LIST OF ABBREVIATIONS:

1.	CAAS	Ceylon Association for the Advancement of Science
2.	CERN	Centre Européen de Recherche Nucléaire
3.	CNRS	Centre National de la Recherche Scientifique
4.	COST	Committee on Science and Technology
5.	CSIR	Centre for Scientific and Industrial Research
6.	DCs	Developed Countries
7.	DDE	Department of Electronics, Electronics Commission
8.	DDS	Department of Space, Space Commission
9.	DEA	Department of Atomic Energy
10.	DNA	Deoxyribonucleic Acid
11.	DP	Development Plan
12.	DSIR	Department of Scientific and Industrial Research
13.	DST	Department of Science and Technology
14.	ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
15.	FTE	Full-Time Equivalent
16.	GCE	General Certificate of Education
17.	GDP	Gross Domestic Product
18.	GCE (O.L.)	General Certificate of Education (Ordinary Level)
19.	GNP	Gross National Product
20.	HTR	High Technology Recruitment
21.	IAEA	International Atomic Energy Agency

22.	ICIPE	International Centre of Insect Physiology and Ecology
23.	ICTP	International Centre of Theoretical Physics
24.	ILO	International Labour Organization
25.	LDCs	Less Developed Countries
26.	MIT	Massachusetts Institute of Technology
27.	NEDA	National Economic and Development Authority
28.	NSC	National Science Council
29.	NSF	National Science Foundation
30.	NSTA	The Philippines National Science and Technology Authority
31.	OECD	Organization for Economic Cooperation and Development
32.	PCA	Philippine Coconut Authority
33.	PQLI	Physical Quality of Life Index
34.	R & D	Research and Development
35.	RONAST	The Royal Nepal Academy of Science and Technology
36.	S & E	Scientists and Engineers
37.	S & T	Science and Technology
38.	SACC	Scientific Advisory Committee to the Cabinet
39.	SAREC	Swedish Agency for Research Cooperation with Developing Countries
40.	SLAAS	Sir Lanka Association for the Advancement of Science
41.	SPI	Science Promotion Institute
42.	SPO	Science Policy Organization
43.	SSC	Secondary School Certificate
44.	STP	Science and Technology Policy
45.	STPI	Science and Technology Policy Instruments

46.	TPA	Technology Policy Assessment
47.	UK	United Kingdom
48.	UGC	University Grants Commission
49.	UNEP	United Nations Environment Programme
50.	UNESCO	United Nations Educational, Scientific and Cultural Organization
51.	UNFSSTD	United Nations Financing System on Science and Technology for Development
52.	UNIDO	United Nations Industrial Development Organization
53.	UNCSTD	United Nations Conference on Science and Technology for Development
54.	USA	United States of America
55.	USAID	United States Agency for International Development
56.	USSR	Union of Soviet Socialist Republics
57.	NCST	National Committee on Science and Technology
58.	ICSSR	Indian Council of Social Science Research

PREFACE:

This book emerges from over two decades of focused attention on issues of science and technology policy in Asia. In 1968, the Ministerial Conference on the Application of Science and Technology to the Development of Asia (CASTASIA I) was convened under UNESCO auspices in New Delhi. It brought about a regional focus to strengthen national scientific and technical resources in the region.

Later (1982) CASTASIA II met in Manila. It generated interest in linking scientific and technical resources to national development plans through science and technology policy. It also reinforced emerging interests in regional cooperation in these matters.

The spirit of CASTASIA II led directly to this volume of readings. In 1984 UNESCO commissioned two science and technology specialists from the region to travel among Asian countries and collect published and unpublished articles and reports which:

- Present seminal issues dealing with science and technology policy
- Reflect practical science and technology policy experiences of Asian countries

A very large number of titles were collected during the round of visits to scientific and technical agencies, organizations and individuals. They were sorted by the editors and a sample of them was taken to a 10-day workshop convened in Nepal in late-1985 .

At that workshop, UNESCO, FIT and the Asian and Pacific Centre for the Transfer of Technology joined forces to sponsor an all-Asian Seminar on Science and Technology Policy Management (held in Kathmandu and hosted by the Royal Nepal Academy of Science and Technology). The workshop provided the editors of this volume with sufficient guidelines to make a final selection of articles for publication here. 1987 saw the completion of editing and production of this volume.

Before proceeding to the articles themselves, we wish to emphasize three points. First, all the work presented in this volume reflects real practical experiences with science and technology policy as an instrument for development.

Secondly, these articles offer lessons learned which are valuable for science and technology policy-makers and managers in non-Asian countries as well.

Thirdly, only a very few of the articles originally sollected could be reprinted here. N ever the less the source material represents a significant investment in science and technology as an instrument for development in Asia. Further, it reflects a strong scientific and technical tradition in Asia which, as some of the articles in Chapter 1 demonstrate, predates that tin Europe and North America.

The editors wish to express their profound gratitude for the support and encouragement received from authors (published and unpublished) and organizations during the development of this volume. We have every expectation that the authors' pioneering work in this field will contribute significantly to realization of the role of science and technology policy in the development process in Asia, and elsewhere.

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FOREWORD:

Society cannot transform itself without improving the quality of its knowledge and skill. Yet skills and knowledge acquisition depend on flexible and mobile societies. This is the tautology with which this book deals.

Flexible and mobile societies recognize that clinging to what worked in the past, or insulating against the differences and ambiguities of other societies actually stem the flow of new knowledge. Worse yet, they inhibit the development and enrichment of indigenous technologies and skills.

This book documents the efforts of Asian countries to transform society through scientific and technical innovation. The countries reflected here have put a lot of energy into organizing political, bureaucratic, academic, industrial and social environments so that they generate new knowledge, import appropriate foreign technologies and apply new skills for social, political and economic development. Asian and non-Asian countries, alike, can learn a lot from these experiences about how to produce a favourable policy environment in which science and technology for development can thrive.

The focus here is on policy as an instrument for strengthening the role of science and technology for development. Why policy? Because it provides legitimacy for the scientific and technological endeavour, especially among non-scientific people who control the resources which are invested in development. But also because it serves as a bridge between the abstract concepts and methods of scientists and the practical needs of society.

It is through policy formulation that society disciplines its flexibility and mobility. A country's policies characterize its commitment to development and its degree of sophistication in mandating, planning, resourcing, monitoring and controlling the development process. Through policy formulation society establishes goals and allocates resources for scientific and technical progress. A country's policies inform others of the superordinate nature of scientific and technical goals.

All of the countries represented in this book can lay claim to a great deal of sophistication in the science and technology policy process. This collection of articles demonstrates that scientific and technical innovation has an ancient history in

Asia--one that predates such developments in Europe. But for all readers, bombarded as we have been in the last 300 years by "western" technical innovations, these articles serve to remind us of the scientific foundation laid for us so carefully by ancient Asian theoreticians.

These articles also describe a reawakening of scientific inquiry in Asia. In some cases they reflect a desire to remember the region's scientific heritage and use it as a springboard for indigenous technical developments. In other cases the articles reflect deliberate attempts to liberalize political systems so that scientific and technical infrastructures are free to wander among the abstractions which eventually lead to technical innovation and societal development.

These 18 articles were culled from over 300 which were reviewed; they were selected for inclusion in this volume because they present very basic lessons about the science and technology policy formulation process. In effect, these few articles take us through that entire process--from fundamental considerations of the relationships between science and society, to presentations of science indicators and policy instruments.

The authors in Chapter 1, *Science and Society: Their Relationship*, provide a foundation for our inquiry by proposing that social progress depends on science and, conversely, that scientific and technical progress are tied to social behavior. This argues, they point out, for an holistic approach to science and technology policy formulation for development purposes.

Chapter 2, *The Historical Development of Science and Technology in Asia*, builds on the science-and-society foundation laid in Chapter 1 by reflecting on the development of scientific ideas in Asian cultures. All of the scientific ideas reflected in this Chapter have as much significance for non-Asian countries as they do for Asian ones. But by examining them in the Asian community context, they give us an opportunity to focus a microscope on the role of science in societal development.

Finally, the concept and role of science and technology policy is introduced in Chapter 3, *Science and Technology Policy-Making*. Here, policy is seen as an instrument for applying scientific and technical processes to the problems of development. This Chapter, then, lays the final stone in the foundation on which subsequent discussions of science and technology policy for development are based.

It only remains in the balance of the book to erect the structural elements of the science and technology policy formulation process. One of the first to be considered

is a country's bureaucratic organization and structure for policy formulation. Chapter 4, *The Organizational Structure of Science and Technology Policy-Making,* offers some organizational guidelines. Chapter 5, *Science and Technology Policy Decision Criteria,* proposes bases for deciding what scientific and technical priorities should be in any given country. Both articles in this Chapter suggest that such decisions be based, first and foremost, on societal needs and development planning, rather than purely scientific ambitions.

Chapter 6, *Science and Technology Policy Assessment,* demonstrates the application of sophisticated policy formulation tools. Chapter 1 dealt with abstractions about the relationship between science and society. But Chapter 6 provides practical lessons in the use of policy assessment and the application of science indicators for policy formulation purposes.

From a strictly academic point of view, this book could have concluded with Chapter 6. Through this Chapter the book presents all the basic components of a viable science and technology policy process. However, political and social realities in countries throughout the world present various obstacles to the formulation and implementation of science and technology policy. Therefore, the seventh Chapter, *Experience with Science and Technology Policy Reform and Planning,* was included to demonstrate how at least two countries in Asia have realigned their political and bureaucratic goals and systems in order to permit more productive scientific and technical pursuits of development problems.

Finally, the book concludes with Chapter 8, *International Cooperation for Science and Technology Policy in Asia.* The article presented here voices deeply felt concerns, shared by scientists all over the world, for technical cooperation supported by political will. As with the other articles in this book, this one focuses on Asian countries in particular. But the sentiments expressed are no less accurate for non-Asian countries.

Each chapter of this book has a two or three-page introduction written by the editors. It is designed to introduce the authors represented in the chapter. But it also highlights key lessons that can be learned from the articles. This book is designed to serve not only as a basic text, but also as a guide for workshop development of many of the issues discussed in the articles.

Orchestrated over a 10-day period, this book could serve as the basic document for a workshop on the formulation of science and technology policy for development. Each chapter introduction can serve as a guide for trainers. The questions raised

therein can provide the basis for small group discussions and exercises. The articles provide the basic textual material from which answers to the study questions can be drawn. Interspersed with appropriate field visits to policy development units and presentations by local specialists, this sequence of articles can serve as the heart of a dynamic training experience for science and technology policy personnel.

In late November of 1985, just such a workshop convened in Kathmandu, Nepal to examine the kinds of issues raised in this book. The workshop was jointly sponsored by the United Nations Educational, Scientific and Cultural Organization, the Foundation for International Training and the Asian and Pacific Centre for the Transfer of Technology.

Twenty-one participants from 16 Asian countries came to this workshop, thereby reinforcing the assumption that these are important issues of priority concern to all developing nations. Unfortunately, the materials used in this workshop were nowhere nearly so well developed as they are in this volume. In fact, that workshop was used to inform decisions made about the contents of this book. Therefore, all participants of the workshop deserve the sincere thanks of readers who find these articles useful in their own science and technology policy endeavours.

Knowledge and skills are human attributes. Social and political systems are artifacts of human attempts to relate to each other in organized and constructive ways. It remains a challenge for each of us to integrate knowledge, skills and social behavior on behalf of improved life for all humankind.

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