP in 1974 and serves as secretariat of the High-Level Committee on the Review of Technical Co-operation Among Developing Countries. This committee, which meets biennially, is responsible for the overall intergovernmental review of TCDC. The Special Unit also carries out other substantive responsibilities for the promotion and implementation of TCDC activities. Its overall aim is the mobilisation of TCDC. The primary concern is methodological rather than substantive sectoral development per se.

The Unit's mandated functions are:

- carrying out research and analysis with respect to TCDC issues and problems;
- financial arrangements for TCDC;
- development and strengthening of INRES and inquiry services and promoting their wider use through appropriate linkages with the information systems in other UN development system organisations and national institutions;

- co-ordination of TCDC matters within UNDP and the UN development system; and
- promoting wider use of the capacities of developing countries.

Some examples of successful technical co-operation activities promoted by UNDP include:

- Ghana is adapting Senegalese techniques for fish-smoking, which are suitable for the traditional communities of West Africa and meet the taste preferences of the local population. (SU/TCDC 1995)
- Peru has a traditional way of preventing weight losses to potatoes, caused by modern refrigeration processes, which affect sugar content. The technique was transferred to Colombia, Cuba and Guatemala. (SU/TCDC 1995)
- China's Wuxi Regional Centre for Integrated Fish Farming became internationally known following a capacity and needs matching exercise organised by UNDP in China in 1983. The Centre has worked with Thailand and Turkey on fish farming through both bilateral and other contacts, and worked with Bangladesh following a second exercise in 1994. (SU/TCDC 1995)
- GLARES, a Latin American network on rural energy for sustainable development, has issued a handbook on rural energy planning. In November 1992, 19 Latin American and Caribbean countries met in Buenos Aires to agree on an agenda for cooperation. (SU/TCDC 1995)
- Biogas technology is moving from China to Brazil and Costa Rica and from India through an NGO, AFPRO, to Cambodia. (SU/TCDC 1995)
- In Jaipur (India), a simple, flexible and inexpensive foot-replacement prosthesis has been developed. The "Jaipur foot" was vastly improved in the 1980s and the technology has been transferred to Malaysia and Nicaragua. (SU/TCDC 1995)
- "Operation Ear-lift", first conducted in Kenya in 1987 and then in the Lao People's Democratic Republic in 1989 by a Thai mobile unit for hearing treatment, was set up as a private voluntary enterprise in the early 1970s. The effort received support from a number of surgeons in Thailand and was recognised by the Thai Government in the 1980s. Kenya has set up its own ear-testing and surgery service, using instruments and techniques developed by the Thai surgeon. (SU/TCDC 1995)
- Economic scholarships provided for the training of over 2000 participants between Singapore and the Caribbean (SU/TCDC 1998a)
- The International Centre for Agroforestry in Kenya succeeded in helping farmers in several countries to adopt environmentally friendly and profitable techniques. (SU/TCDC 1998a)
- In the Andes, a pioneering research consortium of institutions, researchers, villagers and farmers focused on poverty reduction, environmental restoration and increased production. (SU/TCDC 1998a)

We note that most of these cases involve fairly simple technologies with low science inputs, though they are important nonetheless. This raises a challenge for priority making in the future, whether the South should have more of these types of technologies or more high-technologies involving high science inputs. Some of the more high technology co-operation efforts, which also appear to have led to useful outputs, are described separately in text boxes throughout the report.

SU/TCDC has had a small budget and small staff. It has seen its work to be promotional in a number of key areas. One major effort has been to bring interested parties together to discuss future activities, through Capacity and Needs Matching (CNM) exercises. Between 1983 and 1990, an average of two such exercises were reported to have been conducted per year, for a total of 14. The Unit has also supported the conduct of studies and surveys of needs and capacities, frequently leading to TCDC project agreements between countries, and has held meetings, seminars and workshops for the purpose of considering common problems, matching needs and capabilities, and drafting agreements on joint programmes. SU/TCDC maintains the Web of Information for Development (WIDE Online) to collect and disseminate information on Southern expertise and successful practices, development institutions, centres of excellence, and training courses (SU/TCDC 1998b). Most support from SU/TCDC has been allocated to projects in areas of poverty alleviation, the environment, promotion of small and medium enterprises as an employment generating strategy, application of technology, coastal fishing development, urban management, and the promotion of women in development.

Many reports identify the critical missing link in South-South co-operation to date as the lack of adequate financial resources to make proposed activities viable. The Special Unit for TCDC has been inadequately funded, with yearly average allocations from UNDP of $0.12 million for the period 1976-8, $1.12 million for 1982-89, $2.0 million for 1992-6, and $3.75 million for 1997-2000. This translates to an overall yearly average of only $1.75 million per year, or a total allocation of 0.2% of the $16 billion total resources available to UNDP.

Somewhat more positively, during the 1992-1996 programming cycle, the UNDP board identified TCDC as one of its six programme priorities. For the 1997-1999 programming cycle, UNDP for the first time allocated 0.5% of its overall program resources for TCDC. While this 0.5% allocation represents a jump of 250% over the earlier average of 0.2%, it is still only a small step by any absolute measure.

The developing countries themselves have not become any more alert to the primary responsibility they hold for financing TCDC activities. Very few have taken advantage of the IPF mechanism to allocate resources for TCDC projects. None have contributed to the Trust Fund for South-South Co-operation or the Perez Guerrero Trust Fund for the promotion of South-South co-operation. Among developed countries, only Japan and Ireland have contributed to the South-South Trust Fund, donating US$8 million and

US$36,000, respectively. The Republic of Korea has pledged US$200,000 to promote such activities, and the support for the Seoul Forum is a good step in the direction of more active participation.

A further shortcoming of past co-operation activities has been the absence of systematic follow up. For example, the SU/TCDC arranged 16 programming exercises and project planning meetings between 1983 and 1989. Each one was attended by between 5 and 28 countries, and 2123 potential projects were identified. However, little information exists on how many of these projects were implemented, with what results and how many were cancelled. Many observers feel that the rate of implementation of activities following these meetings is seldom above 50%. Without more careful follow up and assessment it is difficult to say whether a 50% rate is good or bad. Certainly, project-planning meetings should generate many ideas and not all of them will be found worthwhile on later detailed examination.

Comments and ideas from participants suggest that the process has too often been somewhat ad hoc. Often the activities that are agreed to between participating countries are lost sight of completely after the consultation ends. In many cases there is little consideration given to the resource requirements for various proposals and the likelihood that the resources will be available. Sometimes, many developing countries cannot even adequately design the activities that are agreed to and for which funding is not difficult or onerous. As such, project agreements are described by some as more of a wish list rather than serious commitments or undertakings (Muhith et al. 1991).

Based on these assessments, the SU/TCDC has set out a new course for itself. This is to focus more on policy exchanges; to move from ad hoc interventions to clusters of activities and some flagship projects that are more carefully planned; to a greater reliance on pivotal countries of the South, which are more active and have greater capacity; to stress increased non-core resource generation; and to make the South network more interactive and dynamic. The Seoul Forum is an example of the new thrust on policy exchange that can develop a cluster of S&T related activities strongly supported by Southern actors and with adequate resources. The UNDP's commitment to follow up on the identified priorities is heartening.

Other UN organisations and agencies

A key difficulty in evaluating the impact of TCDC promoted by the overall UN system lies with the limitations of the available data. Although all agencies report that TCDC activities have been "mainstreamed" such that all programs incorporate TCDC principles, a recent evaluation of the impact of TCDC found available data to be incomplete and largely non-quantitative, thus preventing the establishment of

appropriate benchmarks to assess the true extent of support for TCDC by the UN system.

Despite limited data, various reports suggest that many organisations in the UN Development System outside of UNDP have undertaken activities aimed at strengthening national and regional institutions in developing countries. A few organisations within the UN development system are particularly noteworthy for their contributions to TCDC. UNFPA and ILO have been active in facilitating skills and knowledge sharing programmes (SU/TCDC 1998a; UNDP 1997). The Food and Agriculture Organisation (FAO) has employed TCDC as a major modality in its service delivery, reportedly engaging in such activities as the use of TCDC experts, training and study tours, regional and sub-regional workshops, support to regional organisations, and the dissemination of information on innovation and best practices. FAO states that it maintains a comprehensive roster of TCDC experts in the South as part of their Agricultural Sciences and Technology Information System. The World Health Organisation (WHO) reports supporting the preparation of a TCDC directory in the health sector, as well as promoting knowledge sharing between various medical research and training institutions. UNIDO is currently focussed on high-impact TCDC activities at the regional and sub-regional levels, aiming to facilitate the flow of economic and technical support from more advanced to less advanced countries in each region (UNDP 1997). UNIDO manages an industrial and technology information bank and technology information exchange system. The Universal Postal Union maintains a roster of experts in postal services and communications in the South. UNCTAD's Global Trade Point Network provides information on goods and services, trade practices and investment opportunities in 117 Southern countries (UN General Assembly 1999b). A few specific examples of successful UN-sponsored co-operation projects are described below:

Nigeria's 1994 Capacity and Needs Matching Exercise in agriculture, industry and technology, sponsored by SU/TCDC, attracted 25 other developing countries from Africa, Asia, Latin America and the Caribbean to explore possibilities for technical co-operation with 70 Nigerian institutions and organisations from both the public and private sectors. The exercise is reported to have generated 271 bilateral agreements, over 95% of which were between Nigeria and other countries, although only about 20% of these agreements have so far been implemented. However, the exercise has contributed to stimulating and facilitating capacity building through sharing of training expertise and facilities. During 1994, approximately 70 Nigerians attended training courses arising from the workshop, in China, India, Indonesia, Singapore, Thailand, Turkey and Uganda. Nigeria has also hosted training courses for professionals from 15 other developing countries.

The International Network on Small Hydro-Power Development among Developing Countries was established based on collaboration between the Hangzhou Centre for Small Hydro Power in China, SU/TCDC and UNIDO. Its aim is to strengthen the

capacity of developing countries to develop and manage small hydro-power systems for sustainable socio-economic development. The project's achievements so far include the establishment of the Network itself and its regular annual conference; the enlistment of the participation and support of developed countries in a triangular co-operation arrangement; the establishment of a Trust Fund to fund the project's activities; an increasing number of participating developing countries; and capacity-building efforts such as training activities, information exchange and technical assistance schemes. In 1995 and 1996, training was provided for 82 people from 31 developing countries (Akeredolu-Ale 1999).

The project entitled *Best Practices on Poverty Reduction: Technical Co-operation in Latin America and the Caribbean* was created to identify and disseminate successful poverty-reduction practices in Argentina, Bolivia, Colombia, El Salvador, Jamaica and Venezuela, and to contribute to the development of practical guidelines for building alliances for poverty reduction. The project was sponsored by SU/TCDC, UNDP, EDI/World Bank, and the Inter-American Foundation. Outputs of the project include 100 case studies of successful partnerships and 400 profiles of best practices for poverty reduction; the creation of a network of academic and research organisations; and 20 training courses and seminars to disseminate the project's findings at regional and sub-regional levels. The project has significantly raised the level of awareness regarding strategies and best practices for poverty reduction (Akeredolu-Ale 1999).

Within the UN system, scientific and technical co-operation activities have largely focussed on sharing information concerning different countries' technical capabilities. Most UN organisations have collated information on expertise, institutions and best practices within developing countries. However, we have been unable to find any reports on the effectiveness of these databases and information services. Statements are frequently made that the information has been collected and made available, but such statements tend to be silent regarding who uses these services, how useful are the databases, and how active and current is the information contained within.

Recent evaluations suggest that TCDC has failed to live up to its expected potential within the UN system. Indeed, "in terms of relevance of inputs, despite the wide range of 'TCDC' activities reported by the organisations of the UN development system over the years, … 'TCDC and ECDC are still not optimally applied in the operational activities of the UN system'" (Akeredolu-Ale 1999, para.33, quoting Doc. No. A/53/226/Add.4, para.31). The main impediments to the effective implementation of TCDC have often been listed as: lack of agreement on critical terms such as the concept of TCDC itself, its fundamental objectives, and the appropriate roles of different partners; lack of information concerning the usefulness and applicability of TCDC; weak organisation and a lack of institutionalised technical support; shortage of funds; and negative attitudes towards TCDC (South Commission 1990). All too often, there have been conferences and planning exercises sponsored by UN organisations to develop co-operative projects

which are never implemented due to lack of follow-up and insufficient resources. Several examples of this, given by Akeredolu-Ale (1999), are given below, and many other examples were provided by participants at the Seoul Forum.

Project Title: Capacity And Needs Matching Exercise: The Coconut Industry (1992)

This exercise, promoted and funded by the SU/TCDC, took place in Jakarta in March 1992, bringing together twenty-five coconut-producing countries from Asia, Africa, Latin America and the Caribbean. The meeting allowed the participants to share their experiences and discuss technical and economic co-operation issues related to the coconut industry, and yielded ninety-five proposals for technical co-operation. However, implementation of these proposals proved problematic, primarily due to lack of funds. Thus, apart from providing an opportunity for discussion, the project cannot be said to have made a significant impact.

Project Title: Inter-University Cooperation In Policy Research For Sustainable Development (Ethiopia, 1993)

This project was a follow-up to a UNESCO seminar on cooperation among universities in the South in policy-oriented research for sustainable development, and was intended to facilitate networking among eight African universities and two universities each from Europe and North America. While the network is reported to have been established, it has not undertaken any significant activities due to weak telecommunication capacities of the participating African universities, inadequate management, and lack of funding. The few research papers produced under the project have not been published due to lack of funds, and other papers commissioned have yet to be completed three years after the deadline.

Project Title: Workshop on Simple and Low-Cost Meat Preservation Technologies for French-Speaking African Countries (1992)

The objective of this workshop, which was attended by participants from 18 francophone African countries, was to disseminate the results of applied research on low-cost meat preservation technologies and strengthen the institutional basis for technical co-operation among francophone African countries. Although the project improved the technical knowledge of the participants in this area, the decision to create a network for continued interaction and exchange has not yet been followed through.

Project Title: South-South Conference on Trade, Finance and Investment (Costa Rica, 1997)

The objective of this meeting was to provide a forum for discussion of the central development challenges facing the South with respect to trade, finance and investment, as well as to formulate a concrete programme of cooperation among developing countries in these areas. The conference was attended by member-States of the Group

of 77 identified as business and industrial leaders, China, UNCTAD, UNIDO, regional inter-governmental organisations, private-sector organisations and regional development banks. The San Jose Programme of Action was adopted at the conference, outlining the opportunities and challenges presented by globalisation and liberalisation, and a draft plan for increased co-operation among developing countries in trade and investment. However, there has been little or no follow-up action on the San Jose Programme.

Overall, the South Commission Report (1990) summarises the impact of TCDC activities up to 1990 as follows:

> In most cases, idealism has not been tempered by a degree of practicality or matched by commitment to action. A tendency to underestimate obstacles and the effort and time needed to get tangible benefits has often left expectations unfulfilled and thus led to frustration and even cynicism. (p.149)

National Actions

There are many examples of outstanding national programmes and institutional arrangements. The UNDP finds that the 25 countries listed in Table 4 have fairly well-established institutions and programs for South-South technical co-operation. We have not been able to find any systematic information on each country but have outlined below a few cases and examples[3].

Table 4: Countries with Significant Institutions and Resources for TCDC (UNDP)

Asia and the Pacific	Africa	Latin America & the Caribbean	Arab States and the CIS
China	Ghana	Argentina	Egypt
India	Mauritius	Brazil	Tunisia
Indonesia	Nigeria	Chile	Turkey
Korea	Senegal	Colombia	
Malaysia	South Africa	Costa Rica	
Pakistan		Cuba	
Singapore		Mexico	
Thailand		Peru	
		Trinidad & Tobago	

Despite the absence of a national policy for technical co-operation and problems of inadequate funding, Nigeria has participated in many important co-operation activities, some of which were initiated and largely funded by the country itself. Its co-operation activities have largely focussed on training and exchange of experts. It has promoted the mobilisation of its own technical experts to serve in other countries of the South through the Nigerian Technical Aid Corps scheme (see box below), and has used experts from other developing countries in implementing some of its major development programmes.

Senegal has participated in many technical co-operation projects over the last five years. The country has provided short-term training to thirty students attending the Centre de Formation Professional et Technique, and has provided technical assistance to other francophone developing countries. Both of these initiatives were funded under a triangular co-operation arrangement with France. Senegal has also been a recipient of technical assistance from Tunisia, Morocco, Egypt and Saudi Arabia, and has benefited from training courses offered by a number of Asian and Arab countries.

[3] Akeredolu-Ale (1999) was a source for several of the individual examples and country profiles.

THE NIGERIAN TECHNICAL AID CORPS SCHEME (1987)

This initiative was funded and promoted nationally. The project was implemented and managed by the Directorate of Nigeria's Technical Aid Corps, a special Directorate in the Ministry of Foreign Affairs. Under the scheme, volunteers are assigned abroad for a period of two years. The objective of the scheme was "to assist Black African, Caribbean and Pacific countries which regularly request for Nigerian Technical Assistance…[and] to demonstrate Nigeria's concern for the developmental aspirations of the Third World, while also offering a unique opportunity for young and dynamic Nigerians to contribute to the development of sister African countries" (Akeredolu-Ale 1999, para.184).

Not much information could be found on the size, scope and impact of this initiative. However, data suggests that at least 300 volunteers were deployed to over twenty countries between 1987 and 1992. The volunteers in highest demand during this period were science teachers, nurses, medical doctors and engineers. It appears that the internal problems of Nigeria in the past decade have not allowed the initiative to prosper.

China has a substantial programme of technical co-operation, from which the country itself has acquired valuable knowledge in fields such as environmental protection, meteorology, agriculture and forestry, and from which many developing countries are benefiting (UNESCO 1998). The Chinese Government has established technology co-operation agreements and exchanges with over 135 countries. As of 1993, China had become a member of over 800 international academic institutions, and in 1994 alone held 400 international academic science and technology meetings for over 10000 visiting scholars (UNESCO 1998). The Chinese Government is reported to spend approximately US$1.0 million per year on TCDC training courses for other countries of the South. Courses were held in 1997 and 1998 on such topics as Small Hydro-Power, pottery technology, and mushroom technology. Between 1993 and 1998, 124 Chinese experts were deployed to 23 countries.

India has been formally involved in technical co-operation activities since 1964 and views TCDC implementation as an integral part of the country's foreign policy. The Indian Technical and Economic Co-operation Programme (ITEC) implements substantial co-operation activities in the areas of training and study tours, deployment of Indian experts and consultants, and direct technical support to industrial and infrastructure projects. Although ITEC is essentially bilateral, its resources have on occasion been used to finance trilateral and regional programmes under the Economic Commission for Africa, UNIDO and Group of 77. The programme trains nearly two thousand persons from over 100 countries each year in 54 Indian institutes. ITEC also arranges around twenty study visits per year for delegations from partner countries. Recent projects undertaken by ITEC include the establishment of solar energy plants in Cuba and Costa Rica, computerisation of some offices of the Government of Senegal, augmenting milk production in Kyrghyzstan, and sharing experience in dry-farming techniques with Iraq.

India spends approximately US$60-70 million per year on ITEC activities and these amounted to a cumulative expenditure of US$2.0 billion in 1997, over a period of 33 years.

In addition to its financial outlays through ITEC, India has deployed a portion of the IPF assistance it receives from UNDP for technical co-operation activities, including Project INTERACT, described in the box below. India is also very active in providing education and training facilities for students from the South. The country offers roughly 1000 scholarships annually for students from developing countries. In 1994, there were 13000 foreign students pursuing higher education in India, including about 5800 from Africa, 4400 from East and South Asia and 2000 from West Asia (Technical Co-operation Division, Ministry of External Affairs, Government of India 1999; UNCTAD 1998).

Indonesia has implemented many significant co-operation activities under its "Strengthening of TCDC" programme, funded entirely from the country's IPF for a total cost of US$1.9 million. Notable activities include the training of 252 Indonesians abroad, largely in other developing countries; an Expert Group Meeting on Poverty Alleviation, which was attended by 34 participants from 8 developing countries; numerous study visits at Indonesian institutions for overseas trainees; and 16 technical assistance missions to Cambodia and the Philippines. Through this programme, the country has also been the recipient of technical assistance from other countries in 65 projects.

PROJECT INTERACT (1981-1984)

This project dealt with the application of small/mini computer systems to electric power systems management, passenger reservation systems on railways, and advanced weather forecasting techniques. R&D collaborators on the project included the Computer Maintenance and Services Corporation (CMC, a public sector computer company) and the departments responsible for the sectors, and computer specialists from Venezuela, Mexico and Yugoslavia. It was agreed that the technology flowing from all three aspects of the project would be fully shared between the participating countries and that each country would be free to commercially use the technologies without future technology payments. Total funding to Project INTERACT was approximately US$2.1 million, US$1.5 million of which was provided by the now defunct UN Fund for Science and Technology for Development and the remainder provided by the GOI under its IPF allocations. The project was completed in 1984 and was favourably reviewed by leading external experts.

Source: note from Dr. Ashok Parthasarathi

Through the Singapore Co-operation Programme, Singapore has sponsored training courses and study visits for over 7000 professionals from 105 developing countries since 1992. The annual budget of these activities is US$10.0 million. Although many of Singapore's technical assistance activities are bilateral arrangements, the country also uses triangular arrangements, and now has Third-Country Partnership arrangements with eleven developed countries. Both the private sector and centres of excellence in the public sector participate strongly in implementing co-operation programmes.

The Government of Brazil established the Brazilian Co-operation Fund to finance co-operation with other members of the Organisation of American States in the area of human and institutional capacity building. Efforts have included courses, internships and technical visits; fielding of Brazilian experts to conduct courses and seminars; and the provision of expert and advisory services. The Fund has financed 47 technical co-operation projects in agriculture, energy, health, environment, public administration, and education. Brazil also participates in several co-operation implementation networks, such as FAO's Agreement on the Use of Experts in TCDC; triangular co-operation activities with SELA; and the MERCOSUR regional block. The country's co-operation activities also extend to Asia, Africa, and Eastern Europe.

Chile has been particularly active in the area of technical assistance. Chile's International Co-operation Agency (AGCI), which manages and coordinates technical co-operation activities with other developing countries, raised US$1.2 billion in concessional funds and technical assistance from international multilateral and bilateral co-operation sources between 1990 and 1998. Chile's co-operation efforts also include a scholarship programme for continuing education, which is aimed at other Latin American countries.

Most developing countries display an awareness of the appropriateness and cost-effectiveness of TCDC as a technical co-operation modality, and continuously affirm the relevance of the TCDC modality to their own economic and social development strategies. However, many are not making the maximum effort to practice and advance TCDC (South Commission 1990). Despite participation in and initiation of TCDC projects, most developing countries do not yet have a national TCDC policy. China, India, Brazil, Singapore, and Kenya are exceptions to this (Akeredolu-Ale 1999).

Many countries have established national TCDC Focal Points to work with SU/TCDC. These act as channels of communication and assist with the identification of opportunities for the application of TCDC. Their activities include project formulation with co-operative partners, matching needs and capacities, and the mobilisation of resources for technical co-operation. According to a number of reports, national TCDC focal points frequently have an inadequate grasp of their capacities and needs, not to mention mechanisms to manage the transfer and absorption of technology (South Commission 1990). Many suffer from poor quality of leadership, support personnel,

administrative facilities, communication facilities and funding. Such weakness of national focal points, coupled with the absence of specific national policies, imposes a critical limitation on the ability of developing countries to participate effectively in TCDC. In addition, serious shortcomings exist in the funding of national technical co-operation projects, as most developing countries make no specific or regular budgetary allocations for the effective running of focal points and funding of TCDC initiatives (Akeredolu-Ale 1999).

Furthermore, despite the strength of some national co-operation programmes, there is a clear predominance of activities in TCDC-related training and the exchange of experts rather than in technical co-operation activities concerned more directly with the development of particular productive sectors. As well, existing programmes exhibit a strong regional focus, as in the case of the Latin American Economic System and of the high-capacity pivotal countries in Asia. Countries tend to collaborate more readily with those with whom they share language, history, or cultural traditions. An example of South-South co-operation cited by Dr. Vargas that breaks out of this tradition is the project between Brazil and China to co-operate in remote sensing applications using satellites. A further example is the Africa/Asia joint research project on interspecific rice hybridization, as described in the box below.

AFRICA/ASIA JOINT RESEARCH: INTERSPECIFIC HYBRIDZATION BETWEEN AFRICAN AND ASIAN RICE SPECIES

This project is developing radically new low-management, high-yielding varieties of rice through cross-breeding of African and Asian rice. The new rice varieties have the capacity to suppress weeds and withstand environmental stresses and diseases. The project includes rice experts from institutions in several countries, including the University of Tokyo; Japan International Centre for Agricultural Sciences; the University of Kyoto; seventeen African National Agricultural Research Systems; the West African Rice Development Association; the International Rice Research Institute in the Philippines; the Institut Français de Recherche Scientifique pour le Développement en Coopération; the International Centre for Tropical Agriculture; and Cornell University.

In 1997 and 1998, the project dispatched back-cross progenies to Asia, Latin America and seventeen African nations, including Benin, Burkina Faso, Cameroon, Ivory Coast, Gambia, Ghana, Guinea, Guinea Bissau, Nigeria, Sierra Leone, and Togo. The farmers themselves have been allowed to take a leading role in the breeding process. Preliminary results show that increased proportions of farmers from Ivory Coast, Guinea, Ghana and Togo are including at least one variety in their seed profiles, and in some cases three to five. Studies indicate that by the year 2000, a modest 10-15% adoption rate will reduce imports by 10-25% and increase farmers' incomes by more than 25%.

Source: SU/TCDC 1999

At the same time, both the South Commission (1990) and SU/TCDC (1995) have noted a tendency on the part of many developing countries to view South-South co-operation as a less desirable co-operation modality compared with North-South exchanges. The forging of South-South bonds must overcome the habit of using familiar links with the North, sometimes a habit supported by powerful domestic and foreign interests but at other times simply due to the larger resources available for North-South linkages. The orientation of the business sector towards the North and links with trans-national corporations have tended to limit contracts within the South, and deliberate policies to promote private co-operation have been largely absent. However, this situation is beginning to change.

We would suggest a modification to the Secretary General's observation "co-operation in industry, technology transfer and enterprise development is perhaps one of the weakest aspects of South-South co-operation. This is due largely to limited involvement of the private sector in schemes of South-South co-operation,"(UN General Assembly 1999b, para.25). Of the suggested weaknesses we find that co-operation on specifically technology related activities remains the weak area and probably much more needs to be done regarding firm to firm co-operation[4]. One existing initiative designed to promote firm-to-firm co-operation is described in the box below.

IBEROEKA

The IBEROEKA projects support innovation in the industrial sector and promote interfirm co-operation in R&D. The projects form part of the Programa Iberoamericano de Ciencia y Tecnología para el Desarrollo (CYTED) international co-operation activities. The initiative involves national science and technology councils, technological institutes and centres, universities and various government bodies from 19 Latin American countries, as well as Spain and Portugal. The specific projects are defined and designed by companies from at least two member countries, possibly in collaboration with a science and technology centre. Projects are financed by the governments of the partners' own countries.

A recent list of IBEROEKA projects noted the involvement of almost 100 companies and over 30 scientific institutions. Almost half of those institutions were universities in Spain, Brazil, Portugal, Uruguay, Panama and Ecuador.

Source: UNCTAD 1998

[4] For a more detailed discussion of inter-firm technology co-operation refer to T. Tesfachew, "The Role of Governments in Promoting Inter-Firm Technology Co-operation," in UNCTAD 1998, and Plonski, Alcorta and Rimoli (1998) for case studies of inter-firm collaborations within Latin America.

Despite the aforementioned limitations of national co-operation schemes, a number of recent positive developments can be noted. These include the use of more sophisticated and complex forms of exchange rather than just single training episodes or study tours; the expansion of interregional activities rather than just bilateral and intraregional programmes; the increasing use of triangular co-operation arrangements with developed countries; the growing role of high-capacity pivotal countries; and the increasing participation of the private sector and NGOs in implementation of co-operation projects. Interfirm technology agreements have increased from approximately ten per year in the 1980s to forty per year in 1996. Greater efforts are visible within the stronger regional groupings such as MERCOSUR and ASEAN.

A few examples of innovative projects are described here, in addition to those provided in text boxes throughout this section.

BIOPHARMACEUTICALS IN LATIN AMERICA

The Cuban Government has identified work on biotechnology and its applications as a national priority. In 1986, it established the Centro de Ingeniería Genética y Biotecnología (CIGB) to work in different areas of genetic engineering and biotechnology research and production, including biopharmaceuticals, diagnostic kits and plant biotechnology. CIGB is a large institution with modern infrastructure, including its own plant, and has developed numerous vaccines and diagnostic kits, among other products. Other Cuban institutions also undertake research and production in biotechnology, including the Finlay Institute, which has developed vaccines for several diseases such as meningitis.

Although these institutes have developed strong R&D and industrial capacities, they have faced enormous barriers to marketing their products. Vaccines are generally acquired by government agencies on the basis of bidding procedures, and the Cuban producers faced the mistrust that is often associated with production originating in developing countries.

The Cuban institutions have entered into co-operation arrangements with ELEA SA, a large Argentine pharmaceutical company, in order to find commercial channels for their products. ELEA SA markets a wide range of products and has connections with several university research centres. Collaboration with the Cuban institutions would allow the company to expand its mix of products and thus consolidate its market position in Argentina, the 12th largest pharmaceutical market (by value of sales) in the world.

CIGB agreed to market various biopharmaceuticals it produced in Argentina exclusively through ELEA SA. The Finlay Institute agreed to produce its anti-meningococcical vaccine through ELEA SA for distribution and sale in Argentina. Although the agreement was centred on the marketing by one partner of products developed and produced by the other, the technical capacities and financial support of the ELEA SA allowed the Cuban partner to undertake tests on the vaccine in Argentina that are likely to strengthen its market prospects elsewhere.

Source: UNCTAD 1998

VISUALSOFT INDIA LTD. AND KONSORTIUM BUMI KOMPUTER (KBK) (MALAYSIA)

In 1997, Visualsoft, a company specialising in software development for networks, signed a Memorandum of Understanding with Malaysia's KBK for co-operation in software development and services. The agreement included setting up two joint-venture centres, one to be built in Hyderabad, India and the other in Malaysia. The partnership provided KBK with technological and R&D support, as well as a steady and guaranteed supply of network softwares needed for the Malaysian market. Visualsoft received new capital and the opportunity to upgrade its technology and establish a strong presence in the South-East Asian market.

Source: UNCTAD 1998

THE EAST ASIAN ECONOMIC DEVELOPMENT EXPERIENCE TRAINING PROGRAMME (1997)

This programme provided policy-oriented training on East Asia's development experience for mid-level professionals from the civil service, academia, the media and the private sector in Southern and East Africa. The month-long training programme included a series of lectures, visits to key economic institutions in Singapore, guided use of the facilities available at the Institute of Southeast Asian Studies, and field visits to Malaysia and Thailand.

Source: SU/TCDC 1999

MARINE BIODIVERSITY CO-OPERATION AMONG SMALL ISLAND DEVELOPING STATES

Twenty-two island States in the South Pacific, which share extensive marine resources, have participated in co-operative initiatives in marine biodiversity through such regional institutions as the South Pacific Commission, South Pacific Environment Programme, the Forum Fisheries Agency and the University of the South Pacific. The initiatives focus on training, research, support for policy-making and resource management. Approximately 10000 people per year are trained by the University of the South Pacific Marine Studies Programme. The Forum Fisheries Agency is aiding the countries of the South Pacific in managing their tuna resources. However, no information was available regarding the impacts of this programme.

Source: UN General Assembly 1999a

BIOTICA (ARGENTINA) AND SEMENTES AGROCERES (BRAZIL)

The partnership between Biotica and SA was orchestrated by the Brazilian-Argentinean Centre for Biotechnology (CABBIO), an association of firms and individuals which is jointly funded by the two governments but is privately run. Biotica is a small research-oriented firm specialising in vegetable micro propagation and new potato seed technology, while SA is a leading manufacturer of agricultural seeds and animal food in Brazil. The objective of the partnership was to develop, produce and market a new variety of potato seed using Biotica's knowledge and research capabilities and SA's financial resources and large-scale production and marketing competencies.

A new variety of potato was successfully developed and tested in Brazil, where it is accounting for 2% of the Brazilian market and competing successfully with imports from Europe. However, the relationship between the partners was not smooth, due to lack of awareness on the part of the small-scale partner about the business culture and different perspectives of achievements. While Biotica was more concerned with technical advance, management from SA tended to focus on financial results.

Source: Alcorta et al. 1998

The review of experiences, both successful cases and less successful ones, suggests to us that, as the South Commission has stated, the actions of South-South co-operation in science and technology have been few compared to the rhetoric. However, they also confirm that there is an increasing role for and value in such co-operation.

III. ISSUES FOR THE FUTURE – THE NEW CONTEXT FOR SOUTH-SOUTH COOPERATION IN SCIENCE AND TECHNOLOGY IN THE 21ST CENTURY

GLOBALISATION AND THE NEW CONTEXT FOR CO-OPERATION

Since the 1980s, major changes have been taking place within the international economic system, which is increasingly being shaped by globalisation and economic liberalisation. Rapid international mobility of most factors of production is taking place, with the exception of labour. Markets for money, finance and technology are becoming increasingly globally integrated, fuelled by technological advancement and movement towards a liberalised global trading regime. Within these global markets, transnational corporations based in the North predominate. The decisions made by private bodies thus have a more pronounced impact on world economic activity. The process of global integration has so far been rapid but highly unregulated, causing increasing uncertainty, unpredictability and instability in the world economy (see Sagasti 1999).

It is argued that these changes accentuate the continued validity and relevance of TCDC as a means of assisting developing countries to participate effectively in the newly emerging economic order. The South Commission (1990) claims that the South can and should exploit its collective resources to acquire maximum countervailing power and press for global consensus on the goals and management of the new international system. However, the Commission later contradicts its own conclusion:

> The countries of the South have failed to achieve [the required] solidarity. They have not been able to establish common priorities in keeping with the development interests of all, or to share technical and negotiating expertise, or to hold constructive South-South discussions in advance of negotiations, or even to develop a shared professional service to support them on matters under negotiation. (p.22)

If we acknowledge that achieving such solidarity has been difficult in the past, presumably it will be even more difficult in the future, since the developing countries are becoming increasingly differentiated and heterogeneous with respect to levels of economic and social development, technological capacities, and extent of integration into the global economy. Some “have transformed their economies, made significant progress in harnessing science and technology to production, and are poised to compete effectively in the world economy. [Many] others remain backward and have registered virtually no progress since the 1960s" (Jalloh 1993, p.157).

The East-Asian NICs and other high-performing Asian economies, as well as some countries in Latin America, the Caribbean, the Middle East and North Africa have achieved high levels of economic growth, and have demonstrated enhanced capacity to respond to the new global challenges. Meanwhile, the smaller, poorer economies, with economic growth barely keeping pace with population growth, continue to experience problems of food insecurity, and have found themselves unable to take advantage of the

opportunities presented by global changes. We suggest that the differentiation and fragmentation of economic interests among developing countries will make it more difficult for the South to maintain common positions across the board in future North-South dialogue.

As the colonial past becomes increasingly remote for most developing countries, "the conceptual basis of South-South co-operation which existed for nearly three decades now no longer exists" (Jalloh 1993, p.154). The ideology which once provided the vision and inspiration for South-South co-operation has deteriorated, and the concept now lacks a forceful ideology to sustain it.

Instead, it has become "almost impossible to find one unifying common interest which can bring them together…the strategy of South-South co-operation has to be built around clusters of common interests" (Gunatilleke 1993, p.252). In this vein, the Report of the South Commission (1990) began to develop a "strengthened rationale" for South-South co-operation. This rationale contained several key components representing new driving forces for co-operation: the emergence of new complementarities among the countries of the South; the existence of surplus capital in some countries which could be profitably invested in other countries of the South; and the need for joint-management of natural resources, as well as the need to deal with common problems such as the environment and harnessing science and technology.

Another factor which makes future South-South co-operation more difficult and challenging is the increased role of actors in the private and civil sectors worldwide, which is promoted by the forces of globalisation and new technologies. Some of these actors, such as global TNCs and some NGOs, may be seen to reduce the role of the state, but other firms, NGOs and experts can also augment and supplement the actions of the state. Whether these actors are seen to be positive or negative, there is no alternative but to find positive ways to include them to help the South achieve its goals.

The above review suggests to us that the growing diversity within the South will create new challenges for South-South co-operation if continued along a traditional outlook, but it also opens up new opportunities. The South now has a wider range of development experiences to draw on. The progress made by Korea, China and India, and the success of Latin American countries such as Brazil in following a more S&T-based strategy, can provide valuable lessons for the South. The more dynamic developing economies are in an effective position to share with other countries the techniques and experiences that have made them successful. Furthermore, the growing diversity of technological capacities between countries and the corresponding wider range of manufactures and services available opens up new opportunities for trade and technology transfer within the South.

While the "strengthened rationale" may establish a need and identify potential benefits of continued South-South co-operation, "the ideas are too technical and lack the power to inspire and move people in the way that the earlier motivating ideas for South-South co-operation did" (Jalloh 1993, p.155). Therefore, the development of a new vision is also important. We argue below that a new vision can emerge from many common issues and goals, and also that the opportunities provided by science and technology can provide an excellent rationale and vision for South-South co-operation.

GROWING IMPORTANCE OF SCIENCE AND TECHNOLOGY

The process of globalisation has been significantly bolstered by science and technology, which have greatly influenced the pace of economic and social development all over the world. Advances in science and technology can both open up new opportunities to developing countries and also represent a serious threat. The pace of scientific and technological change over the past few decades is such that the knowledge base required to retain a competitive position in the world economy is growing rapidly. We present one case which is particularly telling: Nortel Networks' recent US$3.25 billion acquisition of Florida's Qtera Corp., a company developing a cutting-edge technology for optical networking equipment, which has only 75 employees and no commercial output or sales (Globe and Mail, December 16, 1999). This example clearly illustrates the growing importance of knowledge as an important entity or resource in its own right.

With the increasing knowledge-intensity of production, the traditional sources of comparative advantage are being eroded. The widening knowledge gap "threatens to leave behind countries that do not have the capacity to utilise new technology, while enhancing the potential for sustainable development for those that do" (Sewell and Melcher 1993, p.162). For economic success, developing countries must rapidly build up their own capabilities in order to apply the new advances and make informed choices. Countries must be able to select those technologies most suitable for their circumstances and conditions and adapt them to make them appropriate. The South must thus accelerate the pace of acquiring, adapting and using the stock of knowledge largely developed in the North while in the long run developing the ability to develop its own technologies suited to its needs.

At the same time as the knowledge base required to remain competitive is expanding, resources for science and technology, both financial and intellectual, are scarce, but more so in the South than in the North. Indeed, while roughly 40% of global GDP is in the countries of the South, they account for only 15% of the world's scientific publications and only 1-2% of the patents filed in Europe and the United States (UNESCO 1998). This disparity in scientific and technological capabilities highlights the

continued importance for the South of co-operation with the countries of the North as a complement to South-South co-operation activities.

For the countries of the South, there is a strong case for co-operation in order to make more effective and efficient use of these scarce resources. This is particularly true for activities such as research and development that require a critical mass in order to function effectively. Most developing countries devote no more than 0.5% of their national income to R&D, compared to the 2-3% allocated by developed countries. Pooling of research resources would bring developing countries closer to meeting the critical minimum of investment required, as well as minimising duplication of efforts in some areas. In addition to allowing developing countries to reach the minimum thresholds, co-operation can also increase the scale economies of the required efforts. The South Centre (1993) suggests that "with the increasing importance of economies of scale and expenditure on research and development, South-South co-operation may well become the most cost-effective means for the South to reach the new frontiers of science and technology" (p.48).

A second reason for co-operation in science and technology concerns the existence of common problems within the South. Science and technology are likely to be key factors in solving problems such as specific diseases and food security. Some of these problems have little direct impact on the countries of the North, and are thus unlikely to be dealt with in the North's scientific research. Scientific and technical co-operation in these areas within the South could be extremely valuable in finding and disseminating effective solutions to these problems.

Co-operation not only augments efforts and inputs but can also bring alternative perspectives and approaches to the solution. Moreover, co-operation allows for greater scope for the resulting applications and innovations and thus potentially greater rewards. It is worthwhile to add that knowledge is not subject to the laws of scarcity. Sharing knowledge does not reduce its original value but often increases it by expanding its boundaries and applicability, although this does not always apply to individual private owners of knowledge whose objective is securing monopoly profits from patents and know-how, nor does this mean that the movement of knowledge and its applications are without cost. However, in an ironic development where IPR issues have become more troubling and contentious, new developments in knowledge and innovations are increasingly making the older paradigm of the economics of scarcity, which has dominated our thinking and is more relevant to traditional products and economy, obsolete (Peter Drucker, interview in the Globe and Mail, 5 January 2000).

Worldwide, as the rate of technological change increases and the range of knowledge required for specific innovations expands, there is a rapid growth in the need for strategic alliances and network structures to increase the pool of knowledge available for achieving goals and to reduce the risks to each individual partner. Alliances and

networks can take many forms and involve various types of actors, such as producers, competitors, suppliers, universities and research institutions, in different combinations for different purposes. All such efforts can increase transaction costs but, if well managed, are found to increase the rate of successful innovation. We submit that the participation of the South in such alliances and networks remains weak, and that where they exist the networks are almost wholly driven by Northern partners. We propose that there is considerable value to increasing Southern driven networks, both with and without Northern partners.

NEEDS OF THE SOUTH

Although we have remarked on the increasing diversity of the South, there still remain many common needs, which can be combined with the new opportunities and threats to form a framework of overall priorities for a future agenda for South-South co-operation. For convenience we have grouped them below under labels such as environment, poverty, and technologies such as biotechnologies, information and communications, and so on, but in reality many of these converge in various ways. For instance, the environmental issues include natural resources, of which the South is particularly rich in quantity, quality and diversity. These are important for new directions in raw materials, energy, medicines and other purposes. Improved use of bio-resources can also address other needs, such as poverty alleviation, sustainable development and energy shortages, and each of these directions can be promoted by the new advances in biotechnology, ICT, computation and so on. Depending on the purpose, one could list some items as needs or technological opportunities, but what is more important in priority setting is to recognise that many of these themes emerge from several different dimensions simultaneously.

Environment

The environmental threats faced by developing countries are numerous. Key threats include the continuous degradation of cultivated land; desertification in arid and semi-arid zones; tropical deforestation; threats to fish stocks from over-fishing and waste dumping; the release of noxious gases and the discharge of untreated industrial effluents; and severe squalor and pollution in large cities (South Commission 1990). As the population of the South continues to grow and as the wealth of the South increases and consumption levels rise, further pressures on the environment are inevitable.

The pressures of feeding an expanding population have in some countries led to shortening or abandonment of traditional crop rotation cycles, such that land is cultivated without respite and soil becomes depleted. In some countries, cultivation has been extended to unsuitable or marginal lands. The need for additional agricultural land begets deforestation, aggravated by commercial ventures seeking new sources of timber. The FAO estimates that up to 11 million hectares of tropical forests are cut down per year (South Commission 1990). The consequences of over-exploitation of agricultural land and deforestation include severe erosion and water run-offs which damage natural water regimes, increased risk of floods and landslides, and the extinction of many species of plants and animals. Desertification is also a major indirect source of atmospheric carbon dioxide.

Industrialisation and economic growth are responsible for many environmental dangers in developing countries, as in the industrialised world. Air pollution caused by emissions from fossil fuel combustion is a growing problem, as is the contamination of water resources caused by uncontrolled disposal of industrial wastes. Severe income inequalities, accompanied by the adoption by the wealthy of Northern consumption patterns, result in increasing demand for goods whose manufacture or use are energy intensive and polluting. A continued rapid rural-urban migration in the countries of the South, combined with continued population growth, will create new and growing demands for housing, roads, transport, and energy. Enormous resources will be required for these, and new and innovative ways of providing these services at lower financial and environmental costs are urgently needed.

The tasks of managing shared resources and dealing with common environmental problems require collective action within the South, as appropriate environmental strategies must be sensitive to the effects of domestic actions on neighbouring countries. Areas calling for close co-operation between groups of developing countries include the management of shared water resources, management of irrigation systems, energy generation and conservation, and the prevention of floods and erosion.

Knowledge and experience regarding the management of common resources, especially in similar ecosystems, could be extremely valuable to other countries and regions facing similar challenges. Similarly, there is great scope for co-operation in pollution control and the management of offshore oil exploration in regional seas or coastal areas. Co-operation in the use of remote-sensing techniques to assess natural resources and in the use of the resulting data would also be valuable, as the South is presently heavily dependent on the North in this area.

Energy

One vital area for South-South co-operation is the energy sector. The availability of energy is a critical prerequisite for economic and industrial development and poverty alleviation (Barnett 2000). However, current patterns of energy consumption and world energy growth are not conducive to achieving sustainable development. Between 1975 and 1997, the energy consumption of developing countries increased threefold, and their share of global energy consumption doubled (Hamdi 1998). Global energy demand can be expected to grow with rising population, expansion of economic activities and structural shifts in developing countries towards energy-intensive sectors. Over two-thirds of incremental energy demand is likely to occur in the developing countries (Hamdi 1998).

The large anticipated growth in energy demand confronts developing countries with serious financial and environmental constraints. Energy services that are expensive or

uneconomic will negatively affect growth and development. Many people in developing countries are not yet connected to grid electricity, and the supply is not secure for many of those who are connected. It would be very expensive to supply these groups from centralised electricity sources, and thus decentralised renewable sources could be an attractive option for meeting the electricity needs of these populations (Rath 1995).

In addition to the financial burden of growing energy demand, the production and consumption of energy is a key cause of environmental degradation. The emerging consensus on the role of fossil fuels in promoting global warming is likely to put new pressures on the South. The volume of carbon emitted into the atmosphere from fossil fuel consumption could possibly double in less than three decades (Hamdi 1998). Meeting the growing need for energy supplies and services while safeguarding the environment will be a major challenge to policymakers in the South, and is likely to require close co-operation between firms and R&D institutions, as well as between countries.

In order to evolve a sustainable pattern of development in the long-term, it will become extremely important for developing countries to find ways of increasing the energy supply from renewable sources. Renewable energy technologies such as hydropower, geothermal, wind turbines, small-scale solar and biomass are operating on a competitive basis worldwide, but the contribution of renewable energy technologies to global energy supplies has so far fallen short of expectations. Most renewable technologies are still not fully competitive with fossil fuels for power generation due to low oil prices and domestic energy prices that are subsidized and do not reflect environmental costs (Hamdi 1998).

Developing countries have large resources of one or more of the renewable energy sources. Traditional rural economies use large amounts of biomass, charcoal, wood, twigs, crop residues and animal dung, which provides some special options and opportunities which are not relevant to the developed countries (Rath 1995). Energy generation using biomass should thus be an area of high priority for international research co-operation in the South. Some renewable energy technologies are suitable for isolated rural areas and can meet the basic energy needs of rural households, such as lighting and refrigeration.

The South must also find ways to improve energy efficiency in industry, agriculture and transport. Energy efficient technologies present opportunities for countries with rapidly rising energy consumption to control the high energy costs of commercial and residential buildings and limit the environmental damage caused by energy generation in a cost-effective manner. However, a number of barriers hinder the adoption of energy efficiency measures in developing countries. These include: inappropriate policies, weak technical capacities, lack of information about the available options and

opportunities, and financial barriers. Co-operation among the countries of the South could help to alleviate some of these barriers.

The South's capacities in the energy sector are significant, and a number of developing countries, including Brazil, China, India and South Africa, now have significant expertise in this area (SU/TCDC 1998a). Pooling of the South's resources in energy research and arriving at negotiated agreements on responses to global warming could be expected to provide significant benefits for all concerned. Collaboration among the countries of the South on energy technologies provides a mechanism for countries to hedge costs on complex and risky projects, as well as building and strengthening indigenous capacities in developing countries, providing adequate energy services to the billions of people in rural areas, promoting and diffusing renewable technologies, promoting the rational and efficient use of energy, protecting the environment, and promoting energy security through diversity of supply (Hamdi 1998). As such, co-operation in this area could be a powerful instrument for achieving a sustainable, economic and stable world energy system.

Developing countries have so far allowed the North to take the initiative in raising environmental issues and proposing action. The countries of the South need to develop a comprehensive position on environment and development in order to ensure that their interests are more adequately represented in the global environmental agenda. A common position is also crucial for more effective participation in negotiations with the North on the development and sharing of technologies for energy conservation and pollution control.

While technology is by no means a panacea to environmental degradation, "it remains essential to the diagnosis of environmental problems and for the design of strategies to find solutions" (Rath 1996, p.16). Co-operation in three key areas would help the countries of the South to meet the environmental challenges facing them: the development of new technologies and practices suited to local conditions; the application of existing energy efficient or cleaner technologies on a wider scale; and improving the efficiency with which older technologies are operated (Rath 1995). International co-operation can also help by pooling markets for environmentally sound products and services, thus increasing scale and reducing costs. The establishment of joint technology standards could facilitate this process (Rath 1995). Finally, it would be useful for the countries of the South to learn about each others' experiences in the use of different policy instruments in order for individual countries to design regulatory systems that are appropriate to their own conditions and administrative capabilities (Rath 1996).

Poverty

The environmental problems in the South described above are intimately connected to poverty, of which they are both a cause and a consequence. Taken by itself, the vast majority of the poor still live in the South. More than one billion people in developing countries are living in absolute poverty, with per capita incomes below US$1 per day, no access to clean water and insufficient income to buy enough food to sustain their energy (UN General Assembly 1999b; World Bank).

Development experience since the 1950s has shown that a rapidly expanding economy is a necessary condition, though by no means sufficient by itself, in order to improve the well-being of the people of the South and satisfy their basic needs. While only rapid development can provide jobs for the growing labour force in the South and create the resources needed to satisfy requirements for food, shelter, health, and education, it does not follow, nor is it possible in many cases, for the South to follow the same industrialisation path historically taken by the North. Growth can reduce poverty only if complemented by specific economic and social policies to that end, including the redistribution of scarce productive assets such as land, the development of human resources through mass education, particularly in science and technology, and strong efforts to curb population growth (South Commission 1990).

People, Livelihoods and Employment

The improved welfare of the people of the South constitutes the key reason for seeking to achieve the higher developmental goals. Any welfare improvement strategy must aim to increase the capacity of people to earn a reasonable and improved standard of living, which requires the creation of new and more productive employment opportunities in both rural and urban areas. Today in most countries of the South, the majority of people live in rural areas and so agricultural development, increased agricultural productivity and more effective use of bio-resources are obvious areas for attention. At the same time, the South can expect large migrations of rural populations to urban centres in the near future. The next twenty-five years will see the emergence of over 60 cities in the South with populations of over ten million, and the present large cities such as Beijing, Lagos, Mumbai and Sao Paulo will also grow further during this period. All these people will need jobs, shelter, supplies of energy, water, sewerage, transportation and so on. A whole set of issues will need to be tackled successfully if the urban centres are not to become increasingly chaotic, polluted and dysfunctional.

Small and medium-sized enterprises (SMEs) have a high potential for stimulating economic growth in developing countries, providing significant employment with low investment requirements and high utilisation of local raw materials. Historically, SMEs have played an important role in the process of industrialisation in market economies.

The experience of some Asian countries shows that SMEs create more jobs per unit of capital invested than larger enterprises (Ngom 1996). Furthermore, since SMEs are often located in both urban and rural areas, they can contribute significantly to improving the livelihood in both. Many new technologies offer ways to improve the performance and efficiency of SMEs and others provide for new economic activities that can be undertaken by small-scale enterprises. The countries of the South would be wise to tap the potential of SMEs for job creation, while recognising that SMEs are only one aspect of successful industrialisation.

India's involvement in small-scale industries with other developing countries highlights the value of South-South co-operation in SME promotion. The National Small Scale Industries Corporation of India has extensive experience in providing technical assistance for SME development in developing countries in Asia, Latin America, and particularly in Africa. The assistance takes the form of study tours, assessments for SME development, training in skill upgrades and entrepreneurship development, and technology exhibitions to facilitate technology transfer and knowledge dissemination. Over 165 projects totalling US$18 million have been conducted with 18 countries in Africa and 6 in Asia (UN General Assembly 1999a).

Health and Disease

The populations of the developing world are burdened by a number of diseases whose transmission depends upon a warm climate, including malaria, hookworm, and schistosomiasis. Malaria is estimated to kill between 1 million and 2.5 million people per year, and is heavily concentrated in the poorest tropical countries, particularly within sub-Saharan Africa, due to climate and ecological conditions. However, the development of a malaria vaccine appears not to be high on the agendas of the international community[5]. The Wellcome Trust found that only US$80 million per year is spent on malaria research, with only a small fraction of that spent on vaccines. The large pharmaceutical firms of the North believe there is no market in malaria, as a potential vaccine would be costly to develop and may not produce financial rewards for its developers. Individual developing countries typically do not have the financial means to develop a malaria vaccine alone (Sachs 1999). As always this generalisation has to be more nuanced, as we acknowledge that a US government laboratory is currently testing a malaria vaccine and that Venezuela has developed and is testing a vaccine for Rotavirus. However, it is obvious that both these efforts and their successes can be increased with greater co-operation.

[5] This has begun to change recently with the lead given by the World Health Organisation and the Gates Foundation.

Although the AIDS virus has infected over 33 million people globally, roughly 95% of all HIV cases are in the developing world, with over two-thirds of those in sub-Saharan Africa. The drug treatments used to attempt to control the disease in the North are far too expensive for the poorest countries to afford. What little vaccine research exists is severely underfunded and tends to focus on specific viral strains and patterns of transmission prevalent in North America and Europe (Sachs 1999). The countries of the South thus cannot expect to benefit much from AIDS research conducted in the North without their own efforts, individually and collectively[6].

[6] However, it must be noted that the critical importance of this crisis and the inability of many countries and their people to pay the prices charged by companies in the North is beginning to shift the debate on intellectual property rights, and has led the pharmaceutical companies to offer specific drugs at drastically reduced prices to poorer countries.

POSSIBILITIES

While the needs of the South provide one side of the matrix of possible emphasis of effort, the possibilities provided by new developments in science and technology and new capacities form another side of the matrix.

New technologies

There are some key areas of scientific research and technological innovation that are widely applicable and in which joint activity would generate significant benefits, including biotechnology, new materials, and microelectronics, among others. These new technologies are difficult and costly to develop, but are easy to imitate and use in production processes once innovations have been developed. As such, these technologies offer vast opportunities for developing countries to accelerate their economic progress and leapfrog over intermediate levels of technology (South Commission 1990).

Biotechnology

As a result of rapid population and economic growth, continuing growth in the demand for food within developing countries can be expected in the years to come. As the area of agricultural land per head diminishes and stresses on soil and the ecosystems continue to mount, biotechnology may become vital for ensuring long-term food security. Biotechnology has the potential to improve the productivity of the South's farming systems, reduce the quantity of chemicals used in agriculture, lower the cost of raw materials, and reduce some of the negative environmental impacts of conventional production methods (South Commission 1990; Verástegui 1999).

Biotechnology and agricultural research is a prime area for South-South co-operation. Within regions and sub-regions, countries have common genetic bases and ecosystems. As such, they face many common problems, and research results could be widely applicable between countries. Since research in this area is complex and costly, countries should pool their resources and work jointly on projects of common interest, such as genetic enhancing centres and gene banks.

However, the development and application of biotechnology brings with it a multitude of challenges. The commercialisation of biotechnology requires increasingly transsectoral capabilities, including knowledge of biosafety and intellectual property rights issues. It is increasingly clear that developing countries need to establish suitable regulatory systems, assess and manage the health and environmental risks of such

products, and tackle issues of public education (Verástegui 1999). CamBioTec, described in the box below, is an example of a triangular co-operation initiative aimed at building capacities in these diverse aspects of biotechnology.

Microelectronics and ICT

The pace of industrialisation can be greatly enhanced by efficient, rapid and cost-effective information flows, which are increasingly becoming possible due to advances in information and communication technologies. The possibilities offered by the so-called information revolution are widespread. The ease and low cost of compiling and transmitting information has made it possible to unbundle production processes and spread out production plants to many locations. This opens the scope for large corporations, particularly Northern TNCs, to subcontract production processes or parts thereof to small and medium enterprises in developing countries.

CAMBIOTEC: CAPACITY BUILDING IN AGRI-BIOTECHNOLOGY

The Canada-Latin America Initiative on Biotechnology for Sustainable Development (CamBioTec) was created in 1995 by the International Development Research Centre (IDRC) of Canada. This is an example of triangular cooperation, with one Northern partner and five Latin American ones. CamBioTec operates as a network of six focal-point institutions in Canada, Mexico, Argentina, Columbia, Chile and Cuba, as well as national regulatory agencies of the countries, national and regional bioindustry associations and individual firms. Its purpose is to facilitate the application of biotechnology in the agricultural and environmental sectors of selected Latin American countries.

Capacity building is one key aspect of the programme, covering regulatory and promotional policies, technical and market information, bioindustry innovation management, monitoring and evaluation of risks and benefits, and general training activities such as workshops, seminars, courses, publications and specific studies. The project also involves direct transfer of expertise and technology between the partner countries. CamBioTec has undertaken impact assessment of agri-food biotechnologies and legislation to access genetic resources. Over 50 specific firm-to-firm contacts have been initiated, largely between Canadian and Latin American firms.

CamBioTec was externally reviewed in 1998. It was found to be a valuable source of information and support to public policy in biotechnology, and was reported to be successful in building communications and relations between Canadian and Latin American firms. However, the evaluation found that the programme was perceived to be "biased" towards promoting greater support to Canadian firms, although this perception may simply be a function of the greater capacities initially brought to the partnership by the Canadian firms. In addition, the evaluation highlighted the weak institutional basis in some countries; insufficient socio-economic research and orientations for biotechnology; and low efforts at public awareness.

Source: Verástegui 1999

Advances in information technology have also made information about technology choices easier and faster to access. Electronic knowledge-networking permits better access to and fuller assessment of technologies already in the public domain, as well as allowing diffusion of information concerning "best practices" in energy technology, pollution control, and clean manufacturing.

Many of the rapidly industrialising countries of the South are competing successfully with the North in software development and data management techniques. Well known cases include: Korea's progress in several areas of ICTs; the provision in some ASEAN countries of a basis for the manufacture of hardware and electronic components, and the development of high speed communications corridors; China's well-established competencies in several areas of manufacturing; and India's successful growth of a large software sector. We need not elaborate on these here, but may simply conclude that these non-uniform capabilities, if they can be combined in and for specific applications and innovations, can provide a much more powerful set of inputs for innovation than if the opportunities are only pursued in isolation.

Engineering and Design

Engineering and design is another area in which co-operation can be extremely valuable, as the engineering design service function cuts across all production sectors. Many large design and construction firms in countries such as the Republic of Korea, India, China and Brazil have become exporters of construction services to other developing countries, particularly for infrastructural projects. In exporting these services, firms from developing countries have set up joint ventures and subcontracting arrangements with partners in other developing countries. However, little is known about the impact of this form of co-operation (UNCTAD 1998).

Leapfrogging

It was noted above that the various advances in science and technology combined with the rapid change in information and communication technology have the potential to greatly increase access to knowledge and sharing of information about technology choices. Access to such information provides developing countries with opportunities to "leapfrog" directly to "frontier" technologies and applications rather than reproducing the outmoded physical and technological paths used historically in the industrial countries. Professor Kayanja (1999) notes that obsolete technologies are more likely to be found in the South, which reiterates the importance of leapfrogging to the technological frontier: "Recirculating dinosaurian technologies simply because they are relevant to the South is an evolutionary blind alley which must be avoided at all costs." (p.2)

The countries of the South may have possibilities for leapfrogging in both traditional areas such as energy production and pulp and paper mills and completely new areas such as micro-electronics, wireless and satellite communications, and remote sensing applications. Leaping to the frontiers of productivity innovation can allow developing countries to gain comparative advantages[7] and avoid repeating the mistakes made in the North, and can result in the use of technologies that are cleaner, more effective, and less costly than outmoded technologies.

The possibilities for leapfrogging are particularly pertinent with respect to the problems of environmental degradation. Technology choices "allow countries to avoid choosing between environment and development," as the South has technological options that the industrialised countries did not have when going through their own industrialisation (Choucri 1998, p.41). Developing countries have the opportunity to avoid the polluting development path followed in the North by incorporating cleaner and more energy efficient technologies into their process of development sooner rather than later.

Reaping the benefits of leapfrogging, however, requires that countries have access to networks of technological knowledge in order to acquire knowledge about "best practices," technology options, and strategies. What is needed is not only the passive infrastructure and administrative capacities to actively participate in such networks, but also appropriate institutional mechanisms for exploiting the available knowledge and facilitating technological change.

We could expand our discussion to cover many other possibilities and elaborate on what is possible in each area, and could illustrate that these technological changes do not just affect esoteric high technology economic activities but can also provide opportunities in many traditional activities. Moreover, we have not dealt at length with the idea that new advances in S&T carry major threats as well as promises to the South. Without an appropriate and increased response, the South will not only fail to take advantage of opportunities but will also be increasingly at threat from the backwash of technological developments occurring elsewhere, as shown by the recent discussions in Montreal in the trade of GMO products. We believe that not making more appropriate use of these possibilities will be the single most important factor retarding the South in achieving the many goals toward which its people and their representatives aspire.

[7] Carlota Perez provided a more detailed discussion of some of these issues in Seoul.

IV. TOWARDS A STRATEGY AND FUTURE DIRECTION

We have argued that any long-term agenda must be embedded in a larger vision, a vision that is challenging, that has the support of many in the South and is in consonance with their aspirations and goals. Beyond that there must be an overall strategy and framework. This is important, as there are many issues, problems, needs, opportunities and ultimately a variety of actors with different responsibilities, capacities and objectives. An overall strategy and framework allows different actors to undertake their actions within a common and mutually supportive fashion. Developing any action plans requires consideration of not only the specific actions needed but also issues of institutions, structures and mechanisms, resources, and finally systems of measuring whether there is appropriate and adequate progress in achieving the goals set out. We have laid out some points below which were intended to provide a basis for discussions at the Seoul Forum. These were further elaborated in the Seoul Accord, which appears in Annex B in its final form and in Annex C as the Zero Draft. While the final form was agreed upon by the participants at the Seoul Forum as a more concise statement which could be presented to the G77, the Zero Draft may be a more useful resource for developing broad policies and programmes.

Vision

We have argued that a new vision for South-South co-operation is needed. The old ideology on which co-operation was based has largely disappeared, and new rationales such as that suggested by the South Commission lack a political rallying cry and the power to motivate and inspire the people of the South. The new vision should encompass a number of key elements and principles, including sustainable development; the preservation of natural and human heritage; 'people-centred' development and grassroots participation; and a view of co-operation as a complementary agenda to the new-found global emphasis on competition. In creating this new vision it must be remembered that idealism alone is not enough, but must rather be "tempered by a degree of practicality [and] matched by commitment to action" (Jalloh 1993, p.157).

Strategy

An overall strategy for South-South co-operation in science and technology should start by focussing on the smaller activities and programmes already existing, building on bilateral and regional arrangements and expanding into more cross-regional activities. Since it is almost impossible to find one unifying common interest which can bring together all the countries of the South, the strategy of South-South co-operation should be built around clusters of common interests: "The global programme of South-South co-

operation would have to be constructed from components for each of which a group of countries would take the lead in response to a compelling need arising from their own national interests in the programme" (Gunatilleke 1993, p.252). Work would be required in identifying the special interest groups for each component and designing the appropriate institutional framework to implement such a programme of co-operation.

One possible model for such a process is that of functional multilateralism, the negotiation of a series of agreements on a number of pressing issues. Functional multilateralism involves many players coming to the table at the same time, with the actors shifting over time and according to issue under consideration[8]. However, some issues and countries may be left out in this form of co-operation, especially smaller poorer countries, and so this model will need to be supplemented with strategies for more disadvantaged groups. Functional multilateralism can also be effective in discussions and negotiations involving both the North and the South, putting Southern governments on an equal footing with developed nations since their participation is seen as essential to the process. Another means of involving the North is through triangular co-operation arrangements, in which co-operation activities between countries of the South are financed by Northern partner countries. Possible mechanisms for such arrangements need to be considered, as well as the role of international agencies, which can often provide useful convening mechanisms.

International co-operation requires, as a prerequisite, that individual partner countries have a minimum of capacity, and thus that they undertake some minimum of national activities in science and technology. Areas where individual national effort is required include the integration of S&T into national development plans, with carefully selected sectoral priorities backed by adequate resources; increased spending on R&D from current levels[9]; according higher priority to all educational activities; placing greater stress on education in basic sciences and effective systems of research; strengthening links between production units and R&D centres; and creating special facilities such as venture capital funds for entrepreneurs harnessing new technologies for productive use.

The overall strategy should be need-based, focussing on applying science and technology to meeting the needs of the countries of the South and solving common problems. Effort should be made to identify areas of scientific research and technological innovation which are of immediate concern to the South and in which joint activity would be expected to generate significant near-term benefits. Examples of such

[8] See Sagasti (1999) for discussion of co-operation in the form of flexible networks focussing on specific themes.

[9] Several authors have recommended a doubling of R&D spending for the South as a whole to bring it close to 1% of GNP (Goldemberg 1993; South Commission 1990). Korea has currently achieved a level of over 2.5% of GDP, as is appropriate in its new status as a member of the OECD.

areas include agriculture, energy, tropical diseases, biotechnology, and information and communications technologies, among many others.

The strategy should also focus on the expansion of educational links within the South, with accent on scientific, technical and vocational courses, as well as the development of managerial and entrepreneurial skills. This could include establishing a network of Centres of Educational Excellence; expansion of fellowships and scholarships; exchanges of staff and teaching materials; and developing programmes of collaborative research.

In the current context of economic reforms which gives an increasing role to the private sector and the market, South-South co-operation needs to expand to include more market-driven actors. The new strategy must therefore include ways of incorporating actors who have not yet been widely involved in South-South co-operation activities. Productive enterprises, both public and private, can contribute to overcoming the South's knowledge gap by promoting technical change and encouraging enterprise and innovation. Possible areas of focus include joint production arrangements and R&D with transnational corporations from both North and South; promotion of small and medium enterprises; setting up consortia of consultancy and design firms; and promoting links between research institutions and productive enterprises to enhance the commercial use of research results. NGOs and other civil society may also have an important role in future co-operation activities.

Relatively easier areas of science and technology co-operation to be developed would be classical "low" technology, comprising older technologies with low science inputs. This is followed by applied sciences, if capabilities in basic sciences are available. The last area is typically science-based high technology, which is harder and more expensive to develop.

There is an imperative for greater follow-up, monitoring and evaluation of South-South co-operation activities. The practical assessment of projects and programmes must be improved in order to clearly identify achievements. Efforts must be made to promote the value of and need for South-South co-operation, building on those achievements and communicating success stories to different stakeholders, particularly policymakers in order to justify the allocation of scarce resources for further co-operative activities.

Actions

From this overall strategic framework, several possible recommended actions for the South can be drawn. We will outline a handful of these[10], but this is by no means intended to serve as a comprehensive list.

At the national level, stronger education and on-the-job training in science and technology, combined with a more effective research system, is needed in order for Southern countries to develop their own capabilities. Internationally, co-operation in education and training remains an under-utilised mechanism for South-South co-operation. Although a few countries have undertaken large programmes of student exchange, the overall movement of students between developing countries remains small. To combat this, existing bilateral programs should be expanded with a millennium fund for South-South exchanges of students and practitioners. Various mechanisms for offering scholarships in order to encourage expansion of the South-South flow of students can be considered, including setting up a foundation for this purpose or working with existing institutions such as the Third World Academy of Sciences (see box below).

THIRD WORLD ACADEMY OF SCIENCES

The Third World Academy of Sciences is an international forum established in 1983 to promote basic and applied sciences in developing countries, facilitate contacts and exchanges among scientists from South, further relations between scientific institutions, and encourage research on major Third World problems. The Academy offers a number of research grants, scholarships and fellowships within the South, including:

- Five prizes of US$10000 awarded annually for outstanding contributions to the advancement of basic sciences, and two prizes of this amount awarded every other year for contributions to applied sciences in Agriculture and Technology.
- Research grants of up to US$10000 awarded in biology, chemistry, physics and math. Roughly 900 grants were given to scientists from 64 countries from 1986-1993.
- Over 300 South-South Fellowships awarded annually to provide travel support for researchers to visit scientific institutions within the South for one month or more.
- The Associateship scheme, allowing researchers to regularly visit centres of excellence in the South.

TWAS sponsored the establishment of the Third World Network of Scientific Organisations, a non-governmental alliance of over 140 scientific organisations from 74 countries in the South. Membership includes ministries of S&T and higher education, research councils and science academies. The goal of the Network is to assist in building political and scientific leadership in the South for science-based economic development, and to in promote South-South and North-South partnerships in science and technology.

Source: Third World Academy of Sciences 1999

[10] These are drawn from such sources as the South Commission Report, the South Centre (1993), and the working group sessions held at the Forum in Seoul (see Annex A).

As well, a network of Centres of Educational Excellence should be established in order to maximise the use of existing universities and technical colleges of high standing in the South. Teleconferencing can be used as a means of delivery for educational programmes in order to make courses more available to students from all over the South. The pilot African Virtual University project (see box below) is an example of how advances in ICT can be used to facilitate educational collaboration in this manner. However, unless strong initiatives are pursued by the South, ICTs will increasingly allow Northern institutions to further expand their reach.

THE AFRICAN VIRTUAL UNIVERSITY

The African Virtual University (AVU) is an interactive instructional telecommunication network established to serve the countries of Sub-Saharan Africa. The objective of the AVU is to harness modern telecommunication technology to share academic faculty, library resources, and laboratory experiences within sub-Saharan Africa. The AVU can thereby contribute to overcoming existing problems of declining budgets, too few faculty, outdated equipment, and limited facilities.

The AVU is currently being implemented and tested in 14 English-speaking and 8 French-speaking universities across sub-Saharan Africa. The AVU will then enter the operational phase when it will offer fully-fledged degrees in Computer Science, Computer Engineering and Electrical Engineering. The AVU also offers professional development training, executive business education, language instruction, information technologies training, and remedial instruction. Since the beginning of its pilot phase, the AVU has broadcast over 2000 hours of instruction to over 9000 students in all regions of sub-Saharan Africa.

Source: "About the African Virtual University", www.avu.org/avusite/about/index/htm

In addition to increasing the pool of scientifically and technically qualified personnel, it is also important to develop systems to utilise them more effectively. A network of Centres of Research and Technological Excellence in the South should be established and strengthened for advanced research, particularly in areas of high technology and environmental sciences. This could start slowly by appointing one or two such centres in more advanced developing countries and establishing regional centres on a pilot basis. Directories and databases of experts and institutions in the South can help to facilitate collaboration, and existing ones should thus be linked in order to arrive at a broad overview of what is taking place in terms of research. Specific topics should be defined for further development and work on a South-South basis, for example in health, in biotechnology, and in policy. Collaborative research programmes could be undertaken at regional and inter-regional levels in both conventional areas such as agriculture and energy and new areas of technology such as biotechnology and micro-electronics. Such research programmes must be complemented by links with productive enterprises that could lead to greater commercial use of research results. The Bolivar Programme (see

box below) is one example of an existing co-operation initiative that promotes linkages between research institutions and productive firms.

THE BOLIVAR PROGRAMME

The Bolivar Programme is an international non-governmental organisation and program which was formally launched in 1992, combining the previously established ENLACE, a regional programme to link production and scientific research sectors, and a similar initiative called the Bolivar Program for Regional Technological Integration, Innovation and Industrial Competitiveness. Its Board of Directors is comprised of individuals of a high business and technical profile. The mission of the Bolivar Programme is the promotion of technological, productive, financial and trade integration, competitiveness and industrial innovation, and facilitating the establishment of partnerships between enterprises and/or research centres from two or more Latin American countries as well as between them and similar entities in other regions.

The programme has created National Commissions in 18 Latin American and Caribbean countries, involving more than 600 top ranking individuals and approximately 200 institutions from the region. These Commissions constitute lobbies which generate a favorable environment for the Programme's activities. Liaison Offices support the work carried out by the National Commissions, promoting meetings and joint initiatives between firms and research centres and assessing the projects submitted by them.

Through the Bolivar Programme, co-operation agreements have been signed with at least 23 regional and international organisations, including ALADI, COLCYT, SELA and UNESCO. Up to April 1993, approximately 110 projects had been submitted in a wide range of productive sectors, including petrochemicals, communications, tanneries, and information sciences.

Source: "Programa Bolivar"

National policies for Science and Technology should be developed and/or updated in all countries of the South. Each country's S&T policy should have an openness to South-South co-operation, and could include policies regarding common needs of the South such as affordable and effective vaccines.

Special attention must be paid to the impacts of changing systems of intellectual property rights (IPR) for the South. The North is trying to further strengthen IPR systems to enlarge the monopolistic rights of their technology sellers. This issue is of particular importance in areas such as agriculture and pharmaceuticals, where patenting may threaten the South's ownership of its bio-resource base and traditional knowledge and methods. The countries of the South would benefit from establishing a common position and strategy on the revisions needed in trade-related intellectual property rights (TRIPs) in order to promote their own socio-economic interests.

We have argued that more monitoring and follow-up of South-South co-operation activities is required. On this front, an overview should be prepared of what is being done by the UN development system in support of science and technology in the South.

Mechanisms

Much more analysis of mechanisms for South-South co-operation is needed in order to identify and evaluate existing mechanisms and determine whether new ones are needed. Possible mechanisms may be permanent or semi-permanent, and could consist of networks or project specific institutions, among other possibilities. Semi-permanent or time-bound mechanisms allow non-functioning institutions to be closed down more easily. The strengths and potentials of existing institutions should be analysed and more fully exploited. At the same time, structures and new institutions will be needed, and this need must be balanced with financial constraints. Continuing and systematic work in this area is required.

Resources

There is unanimous agreement that a lack of resources has been the critical shortcoming of South-South co-operation activities to date. Thus a key issue for the future is how to secure adequate resources for the implementation and follow-up of proposed programmes and actions. While UNDP's allocations for TCDC have increased very gradually over time, there is still considerable scope for improvement in this area. National resources earmarked for co-operation programmes can and should be increased, although this raises a number of questions: Should it be a percentage of national resource allocations? If so, what percentage? Is there any desirable indicative figure? Certainly the richer and more advanced countries of the South should take the initiative in providing financial support for co-operation in science and technology. Other possible mechanisms for securing financial resources for South-South co-operation include triangular arrangements with the countries of the North or with the richer Southern countries, and funding arrangements with the private sector. The possible role for multilateral banks should also be considered.

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ANNEX A: SUMMARY OF WORKING GROUP DISCUSSIONS

The deliberations in Seoul were very rich and fruitful, and the participants demonstrated their support for the overall framework presented in this report. Most of the recommendations made here were endorsed by the experts in attendance, who elaborated on them and also made additional recommendations.

CONTEXT, MECHANISMS AND STRATEGIES

His Excellency Chief Arthur C.I. Mbanefo set the tone for the discussions in saying that he was confident that the outcome of the Forum would constitute a valuable input to the preparatory process of the South Summit to be held in April 2000 in Havana. He confirmed that the Group of 77 attaches great significance to the critical contribution of science and technology to the development of the South, which is faced with new and formidable challenges to shape their destinies in a balanced partnership with the rest of the international community.

The Group of 77 decided that the first G-77 Summit in April 2000 would focus on the issues of knowledge and technology and South-South co-operation, and would aim to launch new initiatives in the field of South-South co-operation in science and technology[1]. He saw the South Summit as an opportune time for formulating a new platform and defining the common interests of the South around the key development challenges and issues. He believed that efforts by the developing countries towards achieving sustainable development can only be effective with simultaneous effort towards promotion of science and technology.

He concluded that during the last decade, the process of globalisation has created increased benefits from science and technology advancement, but the South remained marginalised in this process. Science and technology for development should remain one of the priority issues on the agenda of the United Nations, and the UNDP, particularly its TCDC Unit, should play a central role in the promotion of co-operation in science and technology.

There was general agreement among the participants at the Forum that:

- We need to break out of a number of old ideas that are either non-productive or infeasible given the changed conditions within the South. Many of the options that were available to the Republic of Korea and to the ASEAN tigers are not available to all developing countries.

[1] The final documents of the South Summit can be found at http://www.g77.org/summit/summit.htm.

- Many of the participants noted that the globe cannot support billions more people who would all adopt Northern consumption patterns, as the environmental space available does not allow for such levels of consumption. We must remember that the capacity to create innovative solutions exists in the poor, and what is needed is the enabling conditions and technological support to help them to carry out those solutions.
- Key obstacles to South-South co-operation in science and technology are: lack of financial resources; lack of focus; lack of political will; and lack of vision.
- The vision for the G77 should be to promote the participation of all peoples and countries.

Priorities:

Minister Ng'wandu said that the key priorities for African countries are water, food and health. The environment was also noted as an area of urgent social concern to the South. Professor Tom Odhiambo noted that these major needs may provide good starting points for S&T priorities.

Dr. Lydia Makhubu said that education must be given priority, and illiteracy is unacceptable. Cooperation in education and training opportunities is thus clearly important. The group agreed that human resource development should be a key focus for development.

There were several concerns related to the "brain drain" from developing countries. The participants agreed that the first priority is the development of an enabling environment for the better use of the knowledge resources which exist in the South. Professor Odhiambo stated that enabling conditions require political will, and that the most damaging view is that one is too poor to be able to achieve anything.

Development, both social and economic, is the goal, and science and technology are the tools for achieving that goal.

Strategies:

Ultimately national efforts must form the first basis for cooperation with others, since cooperation requires two or more willing and *able* partners. Each government must have a clear commitment to science and technology. It is essential to begin in a modest way in order to initiate a gradual build-up of South-South cooperative efforts and undertakings in the field of S&T.

Dr. Carlota Perez said that the developing countries need to pay attention to becoming internationally competitive in certain sectors and participating in frontier technologies, while dealing at the other extreme with poverty and the need to guarantee a decent standard of living for the poor. She also noted that all countries have their own regions of LLDC.

A four dimensional model to technology applications was presented by both Dr. Perez and Mr. Ashok Parthasarathi, with minor variations between their models. The four key dimensions are: frontier, internationally competitive, export oriented technology packages; S&T as a knowledge pool; enabling technologies, engineering, development, very specific requirements for specific needs; and technologies for communities and basic needs and for quality of life.

Science and technology inputs must be demand driven. The older emphasis on increased supply of science must be modified to one that is more need-driven. Other complementary inputs and activities, such as the Development part of R&D as well as engineering applications, must also be given adequate emphasis.

The participants agreed that concrete programmes with clear, shareable benefits to the countries of the South should be given priority and mechanisms for co-operation in these areas should then be developed. Priority areas should include those with clear importance as “niche” areas, like natural product development, or areas of strategic importance for development such as information and communication technology. Other possible priority areas include: agriculture and food; solar and other renewable energies; and malaria and other tropical diseases.

Co-operation activities should focus on human resource development through training and education. This should begin by improving the regional institutions already in place.

Of special importance is the raising of funds needed for implementation. Such monies should come primarily from governments of the South, but other sources, including multilateral ones as well as the private sector should also be tapped. The old model of government-driven programs looking for international donor funds should be replaced.

The need for a continuation of the dialogue and involvement of people and institutions of the kind that is taking place in Seoul was highlighted. Such discussion should become a regular practice, which should be built on and developed in the period to come.

Appropriate multilateral models need to be developed for cooperation among the countries of the South. The larger and more advanced countries, such as the Republic

of Korea, should help the least developed by taking the initiative in launching co-operative programmes and contributing funding.

Emphasis must be placed on wider diffusion of experiences. In most countries of the South, there are many examples of creative solutions which are not being used widely enough within the country to have the desired impact. Carlota Perez cited an example of work in Venezuela where 400 different types of pastures were investigated. The project selected types and management practices which are increasing output by 28 times, reducing a number of negative impacts. However, even within the country this work remains isolated and not widely diffused and adapted, let alone wider transfer to other countries.

Mechanisms for monitoring and evaluating the follow-up action and work are essential if the process of implementation is to be energized. Otherwise, the danger is that recommendations will remain on paper, as has been the case in the past. Cooperative programs on S&T need to be better monitored and managed, and the results must be fed back to policymakers, beneficiaries and other stakeholders.

Recommendations:

A generally agreed idea is to promote South Centres of Excellence for training and research. Steps should be taken to secure adequate funds to maintain and improve existing Centers of Excellence in developing countries.

Priority areas should be identified where the introduction of technology can have an impact on national and global industrial and trade competitiveness.

Special attention should be devoted to raising funds, and for channeling these to activities which have a catalytic and multiplier effect. Venture funds might be established in appropriate cases where there are market opportunities. Countries should promote and develop the Venture Capital mechanism to set up a system to commercialize innovation.

UNDP should spearhead efforts to generate seed funding for South-South cooperation in science and technology through committing a reasonable proportion of the allocation for UNDP country programs for South-South co-operation and assisting in approaching bilateral donors, the private sector, foundations and other organizations to make specific contributions for specific purposes and activities in priority areas.

An overview should be prepared of what is being done by the UN family of organizations in support of S&T in the South, in order to derive policy conclusions and recommendations for the Group of 77.

The Group of 77 should organize and hold a periodic conference on S&T.

Issues of TRIPS and intellectual property rights should be paid special attention.

Forum participants were encouraged to do their homework, lobby their S&T leaders, Finance officials, and heads of governments/states in preparation for the Havana Summit, so that they would be prepared to declare their commitments to South-South cooperation.

RESEARCH & DEVELOPMENT

Among the criteria to be taken into account when choosing areas of research for co-operation, the following were mentioned: number of countries affected or concerned; improved quality of life as an objective; feasibility in terms of resources available and institutional support; shared interest among countries of the South.

On many problems which are of interest to the countries of the South, especially those that have to do with the specific character of tropical and sub-tropical regions, no basic research is being done in the North. Such research, which is a prerequisite for applied research and development, needs to be done in the South, and should be pursued by pooling the resources available.

Creating a “virtual community” of South scientists, including those living in the North, is an important and feasible way of giving rise to interaction, cooperation and information flow. This is of special importance in view of many parallel efforts and activities taking place, and which could benefit from mutual exchange and cooperation. UNDP’s efforts to build up WIDE were noted, as a way of enabling the scientists and institutions from the South to inform others about their work, and to find out about the work of others.

TRAINING AND EDUCATION

Education is a lifelong endeavor. Education means acquiring the capacity to participate meaningfully in society. Thinking and doing must be integrated in the individual.

Existing training centers, education networks, information resource centers and similar entities should be strengthened and transformed into regional centers. If necessary, more such centres should be established.

Through national actions, countries of the South must create the enabling environment and build the critical minimum of literacy.

Existing models of S&T cooperation in the area of education and training can be referred to, such as the ASEAN University Network and ASEAN S&T HRD Programme. The financing mechanisms of such programmes should be studied.

A minimum target of 5000 fellowships/scholarships should be made for South-South co-operation and supported by the G77.

BIO-RESOURCES AND BIOTECHNOLOGIES

Protection of its rich biodiversity is very important for all of the South, since it can provide common benefits and is an area of common threats. Cooperation in this area is thus important. The South needs to develop its own capacities in biotechnology without its resources being pirated by the North. There is a strong need for bio-piracy legislation in the South.

There is a high priority for research which clarifies the implications of different developments in biotechnology and GMOs. Some developments will represent threats to the South and others will represent opportunities.

ICTs are often touted as the key area of technological importance for the South, but biotechnology is just as crucial to the very survival of the South as ICT.

HEALTH

Little work is being done on malaria vaccines in the North, which presents a real opportunity for companies and research institutions in developing countries.

The South must take ownership of this problem rather than going back to the international agencies. For example, Thailand has started a self-funded R&D program on tropical diseases. At the same time, the development of vaccines is a very complex problem, and even the most advanced laboratories in the world have difficulty finding solutions. The South should be *driving* the process, but not going it alone; this has not been happening in the past.

The required solution must be both effective and cheap – *if the solution is not cheap then it cannot be applied* – which complicates matters substantially.

There is a need for government-guided private sector involvement that recognizes the ability of the private sector to bring in investment and get value out of what they do. Government should be the facilitator, invoking the private sector to pick up on key areas.

ICTS

ICTs have potential application in governance, health, education and food security.

ICTs should be analyzed and understood to see how different countries have shared local problems and applications.

In many countries, there is little access to computers.

Recommendations:

- Setting up a technology innovation strategy with a strong component on ICTs.
- South-South cooperation on the changing legal framework to accommodate IT development and entrepreneurs activities. Countries should share how to make enabling regulations (eg. Telecom regulatory authority).
- Co-operation in IT education: Create a program of education and training at all levels to develop hardware and cheap technologies relevant to South-South needs. We need to identify countries with strong capacities in ICTs that could provide other countries with training in hardware and software. Exchange of students and faculty in these areas should be promoted. An IT Resource Center should be established with the purpose of training at advanced levels and sharing experiences of Southern countries in improving governance, health and education, along with social legal framework.
- South-South partnership in developing and maintaining ITC to rural area where ISP's may not find it profitable to do this.
- Support technologies that promote cheap connectivity and bandwidth management
- Sharing of experiences in ITC implementation and distance learning
- Allocate concrete budget support to ICT development.
- Use of ICTs to promote South-South co-operation: Creation of joint web sites; Facilitate connectivity and linking.

POLICIES FOR S&T / S&T FOR POLICY

The participants reinforced the Vienna recommendations for each country to: have/update a S&T policy; establish a S&T management system; and provide the adequate funding.

An intelligent summary of each South country's S&T policy should be put in a shared knowledge base for the perusal of other South countries. A link should be included to the officer in each country able to provide more information, and possibly requested technical cooperation. The site should desirably include a description of the process used to establish/update the S&T policy, and, if available, the results of monitoring its implementation and evaluating its impacts.

South countries' S&T policies should have an openness to South-South cooperation. S&T policy should not be limited to national borders, but should include policies regarding common needs of the countries of the South.

The participants recommended that a minimum level of 1% of each country's GDP be devoted to S&T. A number of national mechanisms for funding S&T activities were discussed, including: a portion of the income from privatisations; mandatory contributions from companies requesting authorization to operate in industries such as telecommunications; and tax incentives for company expenses in R&D.

Best practices on policy, innovation and action should be shared more regularly and included in technology agreements between South and North countries.

IPR ISSUES

Many governments and agencies in developing countries are beginning to take intellectual properties seriously, i.e. protecting the IPR from their research results. The group does not see this trend necessarily as conflicting with sharing of knowledge among developing countries.

Greater study of various implications of TRIPS and intellectual property rights needs to be paid special attention by the countries of the South.

It was noted that within the North there was no single position on a number of issues such as patents on lifeforms, plants, and in other emerging areas. It is important for the South to examine these different options more carefully and promote and adopt those that are most favorable for innovation and equity.

ANNEX B: SEOUL ACCORD (FINAL VERSION)

FORUM ON SOUTH-SOUTH COOPERATION
IN SCIENCE AND TECHNOLOGY

14-17 February 2000
Seoul, Republic of Korea

THE SEOUL ACCORD

We, the participants of this Forum on South-South Cooperation in Science and Technology (FOSAT), meeting in Seoul, Republic of Korea from 14 to 17 February 2000, recognizing the enormous challenges of development facing the countries of the South, convinced of the vast opportunities that science and technology offer in meeting these challenges through South-South cooperation and committed to a comprehensive programme for the effective and sustained implementation of the objectives of this Accord, hereby

CONSIDER THAT

- **Science and technology be promoted and accorded high priority as a means of addressing basic human needs including poverty alleviation and human development.**
- **Critical individual and collective developmental capacities of the South be built and sustained taking full advantage of the benefits of advances in science and technology.**
- **Focus be placed on existing and new modes of cooperation, especially in areas such as biodiversity, biotechnology, information and communication technology, and renewable energy.**
- **Viable mechanisms be established or strengthened to foster South-South science and technology cooperation.**

RECOMMEND THE FOLLOWING ACTIONS:

1. **Establish a South-South network, linking R&D institutions and other centers of excellence in order to enhance our collective efforts in the generation and use of knowledge.**

2. **Establish effective mechanisms to facilitate technological cooperation among firms in each of our countries in order to be more competitive internationally, among which setting up information systems aimed at identifying common projects and needs where collective actions would lower the costs for all participants would be particularly valuable.**

3. **Increase the human capital base by pooling efforts on education and relevant training programs with special emphasis on women.**

4. **Share experiences regarding the contribution of science and technology to food security and poverty alleviation in our countries and expand on their applications.**

5. **Establish strategic South-South programmes of R&D on the development of vaccines, drugs and diagnostics for the prevention and cure of major communicable diseases in the South, such as malaria, tuberculosis and HIV.**

6. **Devise and support mechanisms that would enable countries of the South to pool their technical, institutional and financial resources to undertake and catalyze South-South cooperation in science and technology for development.**

We thank the Government of the Republic of Korea, the United Nations Development Programme (UNDP) and its Special Unit for Technical Cooperation among Developing Countries for sponsoring and organizing this important forum.

ANNEX C: ZERO DRAFT OF SEOUL ACCORD

SEOUL FORUM ON SOUTH-SOUTH COOPERATION IN SCIENCE AND TECHNOLOGY
(Zero Draft)

14 – 17 February 2000
Seoul, Republic of Korea

Seoul Accord

[This is a very preliminary draft of this document to begin a process of thinking and to suggest a format. As we get inputs and feed back this can be expanded into three pages maximum]

We, the participants of the Seoul Forum on South-South Co-operation in Science and Technology, convened in Seoul, Republic of Korea from 14 to 17 February 1999, in thanking the Government of the Republic of Korea and the Special Unit for Technical Cooperation among Developing Countries of the United Nations Development Programme (UNDP) for sponsoring and organizing this historical forum, and by adopting this Seoul Accord,

WE AFFIRM THAT

- the international economic system is increasingly being shaped by globalization and liberalization, which present both threats and opportunities for the South;
- the pace of scientific and technological change over the past few decades is such that the knowledge base required to retain a competitive position in the world economy has greatly expanded;
- science and its applications can be a key factor in solving problems common to the South, including poverty eradication, health, sustainable development and environmental protection;
- scientific knowledge is an increasingly important tool for decision makers, especially in devising policies for national development; and
- the new information technologies and biotechnology are two critical areas that offer opportunities and challenges for the development of the South.

WE RECOGNIZE THAT COUNTRIES OF THE SOUTH

- embrace a balanced vision of globalization as development of the people, by the people and for the people of all nations;
- are committed to South-South cooperation as a strategy and means of complementing their efforts to effectively ride the wave of globalization and technological transformation;
    - are faced with similar development challenges and have developed or acquired varying development capacities and experience in nation-building, science and technology and sustainable development;
    - have historical commonalties, cultural linkages, geographical assets and demographic advantages;
    - have national, regional, sub-regional, inter-regional and inter-government institutions in support of South-South economic and technical cooperation.

WE RECOMMEND THAT

Priorities in science and technology development and cooperation be accorded to:

- including scientific and technological research as an integral part of development policies, aimed at addressing urgent needs in social equity, education, industrial development, sustainable resource management, peace and international co-operation;
- building the infrastructure and capacity needed to acquire and advance technology and innovation;
- focusing on existing and new modes of production to promote sustainable development, better management practices and more efficient use of natural resources;
- assigning high priority to the adoption and use of new technologies such as biotechnology and information and communication technologies in national and international scientific and industrial policies and development;
- strengthening national and international institutions that promote scientific research and training systems, entrepreneurial development and the dissemination of scientific and technological information;
- strengthening the linkages between R&D centres and productive units in order to enhance the commercial use of scientific results and technological innovation;
- strengthening legal and financial institutions that foster the participation of the private sector in advancing science and technology;
- improving structures and mechanisms that foster South-South cooperation in science and technology, including increased funding for such cooperation.

WE PROPOSE THE FOLLOWING PLAN OF ACTION:

- to form an international "think-tank" (renowned scientific experts) in such critical areas as information and communication technology, biotechnology and biodiversity, new and renewable energies, intellectual property rights, S&T policy and strategy development, industrial and material development, and food production and security, to provide objective advise to Southern policy-makers.
- to establish a South-South network, linking R&D institutions and centres of excellence to enable the exchange of research and scientific information on a more systematic and continuing basis;
- to identify and disseminate among the South successful practices and lessons in national S&T development, including identification of complementary assets as the basis for joint research and industrial cooperation;
- to devise and support a mechanism that would enable countries having the capacity to do so to pool their institutional, technical and financial resources to finance or catalyze South-South cooperation initiatives in science and technology, in light of this Seoul Accord.

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