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Manual on the national budgeting of scientific and technological activities

Integration of the 'science and technology' function in the general State budget

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Preface

The Unesco series "Science policy studies and documents" forms part of a programme to collect, analyse and disseminate information concerning the organization of scientific research and science policies in Member States, authorized by resolution 2.1131(b) adopted by the General Conference of Unesco at its eleventh session in 1960 and confirmed by similar resolutions at each subsequent session.

This series aims at making available to those responsible for scientific research and experimental development throughout the world, factual information concerning the science policies of various Member States of the Organization, as well as normative studies of a general character.

The country studies are carried out by the governmental authorities responsible for science policy in the Member States concerned.

The selection of the countries in which studies on the national science policy are undertaken reflects the following criteria: the originality of the methods used in the planning and execution of the national science policy, the extent of the practical experience acquired in such fields and the level of economic and social development attained. The geographical coverage of these studies is also taken into account.

The normative studies deal with the planning of science policy, the organization and administration of scientific and technological research and other questions relating to science policy.

The same series also includes reports of international meetings on science policy convened by Unesco.

As a general rule, the country studies are published in one language only, either English or French, whereas the normative studies are published in both languages; reports of international meetings are usually published in the main language(s) used in the region.

The present publication, which constitutes a Manual on the national budgeting of scientific and technological activities, sets out the budgetary methods, procedures and instruments needed for preparing a Science and Technology (S&T) budget which:

(a) makes it possible to identify explicitly all budget lines concerning S&T in the general state budget (GSB);

(b) contains an indicator which points out immediately the total amount of budgetary appropriations annually assigned to S&T;

(c) provides a direct reading of the institutional distribution and the object of those appropriations.

One of the best ways to achieve this explicit S&T budget is to introduce the "Science and Technology" (S&T) function as a first-level category into the functional classification, and to use that classification for encoding the budget lines devoted to S&T and for arranging these lines inside the budgetary tables to be included in the GSB. This makes it possible to obtain an explicit S&T budget integrated into the GSB. An S&T budget forms one of the prerequisites for the multi-annual programming of scientific and technological activities with regard to the national objectives of an overall and endogenous development.

This manual has been written mainly with those government officials in mind, and especially those in the developing countries, who are responsible for science and technology policy and who have to draw up programmes and budgets for scientific and technological activities. It has also been written for the officials in charge of the national development plan and State budget, whose co-operation will be required. It should in addition prove useful to the directors of scientific and technological institutions who submit requests for State funding, and it should help students of economics and administration to master the basic concepts that will subsequently enable them to harness science and technology to serve the development of their country.

The original French version of the manual was drafted by the Unesco Secretariat in collaboration with Claude J. Maestre and Ruben E. Zeida, consultants.

The Spanish version was prepared by Ruben E. Zeida with the assistance of the Unesco Secretariat, adapting the original (French) version to the methods and terminology currently employed by the Member States of Latin America. The present, English version is a translation of the (as yet unpublished) revised French version which takes account of a number of modifications introduced into the Spanish version. It may accordingly be more suited to the administrative and budgetary procedures prevailing in Latin American countries than to British procedures which are mainly based on customary rules.

It is based on the experience gained in countries which are already advanced in the budgeting of S&T, on the lessons learned from Unesco's technical assistance in this field to certain Member States, on the recommendations and advice of international experts consulted by the Organization, and on the findings of surveys regarding national practices in this field conducted by Unesco in Member States in North America, Latin America and Europe.

The experience gained by Member States in using this manual, together with comments sent to the Division of Science and Technology Policies of the Organization from any quarter, will undoubtedly enable the manual to be improved and worthwhile additions to be made to it.

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Introduction

The considerable changes that scientific and technological progress has brought about in our standard of living and in the background to our everyday lives are plain for all to see. Everyone has benefited from them, or been a victim of them, depending on one's particular situation and point of view. Developed and developing countries alike nearly all feel that a more systematic and controlled use of science and technology (S&T)* would speed up their development without detriment to their cultural identity. This belief has led governments to place special emphasis on S&T in their strategies and plans for development.

A large proportion of national scientific and technological activities are undertaken by institutions belonging to the public sector and as such are financed in the main by the General State Budget (GSB).** It therefore follows that this budget should be one of the chief instruments of government S&T policy, and that appropriations should be related to the objectives laid down in the national development plan.

It is nevertheless not always possible to see in a budget what funds have been allocated to S&T and to discover the total amount concerned, how it is apportioned and for what purposes, or to assess how these funds relate to the plan's objectives. The fact is that these funds are frequently not visible, being dispersed within a large number of sectoral allocations relating to institutions. The situation stems from certain drawbacks inherent in conventional budgetary procedures which do not make it possible to identify activities of a horizontal or multi-institutional type, and from that fact, in many cases, the government Science and Technology Policy-Making Bodies (STPMB)*** are not integrated into these procedures. The short-comings make it difficult to allocate the limited financial resources of the State budget in a rational manner.

To assist Member States in solving this problem, Unesco has, since 1972, undertaken a series of studies on the methods, procedures and instruments of S&T budgeting in co-operation with the relevant national science and technology policy-making bodies.

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* In the following pages, the abbreviation "S&T" will be frequently used for "Science and Technology".

** In the following pages, the abbreviation "GSB" will be frequently used for "General State Budget".

*** In the following pages, the abbreviation "STPMB" will be frequently used for "Science and Technology Policy-Making Bodies".

5. This manual is the practical outcome of these studies. In preparing it, use has been made of:

(a) the experience of countries with considerable expertise in S&T budgeting (especially Argentina, Belgium, Canada, Colombia, France and the United States of America);

(b) the findings of many technical assistance and fact-finding missions conducted by the Organization (particularly in Belgium, Bolivia, Brazil, Canada, Colombia, Costa Rica, Cuba, Ecuador, Mexico, Panama, Peru, Senegal, the United States of America and Venezuela)(1);*

(c) the recommendations and advice of international experts** consulted on several occasions by the Organization: Paris (November 1972), Ottawa (November 1973), Brussels (January 1975), Montevideo (June 1977) and Paris (December 1977);

(d) the comments received on the various preliminary versions of the Manual (2, 3 and 4);

(e) the findings of surveys conducted by Unesco in Member States in North America, Latin America and Europe concerning their practices in this field (5 and 6);

(f) the contribution of regional conferences such as the Fifth Meeting of the Standing Conference of the Directors of National Councils for Science Policy and Research of the Latin American and Caribbean Member States (Quito, 13-18 March 1978), whose recommendation on this subject will be found in Annex X (7), and the Conference of Ministers Responsible for Science and Technology Policy in the European and North American Region (MINESPOL II, Belgrade, 11-16 September 1978)(8).

6. The aim of this manual is to assist the Member States of Unesco in implementing their science and technology policies by making better use of their current budgetary procedures and by making an explicit identification of S&T appropriations in the budget. To achieve this aim, the manual is arranged as follows:

Part One: The argument in favour of an S&T policy and budget

This part explains the role of innovation in national development and examines the interactions between the various forms of innovation and between innovation and what we have collectively inherited. It then, on this foundation, attempts to demonstrate the need for an explicit science and technology budget to support an activist policy in this field.

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* The figures in brackets refer to the numbered references in the Bibliography (Annex I).

** In particular Mr. P. Amaya (Colombia), Mr. G. Chapman (USA), Mr. D.H.E. Cross (Canada), Mr. J. Defay (Belgium), Mr. A. Del Toro (Colombia), Mr. K. Gresser (Federal Republic of Germany), Mr. Lamouche (EEC), Mr. B.M. McGugan (Canada), Mr. C. Maestre (France), Mr. D. Maquart (France), Mr. J. Perez Fuentes (Mexico), Mr. D.L. Rowat (Canada), Mr. P. Seidl (Brazil), Mr. J. Sevin (France) and Mr. R.E. Zeida (Argentina).

Part Two: Government decision-making and budgeting processes

This part looks at the conceptual and operational framework of science and technology budgeting by examining budgeting in relation to the various types of quantification and by examining the main government decision-making processes in general and then those which concern the State budget in particular.

Part Three: The functional budgeting of science and technology

This part draws upon what can be learned from current national situations to suggest appropriate methods, procedures and instruments for preparing a science and technology budget that would then make it possible to begin a genuine programming of science and technology.

The annexes contain a subject index and examples of budgetary instruments that may help countries to develop their own.

7. The manual is intended firstly for those government officials who are responsible for preparing budgets at any level - national, regional, or local, overall or sectoral - and more especially for those whose function within the budgetary process is linked or could be linked in one way or another with the programming and budgeting of S&T. It should also prove useful to all scientists and technologists who have responsibilities of any kind in the formulation and management of S&T programmes and, more generally, all those who participate in the negotiations, discussions and consultations which are essential to budgeting and planning procedures.

8. The manual thus attempts to set forth basic concepts and useful techniques for:

(a) modernizing public administration;

(b) identifying directly in the GSB all the budget lines concerning S&T, by introducing the function "Science and Technology" as a first-level category into the budgetary functional classification;

(c) reading directly in the GSB analytical tables the total amount (budgetary indicator for S&T), the institutional distribution and the object of all public appropriations annually devoted to S&T activities; these tables are to be obtained by crossing this functional classification with the other budgetary classifications.

9. Conventional or non-conventional budgetary methods, instruments and procedures, however, cannot be transplanted without adjustments to national circumstances. As neither techniques nor people are neutral, it is necessary to select from the various techniques the ones that may be most easily adapted to the needs and traditions of each country. More important still, they should be organized in the way that suits the economic, political and social conditions of the country concerned best. From this point of view, the information contained in this manual could prove very useful.

Part I

The argument in favour of a science and technology policy and budget

Part One of this publication offers to officials responsible for national planning and budgeting the basic information which will make it possible to participate efficiently in the preparation of an explicit science and technology budget. Beginning with a clarification of the role of innovation, taken in its broadest sense, in the development of societies, this part attempts to show the good reasons for an activist government policy in favour of science and technology, based on an explicit S&T budget. It then describes the relevant institutional machinery and the difficulties encountered by governments in their efforts to promote science and technology.

CHAPTER I — THE ROLE OF INNOVATION IN DEVELOPMENT

INTRODUCTION

0. The contribution of science and technology (S&T) to economic growth is quite clear and widely recognized, but its influence on the general evolution of society is far less obvious. In an attempt to cast more light on how social, cultural, scientific and technological innovation interacts with the many facets of human development and to situate the particular role of S&T within this context (9), this chapter adopts a systems approach.

1.1 Should the role of S&T be described or explained?

1. The world today is largely dominated by modern technology engendered by various applications of science. Most countries, however, have only very recently become politically aware of the complex relationship between science, technology and development and have acquired a new understanding of the changes which science and technology can bring about in our living standards and the background to our everyday lives. The realization will certainly entail the adjustment of national priorities and modifications to government decision-making processes, but it does not necessarily imply that the phenomena in question have been thoroughly examined.

2. For example, studies on science and technology's future role in development tend to concentrate on observing the importance of this role without really explaining it, with the result that it is impossible to deduce how it actually functions. Doubtless, simple observation of the rapid progress of science and technology and its far from negligible impact on the various sectors of economic life, of the growing expenditure on research and the need felt by States to provide themselves with activist science and technology policies, obliges us to admit that science and technology are interdependent with economic growth. It is nevertheless difficult, without an overall explanation of the fundamental role of innovation, taken in its broadest sense, in the multiple facets of a society's development, to understand past successes and failures and to ensure that, in future, science and technology will make a systematic and effective contribution to harmonious and endogenous development.

1.2 The multi-dimensional approach to development

1.2.1 The economic model of development

13. In industrialized countries, or in those in the process of so becoming, development has hitherto been centered on the economic model which takes into account only those variables that exert a direct influence on commercial relationships within the society. Government policies promoted development by concentrating on the so-called economic variables such as production, consumption, prices, employment, the currency or the balance of trade, and paid less attention to variables connected with the evolution of non-commercial relationships such as culture, welfare, health or education. Everyone considered this approach to be effective and beneficial to development in general, and the prosperity of the most advanced nations appeared to support their view.

14. The crisis which began in the mid-seventies, and which more and more people feel is likely to continue for a long time, is casting considerable doubt on the economic model and hence on the kind of influence that it exerts on development. Put simply, it is becoming increasingly clear that this economic model is applicable to closed systems to which the economic systems could belong so long as the human and natural environment (society and nature) from which they drew the materials to sustain their growth did not reveal its specific limitations and restrictions. Today, such limitations and restrictions are everywhere - the oil crisis, pollution or increasingly inhuman living conditions, for example - and oblige us to regard socio-economic systems as open systems in the same way as biological systems are. In consequence, development should be considered as the evolution of all the relationships, both commercial and non-commercial, existing in a society whose survival in part depends on its exchanges with its environment.

15. Those responsible for the management of development require as clear-sighted a vision as possible of the components and interactions involved in the complex development process. Such clear-sightedness is hardly compatible with what can be seen by an observer confined to a limited spectrum of relationships, such as a public or private organization or the subset of commercial relationships, since a person runs the considerable risk of basing his judgments on a fragment of the whole. The consequences of this become apparent sooner or later and, in very general terms, show up as a large number of shortcomings in the management of development which damage and disorganize the web of society's internal relationship and international exchanges.

1.2.2 The systemic approach to development *

16. It is important, therefore, for the managers of development to place themselves so as to perceive, beyond the architecture or structure formed by corporate bodies and individuals, the zones of intense interaction and co-ordination between active participants within economic or non-economic social processes. To do so they must adopt a systemic approach** (10).

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* Cf. Maestre, C.J. in the general bibliography, Annex I.

** Not to be confused with the theory, analysis or dynamic of systems.

This is a cross-disciplinary approach which, provided that they avoid the pitfalls of a paralysing reductionism* or all-embracing systemism**, will help them better to understand and describe organized complexity so that they can take more effective action.

17. This approach should not be regarded as a science or theory but as an attitude or method. Unlike the analytic approach, it covers all the components of the system in question together with their interactions, and considers that any social organization, such as an institution, nation or mankind in general, may be regarded as a system:

- which is complex: it is comprised of a wide variety of specialized and co-ordinated components (the system's architectural or organic order) which, within numerous processes (time-dependent phenomena), are linked to each other by a dense pattern of non-linear interactions and performs a series of basic and essential functions (the system's functional order) so as to achieve a common purpose;

- which is open: it is faced with uncertainty and involved in continuous exchange with its environment, taking and giving information and energy;

- whose behaviour is difficult to forecast owing to the variety of the components and to the non-linear character of the interactions; and

- which is homoeostatic: faced with the demands, disturbances and attacks of the environment it maintains a state of dynamic equilibrium by relying on the variety (11) of its components, interactions and regulatory mechanisms.

18. When this approach is applied to the socio-economic and cultural system that constitutes a nation, other possible aspects apart from the architectural order or aspect represented by institutions may be distinguished. To clarify our thinking about development, we shall say that a nation is an architecture composed of specialized and co-ordinated components (institutions and individuals) which perform a series of functions*** (e.g. education, health, production, communication, innovation, defence, etc.) in order to attain a common goal, viz. development, embodied in a blueprint for society (e.g. the national development plan). We shall see later (Section 7.2.4) how to identify these functions which cover groups of essential activities and zones of intense interaction, and how to relate the functional order to the government decision-making process. One can nevertheless already sense that those responsible for a nation's development can translate more efficiently into operational terms the blueprint of their own particular society and the arguments which give it expression by referring at first to the functional order for strategy formulation, and afterwards to the architectural order for its implementation. They can now do this by making calculated concessions to the influences and pressures which the various parties in the development processes, with their perfectly human tendency to defend their own interests, never fail to exert.

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* Simplistic transposition from the biological to the social sphere.

** The temptation to work out a single, all-embracing theory.

*** With certain necessary qualifications, one could contrast the "anatomy" (architectural order) of a society with its "physiology" (functional order).

1.3 The vital role of innovation

1.3.1 Variety and development

19. As we have just seen, any system which reproduces, adjusts and changes itself in the way that a complex social organization does, is influenced by its environment and exposed to all that environment's uncertainties. Such systems can only survive - and therefore develop - when their internal variety (11), i.e. the number of possible states of the system deduced from its components and their interrelationships, can cope with the uncertainties encountered. The fact is, when a homoeostatic system is threatened from without, it can only safeguard its internal equilibrium* by a capacity to offer at least as great a variety of responses as the number of possible forms these attacks can take. Its very survival depends on the balance "variety of responses - variety of disturbances".

20. At any point in the development of a complex social organization, or society, two types of variety may be distinguished**:

(a) the variety which is reliably existing since some time and is (in theory) the disposal of all members of the society, in other words the collective heritage;

(b) the variety which is newly generated and not yet integrated in the society, in other words the innovation.

21. Formerly accumulated variety (collective heritage) may be of a biological or intellectual nature:

(a) the collective biological heritage

- derives from the evolution of the biosphere;
- covers animal and plant life, the countryside, forests, etc., but should not be confused with natural resources (including, for example, the subsoil, air and water), a concept that belongs to the economic model.

(b) the collective intellectual heritage

- may be regarded in a complementary way as the result of the integration of changes and adjustments in a society's values and modes of expression, representation and action, or as the accumulation in time of successive blueprints for society or segments of its history (10);
- includes, for example, accumulated knowledge, socio-cultural values, history, languages, works of art and literature.

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* Here we are referring to a dynamic and not a static (equilibrium).

** Depending on the context or point of view, the term "variety" is replaced with "diversity", "plurality", "difference", "individuality" or "particularity".

22. To the biologist, generated variety takes a number of relatively simple forms such as random mutations during reproduction or very gradual changes in behaviour. In the case of social organisms, however, newly generated variety (innovation) takes the following three mutually complementary forms:

(a) scientific and technological innovation

- is mainly the outcome of scientific research and experimental development (R&D)*, which designates systematic and creative efforts to build up the stock of knowledge on nature and society of truth (criterion) and to use this knowledge to discover new applications (criterion of effectiveness). For this purpose, R&D is backed up by scientific and technological services (STS)** which gather, store, transform and make accessible scientific and technological information and observations;

- covers new discoveries and ideas concerning natural phenomena, mankind, society and culture, as well as inventions and new or improved products and processes.

(b) social innovation***

- is the outcome of changes and a greater differentiation in social roles and behaviour (criterion of fraternity);

- covers all changes in the relationships between the individuals or groups of individuals that make up a community.

(c) cultural innovation

- is the outcome of artistic and literary creativity (criterion of beauty);

- includes all that is new in architecture, painting, music, literature, poetry, the cinema, and so forth.

23. The basic generator of these three forms of variety is, of course, the individual, who is himself a complex system (characterized by his biological and psychological diversity) open to his environment (i.e. society, the biosphere and the collective heritage).

1.3.2 Three functions: the generation, use and preservation of variety

24. As we saw in Section 1.2.2, a nation may be regarded as a complex system composed of specialized and co-ordinated institutions and individuals (the system's architectural order) which, under the authority of the State,

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* Throughout this manual, the abbreviation "R&D" or the word "research" is extensively used for "scientific research and experimental development". The term "development", when it stands alone, always designates the economic, social and cultural development of a community. (See the definition in Section 10.2.)

** Throughout this manual, the abbreviation "STS" stands for "scientific and technological services". (See the definition in Section 10.2.)

*** Do not confuse social innovation with innovations derived from research in the social sciences, which belong to scientific innovation.

perform a series of essential functions such as education, the preservation of health, production, communications or defence (the system's functional order) so as to achieve the objectives stated in the national development plan.

25. When we examine development from the functional standpoint, we recognize the central importance of two particular functions: the innovation function and the collective heritage function. This is because the survival of any society, at whatever point in time or space, depends on its ability to develop and so meet the challenge of an uncertain future and deal with pressures from within and threats from without by making use of all the forms of variety we have mentioned (see Section 1.3.1). Secondly, just as there exists a right to education or health, there exists a right to diversity (i.e. to variety, to be different, to change) which affects every form of freedom and particularly the individual's possibility of safeguarding his own identity and choosing his own future. Thus the conditions of human survival and basic human rights require the State, on behalf of society, to exercise an innovation function and a collective inheritance function.

(a) The innovation or generation variety function

26. Innovation (i.e. newly generated variety) - the equivalent of biological mutation - makes it possible for the systems of values, expression, representation and action of the complex social organization that a nation is to evolve. The scientific and technological innovation engendered by civil R&D is chiefly used in functions connected with the production of goods (e.g. agriculture, industry) and services (e.g. health, communications) with the broad aim of improving the material conditions of life, that is, of contributing to economic development. That derived from military R&D is mainly used by the defence function in order to protect the material conditions of life and the collective heritage of the members of the nation from armed attack. Social and cultural innovation paves the way for changes of a moral, psychological, sociological and aesthetic nature, thus contributing to the nation's social and cultural development, both individually and collectively.

27. At a time when many disadvantaged nations are giving priority to the improvement of material well-being, scientific and technological innovation is clearly of particular importance to development. Since - either as beneficiaries or as victims - we all regularly recognize the effects of S&T in our lives, it would serve no purpose to present specific examples here.

28. In exercising the innovation function the task of the State is to manage the nation's capacity to generate the new variety which it needs. Fulfilling this task calls for:

- a science and technology policy whose object it should be to make of R&D - supported by the STS - a controlled generator of appropriate variety. This generator should so far as possible be programmed according to the criteria of truth, utility and efficiency;
- a policy of social innovation which should work in favour of social diversity as well as individual and collective freedoms;
- a policy of cultural innovation which could prompt artistic and literary creativity.

(b) The heritage or preservation of variety function

29. The collective heritage (formerly accumulated variety) - whether biological or intellectual - has two roles to play in development.

- as the total accumulated knowledge of mankind it serves to regulate and maintain the dynamic balances of the social system and to sustain the creativity that generates additional variety, i.e. innovation;

- as a stable point of reference in the time scale of a human life, it makes it possible to determine whether an innovation - and in particular a scientific and technological innovation - is compatible with the vital task of safeguarding the society's identity.

30. In exercising the heritage function, the task of the State is to manage the nation's capacity to preserve the variety it has accumulated during the past, partly by protecting it through:

- a policy for the preservation of the nation's identity and cultural heritage, and

- a policy for the preservation of the natural environment, and partly through measures to facilitate its reproduction by means of:

  - a policy on education which should facilitate the transmission of existing knowledge and increase the innovation potential.

(c) The strategy of endogenous development or the utilization of variety function

31. The outcome of the innovation-heritage confrontation decides whether the innovation will be integrated or rejected. Only when the innovation is compatible with the collective heritage can it become integrated in it and contribute to the solution of society's problems without creating new ones or jeopardizing its identity. When this is the case, one can speak of endogenous development. The strategy and planning of endogenous development must be founded among other things on an overall policy of variety - innovation and heritage - which calls for the coordination, harmonization and complementarity of scientific, technological, cultural, educational, social, environmental and sectoral economic policies. Past setbacks have been largely due to short-term policies on the use of innovation for strictly economic ends, without concern for the collective heritage.

32. The New International Economic Order (NIEO) (see Section 2.2) is the one which permits every nation to pursue endogenous development. Because of the interdependent relationships (interactions) between nations (architectural order) within the complex open system constituted by the human race, the NIEO must, by influencing the political functions assumed by the States, render their different strategies and blueprints compatible and complementary so that the survival and development of man can be assured.

TO SUM UP:

- the systems approach is a mode of thought which, being concerned with overall, relational and prospective considerations, is highly suitable for the efficient management of the complex system that a nation is;

- a nation is a system whose architectural structure is composed of various specialized and co-ordinated elements (institutions and individuals) which, in combination, exert a concert of elementary and vital functions with a view to the achievement of a common goal - survival and development, as embodied in a blueprint for society;

- the survival and development of a nation depends upon its internal potential for change: that is to say, upon its capacity to generate the new variety which it needs (innovation) at the same time as preserving the existing variety which it has accumulated over time (collective heritage);

- innovation is a function which adds to the variety of the system's components, interactions and regulatory mechanisms and makes it possible to find an effective response to the multiple demands and disturbances arising from the environment, provided that such innovation (newly generated variety) is compatible with the collective heritage (formerly accumulated variety) and capable of integration in it without loss of identity (otherwise at best there will be modernization without endogenous development);

- the strategy of endogenous development calls for an overall policy on variety - innovation and heritage - and its co-ordination with other governmental policies, especially the policy on education and sectoral economic policies;

- the blueprint for society is spelled out in a number of ways, but principally (where such a Plan exists) in the National Development Plan; the preparation of this Plan needs to take close account of the functional order, and its execution needs to take equally close account of the architectural order.

CHAPTER II — THE NEED FOR AN ACTIVE POLICY ON SCIENCE AND TECHNOLOGY

INTRODUCTION

33. A systems analysis of the role of innovation in endogenous development has shown the need for government authorities to take responsibility for the innovation function within the socio-economic system, and especially for its scientific and technological aspects. This need has emerged through the gradual appearance of active governmental policies for science and technology. This chapter begins with an examination of the past and present, national and international, economic and scientific context in which national S&T policies made their first appearance, and then discusses their scope and essential functions.

2.1 A growing awareness

34. For many centuries it was generally believed that scientific and technological innovation was, like social and cultural innovation, an involuntary phenomenon whose effects could only be beneficial to the nation's development. The government, therefore, was not to try and influence it in one way or another but was simply to provide research workers, when necessary, with the financial support they needed to carry out their research. This is the "*laisser-faire*" policy and the immediate source of the view that science is independent and neutral, independent, that is, of national socio-economic development objectives and neutral with respect to the good or bad use made of the results of the research.

35. The industrial explosion of the nineteenth and twentieth centuries, together with the massive organized application of science and technology to military purposes during the Second World War, completely overturned this view, so much so that, during the sixties, everyone considered the relationship between research and economic growth to be solidly established, growth even being held to be virtually proportional to the amount of research performed.

36. Indeed, while the economic model held sway (see Section 1.2.1), scientific and technological innovation was the only form of innovation (see Section 1.3.1) for which there existed any real policy since the West was firmly convinced that only this form of innovation influenced the economic variables and was therefore of recognized commercial value and capable of providing a (materialist) answer to individual and social problems. This belief led governments to plan the allocation of resources needed for national scientific and technological development, which was then aimed to serve economic expansion - regarded as infinite - and increased military potential.

37. There ensued the race to acquire increasingly complex and destructive arms, the irreversible damage to certain natural environments, and the raw materials supply crisis. Everywhere, movements sprang up to challenge the economic model that had engendered a materialist civilization and the "consumer society", the belief that unhindered research would automatically produce results beneficial to mankind, and the direction in which governments and big business had steered R&D throughout the world. Conditions were now ripe for the formulation and implementation of activist governmental science and technology policies in which research and the findings of research were to serve development, now envisaged in a more humane and comprehensive manner (12).

2.2 The New International Economic Order (NIEO) and the United Nations Conference on Science and Technology for Development (UNCSTD)

38. Over the last ten years or so, the concept of a New International Economic Order (NIEO), with radically different attitudes towards the future on the part of both developed and developing countries, had slowly taken shape. The United Nations General Assembly in fact deliberately included the following among the guiding principles on which the NIEO should be based:

> "Giving to the developing countries access to the achievements of modern science and technology, and promoting the transfer of technology and the creation of indigenous technology for the benefit of the developing countries in a form and in accordance with procedures which are suited to their economies".*

39. The whole world had, in fact, become acutely aware of the gulf between the rich countries and countries where people have yet to achieve a level of existence compatible with human dignity. This disparity includes science and technology, since about 90% of the world S&T potential is to be found in the industrialized countries. As a result, all national S&T policies throughout the world are influenced by the problems peculiar to developed countries, many of whose needs and aspirations differ radically from those of developing countries. The latter are thus obliged to acquire, imitate or use a science and technology which has been produced elsewhere with other ends in view. This explains the adverse reactions of these countries to the importing of technologies that are unsuited to, and occasionally even destructive of, the local culture.

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* Declaration on the Establishment of a New International Economic Order, United Nations General Assembly resolution 3201 (S-VI) of 1 May 1974.

40. These issues are so serious and so important for the future of mankind that national science and technology policies can no longer ignore them. The developed countries are beginning to take an interest by conducting research into the specific problems of developing countries, particularly in regard to forms of technology appropriate to their needs. The developing countries, for their part, now recognize that they must:

(a) develop their own scientific and technological potential, which will enable them to negotiate from a stronger position with the exporters of technology;

(b) adapt imported technologies to their own special needs; and

(c) stimulate endogenous scientific and technological innovation.

41. Lastly, there are "world problems", concerning the physical conditions of human survival, with which all mankind is faced, e.g. the natural environment, climate, the oceans, space, energy, etc. The task here, both for the organizations of the United Nations system and for their Member States, is to develop science and technology policies that will measure up to the challenges to be met and will be properly supported by broader and more effective co-operation between nations.

42. The United Nations Conference on Science and Technology for Development (UNCSTD, Vienna, August 1979), which was held at a critical stage in the evolution of the world economy, forms an integral part of the efforts to set up a NIEO based, *inter alia*, on the above-mentioned principle. The UNCSTD adopted decisions and recommendations designed to strengthen the scientific and technological capability and endogenous development of developing countries. It also adopted a Programme of Action in regard to science and technology for development which states that:

> "the formulation of a comprehensive and coherent national science and technology policy, designed as part of the national plans, to contribute to the achievement of a country's development objectives is necessary for the effective application of science and technology for development".*(13)

2.3 The scientific context: the changing face of science and technology

43. The rising level of industrialization, the questioning of the economic model of development, the ever-increasing awareness that the system of production and exchange and its interactions with its natural and human environment are becoming more and more complex, and have all entailed obvious changes in the character of S&T. These changes include:

(a) the broadening of fields of research and the gradual strengthening of links between science and technology:

- to cope with the growing range of industrial products and the need to find fresh outlets,

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* UNCSTD Programme of Action, paragraph 13.

- to allow for the interdependence of natural, economic and social phenomena,

- to adjust to the introduction of certain decision-making aids such as technological assessment or systematic impact studies,

- to take advantage of the intrinsic dynamism of scientific research to speed up technological innovations.

(b) the inclusion of the social sciences in the majority of research programmes in order to bring science into closer touch with society and, in particular, to ensure that innovations are compatible with the collective heritage (see Section 1.3.1);

(c) closer links between fundamental research, applied research and experimental development to improve the efficiency of the innovation process and provide better grounds for requests for funds;

(d) the growing complexity and cost of advanced research;

(e) the transition from broad research guidelines to programmes related to the national objectives defined in the National Development Plan;

(f) more pluridisciplinary and multi-institutional programmes to facilitate mission-oriented research or research into the solution of economic and social problems, instead of discipline-centred research.

44. These changes have had an important impact on the scope and functions of S&T policy, which must be brought into line with the types of activity it seeks to guide.

2.4 Scope and functions of an S&T policy

2.4.1 The recommendations of the UNCSTD Programme of Action

45. After stating the need for a national science and technology policy (see above, Section 2.2), the UNCSTD Programme of Action makes the following recommendations* concerning its scope and content:

Paragraph 18: "The government of each developing country should formulate a national policy for science and technology, which involves carrying out certain essential responsibilities such as the planning, budgeting, management, co-ordination, stimulation, promotion and execution of scientific and technological activities relevant to defined development objectives. It implies also the bringing about of careful interaction between factors responsible for growth and transformation".

Paragraph 20: "The science and technology components should be included in national development plans or strategies as basic instruments for achieving the different objectives and goals contained in

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* Underlining by the authors of the Manual.

them; these plans should also include specific requirements at the sectoral and inter-sectoral level for the generation, mastery, transfer, acquisition, local dissemination, assimilation and utilization of science and technology, including know-how".

Paragraph 21: "An effective science and technology policy should embrace elements such as:

(a) formulation of science and technology plans with the specific view of establishing targets for each science and technology sector, determining sectoral priorities arising from national development objectives and critically evaluating the resources which may be required as a result of co-ordinated intersectoral programmes;

(b) survey of the state of the art in each science and technology sector and assessment of the availability of national resources and science and technology potential;

(c) the mobilization of financial resources for scientific and technological development;

(d) the setting up of the appropriate legal, administrative, fiscal and institutional machinery to carry out the process of scientific and technological development. Furthermore, the science and technology policy should take into consideration manpower, investment and income-distribution policies, and be in harmony with short-term needs as well as long-term requirements;

(e) development of managerial capacities in research and development and technology in all its facets;

(f) the establishment of a national capacity for the assessment, selection, acquisition and adaptation of foreign technology and expertise taking fully into account prevailing economic, social, cultural and environmental conditions;

(g) stimulation of demand for indigenous research, technology and other science and technology services in general;

(h) the diffusion of science and technology among all sectors of the economy and their corresponding programmes, and their continued review, appraisal and adjustment at the macro- and micro-level;

(i) promotion of communication and co-operation among government agencies, research institutions, professional societies and technology users;

(j) undertaking of joint projects among all agents of science and technology development;

(k) the education and training of the human resources required to generate and implement science and technology development policies, plans, programmes and projects;

(l) the promotion of basic and applied research, and research and development in a balanced mix;

(m) protection of the traditional scientific and technological base and, at the same time, upgrading of such knowledge in order to utilize it fully in the development process;

(n) ensuring that the earning capacity of rural communities is increased through the application of science and technology."

Paragraph 22: "The mobilization of science and technology for development should include appropriate measures to ensure that the application of science and technology to development would lead to a constant increase in the well-being of the entire population on the basis of its full participation in the process of development."

2.4.2 Overall and sectoral S&T policies

46. The growing complexity of scientific and technological development calls for high standards of organization and intersectoral collaboration. This is why more and more governments are equipping themselves with an overall national science and technology policy that is designed to fit in with national development plans and contribute to their objectives. It is worth pausing to compare the national processes developed for this purpose. The overall approach to S&T policy is founded on the two main aids to management and co-ordination, namely, flexible planning and the explicit budgeting of national S&T activities. Its main features are (14):

(a) selection of the major national objectives for S&T and the establishment of priorities in relation to the national development plans and strategies;

(b) stating reasons for the choices made and their likely consequences for the future;

(c) explaining the conditions and standards governing scientific and technological development, taking into account both the special characteristics of science and the country's socio-cultural values;

(d) mobilization of human and financial resources and of resources in the form of institutions, information and facilities needed to attain the chosen objectives;

(e) the monitoring and evaluation of what is achieved in application of the government's S&T policy.

47. This said, it should be noted that certain countries back this up with a "sectoral" process which tends rather towards integrating into the different branches of the production sector the R&D and STS directly necessary to them so as to remain competitive where innovation is concerned. There is no single solution to the difficulties arising from the harmonization and necessary co-existence of global and sectoral approaches to S&T policy since these problems are closely bound up with the distinctive features of each country's socio-economic and fiscal systems. On this point it should be observed that the implementation of major national research programmes directed at the solution of socio-economic problems or clearly defined targets usually requires a pluridisciplinary and multi-institutional approach calling for co-operation between a number of ministries, a condition that is hard to fulfil when the S&T policy is exclusively sectoral. This is especially true where the environment, space, fresh water, the oceans, rural development, energy, housing and so on are concerned.

2.4.3 The functions of an S&T policy

48. A close examination of the situation in developed countries, and in a growing number of developing countries too, reveals that an up-to-date S&T policy covers several functions:

(a) The planning and budgeting function

- preparation of that part of the national development plan that concerns S&T programmes,
- annual preparation of an explicit S&T budget
- evaluation, on a continuing basis, of the national S&T potential, including an inventory of ongoing R&D projects,
- forecasts of technological changes and of their impact on society and the environment;

(b) The co-ordination function

- interministerial co-ordination in order to establish a concerted programme of S&T activities and facilitate the execution of multi-institutional programmes;

(c) The administration and promotion function

- mobilization or raising of funds and their distribution among S&T agencies,
- supervision of R&D and STS activities and a critical appraisal of their results;

(d) The execution function

- management of S&T activities within the executing agencies with a view to greater effectiveness;

(e) The function of integrating S&T and bringing S&T to the fore

- popularization of science and improvement of relations between science and society,
- circulating and bringing to the fore the results of S&T activities so that they can be wisely and systematically used;

(f) The function of defending S&T

- defence of fundamental research as opposed to applied research, whose profitability is more immediate and foreseeable,
- defence of the legitimate interests of the scientific community and of the rights and duties of its individual members (e.g. the status of scientific researchers)
- defence of the funds allotted to S&T in the budget;

(g) The advisory function in regard to general policy

- participation in drawing up the national development plan,

- advice on the exploitation of oceans and the natural environment, on energy policy, on military R&D policy, on legislation concerning the use of certain scientific discoveries and inventions, etc.

2.4.4 The national S&T system and potential

49. The chief concern of most countries, especially developing countries, is to mobilize their national scientific and technological potential (human and financial resources, infrastructure, available facilities and the means of access to information), in other words to create an S&T system, build up and ensure that it is used rationally. Their efforts are gradually giving them an independent capacity to apply science and technology to development. This independent S&T capacity is the cornerstone of that endogenous development which the establishment of an NIEO freed from dependence and domination should make possible.

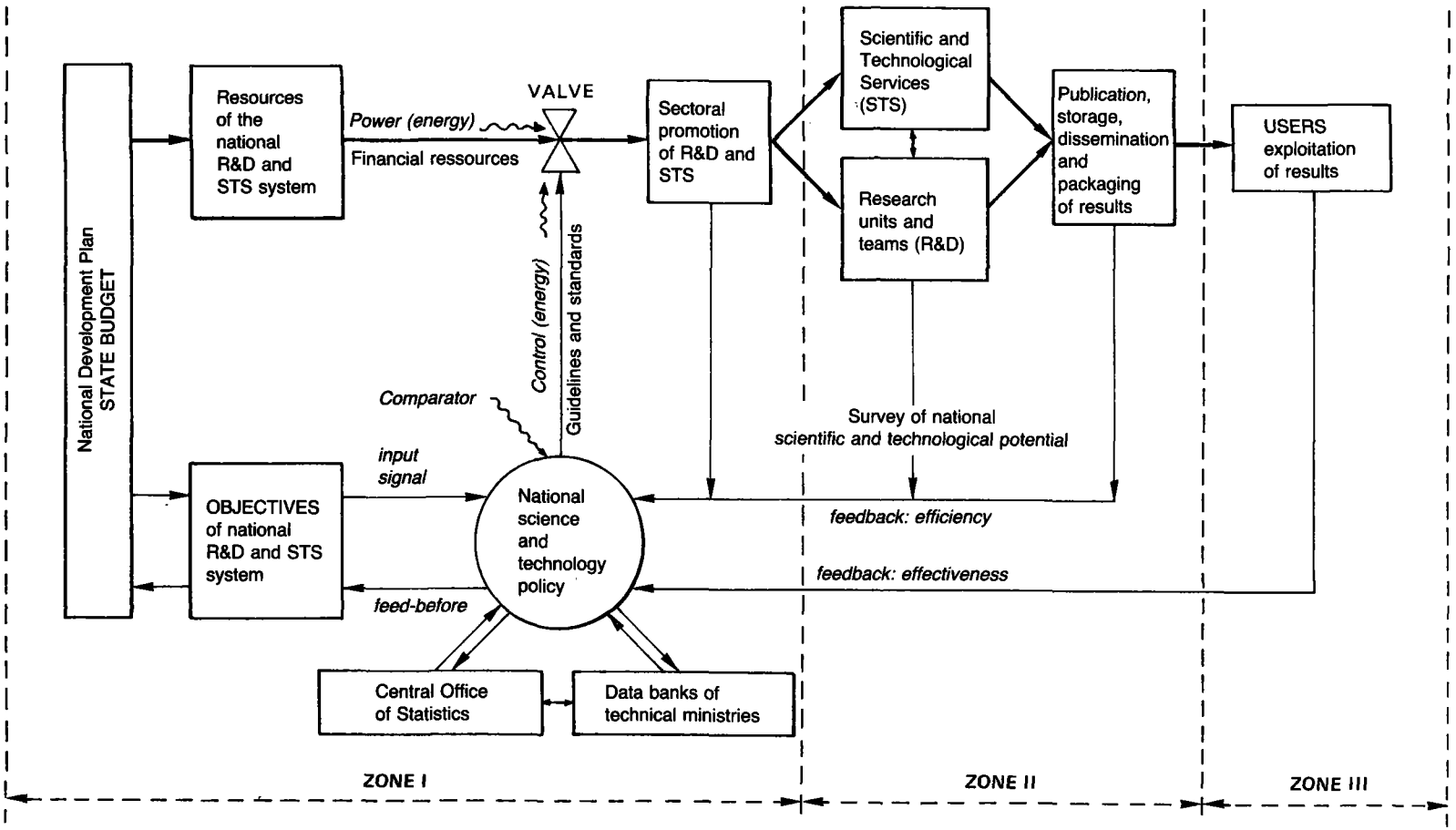
50. In discussing scientific and technological potential, more importance is often attached to the creation and reinforcement of its components (i.e. its structural aspect) than to its efficient use and rational management (i.e. its functional aspect). The fact is that to transform this potential into an organized system, it is not enough to possess an infrastructure and a sufficient number of properly qualified researchers. What is also needed is to provide for a continuous flow of information and a whole host of links between the component parts of this potential and between this potential and its environment, especially the government decision-making processes and bodies (see Part II), the education system, industry and the national socio-cultural context. The national S&T potential will then emerge as an integrated and balanced system capable, by reason of a comprehensive and interdisciplinary approach, of generating or adapting those scientific and technological innovations which will offer a variety of effective solutions to present needs and future challenges without prejudice to the country's natural and cultural heritage. This kind of system, often named National R&D and STS system, is illustrated in Figure I.

TO SUM UP:

- the purpose of a national S&T policy is to mobilize the country's scientific and technological potential so that it can contribute to the general progress of knowledge and to the objectives of endogenous development;

- an overall S&T policy must be founded in part on planning and budgeting so that the various S&T sectoral policies can be co-ordinated.

Figure I - CYBERNETIC MODEL OF THE NATIONAL R&D AND STS SYSTEM



CHAPTER III — THE CASE FOR AN EXPLICIT BUDGET FOR SCIENCE AND TECHNOLOGY

INTRODUCTION

51. Having examined the need, scope and functions of a national S&T policy for endogenous development, we shall now consider the various ways of financing R&D to ensure that policy's effective execution, showing in particular how the State Budget, provided that its preparation and content satisfy certain conditions, can play a decisive role.

3.1 The expansion of government efforts to promote S&T

52. Over the last twenty years or so, government responsibilities regarding S&T have generally tended to increase, chiefly for the following reasons:

(a) recognition of the vital role of S&T in economic and social development (see Chapters I and II above);

(b) private funding sources do not finance enough R&D in fields in which:

- the return cannot be calculated, is insufficient or has a diffuse or long-term impact (e.g. space exploration),
- the anticipated results are difficult to foresee or call for sustained efforts over a long period (e.g. fundamental research),
- the problems are too enormous or involve several sectors (e.g. the environment),
- costs are too high in relation to the financial capacity of companies and other bodies (e.g. nuclear physics),
- social aspects predominate (e.g. urbanization, medical research);

(c) certain fields are of strategic importance for the community's survival and stability, for example those which:

- could endanger the collective heritage, cultural identity or individual liberties (e.g. telecommunications, the mass media),
- could paralyse the whole of industry (e.g. energy),
- concern national security and independence (e.g. military research);

(d) the growing proportion of requests for S&T from social and associated sectors such as health and education;

(e) the State alone is in a position to perform the all-important function of co-ordination and integration:

- co-ordination of S&T activities themselves (between the various branches, between the various sectors of economic activity, between public and private bodies),
- co-ordination between education, S&T and the production of goods and services,
- co-ordination of the various forms of innovation (scientific and technological, social, cultural), and
- integration of innovation with the collective heritage without loss of identity.

53. For all these reasons, an ever-increasing proportion of national S&T activities are being undertaken by public State-financed agencies or by private bodies directly or indirectly supported by government subsidies (see Section 8.2). This is borne out by an examination of available statistics on R&D expenditure in various countries and of the institutions through which their S&T potential is organized. The State should accordingly play a decisive role - as promoter, co-ordinator or executant - in giving direction to national S&T activities. But before dealing with this subject, it should be pointed out that, for this role, the State has means at its disposal other than the budget, e.g. laws and regulations, contracts, tax incentives, credit facilities, special terms for the importation of scientific equipment, the planning of higher education, measures in favour of scientific and professional associations, and so forth.

3.2 The role of government financial support for S&T

54. Effective implementation of the national S&T policy depends on the State allocating enough resources to S&T activities and dividing them between the various bodies engaged in R&D and STS. Government financial support for S&T has two complementary roles, namely

(a) to contribute to the achievement of priority objectives and

(b) to produce the maximum locomotive effect.

3.2.1 Achievement of priority objectives

55. The decision to allocate government financial resources is made on the basis of the priorities (16) accorded to the various S&T activities, and these priorities in turn depend on political, economic, social and scientific criteria such as:

- the expected contribution of the activities to the economic and social objectives of the national development plan;
- the influence that the different branches of science have upon each other and, in particular, the contribution of the fundamental sciences to advances in applied science and to the emergence of new forms of technology;
- national independence based on the autonomous development of S&T;
- the regulation of imports of technology and know-how;
- national sovereignty, security and prestige.

3.2.2 Creation of a locomotive effect

56. Government financial resources are distributed among the various R&D and STS agencies so that the State plays two roles:

(a) as executant, it provides continuing financial support for the S&T activities of government-controlled bodies (see Sections 3.1 and 8.2);

(b) as promoter or co-ordinator, it tries to mobilize additional resources from private national sources and/or from private or public (bilateral and multilateral aid) foreign sources for the S&T activities of autonomous State-owned agencies or private bodies that conform with the general objectives of development.

57. One reason why the State budget might finance S&T is to make the profitability of this kind of research credible by diminishing costs and risks, enough to attract capital from industry and sometimes even from abroad. Thus the power of the State to influence choices in S&T extends far beyond its actual financial input.

58. In the industrialized countries with a market economy, government budgets finance nearly all fundamental research, much of applied research but only certain experimental development projects, which, although of acknowledged value to the community, equally obviously offer no short-term return on investment. It is clear that this locomotive effect and the way in which the State influences choices by means of the State budget will make themselves felt upon the rest of the country's R&D work, i.e. that carried out by productive enterprises; this impact will be particularly felt in the field of experimental development.

59. It can thus be said that, whatever percentage of national expenditure on S&T is financed by the State, an important aspect of the national S&T policy will be to employ these funds to provide the maximum locomotive or multiplier effect by mobilizing resources, in most cases from industry.

This is one thing which will guarantee the efficient use of public appropriations whose amount, distribution and object are decided during the national budgeting* of S&T activities.

3.3 The forms of financial support for S&T

60. Figure II sums up the most common forms of financial support for S&T (sources, channels and procedures, and beneficiary sectors). This comprehensive diagram is, of course, fully applicable to only a few countries. Now is the moment for a brief explanation of how S&T is financed in the budget and of the part played by intermediary organizations or relay funds for the financing of S&T.

3.3.1 The financing of S&T by the State budget

61. The State budget may be defined as "policy in action" (see Chapter VIII). It is (or should be) complementary to planning and programming, the operational parts of which it presents in the form of annual appropriations, executing agencies and projects (see Section 7.2.3, paragraphs 162-4). The budget represents in financial terms the government's share of responsibility in the implementation of the national development plan for a given year. For these reasons, and for the reasons stated in Sections 3.1 and 3.2 above, the financing of S&T through the budget constitutes the main instrument available to a government for putting its S&T policy into effect. State financial support through the budget may be:

(a) direct, i.e. public funds are allocated directly to R&D executing agencies in the form of appropriations by the Exchequer, and grants and contracts by their sponsoring ministries;

(b) indirect, i.e. funds pass via intermediary agencies which then distribute them among the executing agencies, as described in the following section.

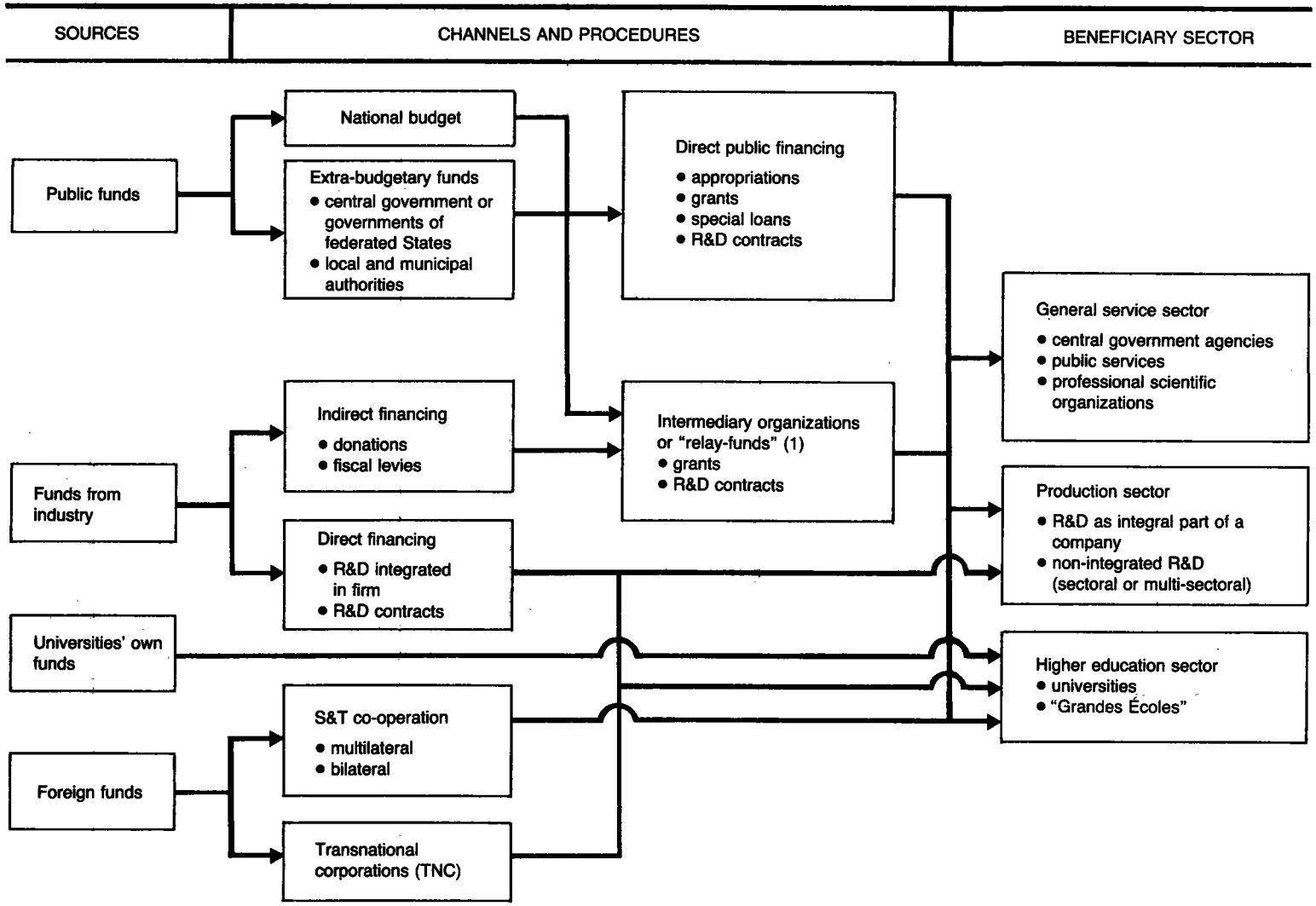
3.3.2 The financing of S&T by means of promotional and special funds

62. (a) The large private foundations

Private foundations for the encouragement of R&D used to play quite an important role in financing scientific research and learned to respond effectively to the initiatives of researchers because they could intervene rapidly, were independent, were frequently bold and innovative and were unhampered by an annual budget rhythm. There still exist some foundations of this kind,

* From now on, the term "budgeting" is employed in its broadest sense, covering not only preparation of the budget document but the entire decision-making process associated with the preparation, adoption and implementation of the State budget.

Figure II - PRINCIPAL FORMS OF FINANCIAL SUPPORT FOR R&D



(1) Includes, depending on the country concerned, the large private foundations, national or sectoral research councils and funds, the special funds of CMEA countries.

mainly in the Federal Republic of Germany, Italy, Spain, Sweden and the United States. Most of them are recognized as being in the public interest and are therefore tax-exempt.

63. (b) National or sectoral research councils and funds

In view of the scale of emerging needs and the concomitant increase in public expenditure on S&T, some governments decided to set up public financing agencies of a new type while others chose to rely on existing private institutions for which they gradually assumed financial responsibility. Both solutions led to the same result. Largely autonomous central agencies, governed by committees of active scientists and responsible for translating practical problems into scientifically formulated questions in the shape of research projects, were entrusted with distributing the State funds allocated to research. Bodies of this kind are to be found in nearly all the countries where there is an organized scientific community.

64. This solution takes away from the State budget some of the power of decision and control, although it can still give a lead and direction when the grants made by private foundations have to be supplemented by appropriations from the State budget or when, as in Belgium, France and the United Kingdom, the State's financial participation is contingent on its partners contributing at least 50% of the cost of research projects chosen from those they have proposed.

65. (c) Special funds derived from a turnover tax on industry

(i) Special government-controlled funds

In countries belonging to the Council for Mutual Economic Assistance (CMEA), the term "special funds" refers to financial resources derived from funds such as the "Technical and Economic Development Fund" in the USSR or the "Technical Development Fund" in Hungary. The resources of these special funds are usually derived from a turnover tax on industry. The money is then allocated by the various ministries concerned to joint R&D programmes of social interest to the whole of a sector of national activity.

(ii) Autonomous special funds

This is an original form of financing, found in Yugoslavia where 70% of national expenditure on R&D is financed by the "self-managing common interest communities" of the federated States. The autonomous special funds are managed by an elected assembly of research workers and users. The size of the fund is determined annually by negotiation between research workers, users (industry) and the government of the federated State, its income being derived from a turnover tax on industry. Sums are allocated by the elected assembly (unlike the procedure used in the USSR, where appropriations from special funds are made by the ministries). The various funds are co-ordinated federally by the Bureau of the Research Communities Association.

Autonomous special funds also exist in certain Latin American countries, but here it is a case of sectoral funds raised by a tax upon the turnover of productive enterprises, their loans, or the goods they export.

3.4 The necessary preconditions for the State budget to become an effective instrument of S&T policy

56. Our look at the forms and roles of financial support for S&T has shown that the State budget is, at least potentially, an essential instrument of a government's activist S&T policy. However, an examination of national budgets shows that this is in fact rarely so.

3.4.1 Why, in practice, the State budget is ill-fitted to serve as an instrument of S&T policy

57. This common shortcoming of the State budget is due mainly to:

- it being impossible clearly to identify activities and appropriations concerning S&T,
- there being inadequate linkage between the national development plan and the State budget,
- a lack of interministerial co-ordination regarding S&T during preparation of the State budget.

58. The fact is that, in most countries, budgeting procedures simply follow the conventional rules governing the administration of resources and public accounting (see Chapter VIII). The result is that the State budget is often no more than a set of accounts giving the anticipated revenue and the total sums made available to each ministry. Since it is not explicitly stated in terms of political functions or national objectives what these sums are intended for, it is difficult if not impossible to identify, within an aggregate sum, how much is allocated to S&T and hence to scrutinize this total, how it is apportioned and the purposes for which it is intended (i.e. the activities it will finance) and how it relates to the forecasts in the national development plan. However, the majority of countries either devote one or more chapters to S&T in the overall or sectoral development plans or draw up a special plan for the development of S&T.

59. Since the sums made available in these conventional budgets are reduced or increased solely at the level of the ministry concerned, S&T activities have all too often been the victim of arbitrary budget decisions which directly or indirectly permanently undermine certain objectives of the national development plan or bring the financial and scientific efforts of several years to nothing by halting an R&D project before it has been completed.

60. The conventional State budget is ill-fitted to perform its potential function in regard to national S&T policy for the following reasons:

- when the budget does not form part of a multi-annual plan, it tends to give prominence to and satisfy short-term considerations at the expense of the medium- or long-term when S&T investments will bear fruit;

- some people still think as they did when the only type of research was fundamental research, and consider S&T activities to be impossible to plan because:

  . the results of R&D are unpredictable since, by definition, R&D is concerned with the unknown,

  . planning limits the research worker's freedom of action and is at odds with the idea that science is independent and neutral (see Section 2.1 above), and

  . the institutional structure of the budget is unsuited to multi-institutional or intersectoral activities.

3.4.2 Why and how could and should the State budget be adapted to perform this function?

71. Today, the arguments used to justify this shortcoming are no longer valid, particularly because:

- fundamental research now accounts for only about 10 to 30% of the total S&T budget in scientifically advanced countries; this means that 70 to 90% of budget appropriations for S&T must be programmed in relation with socio-economic objectives;

- the impact of S&T activities on society's development, stability and security is too great for the direction of such activities to be decided by research workers alone;

- requests for public funds for S&T exceed available financial resources, with the result that choices have to be made and priorities established, and this makes planning necessary;

- the institutional budget of the State may be usefully supplemented by a programme budget which permits the identification - and hence the adequate financing and co-ordination - of multi-institutional activities such as those concerning S&T.

72. It would therefore be desirable for countries allocating more than a certain proportion of the State budget, say 1% to S&T (R&D and STS) to try to (i) identify these appropriations explicitly, and (ii) prepare a consolidated budget of the R&D and STS activities of each ministry, arranged by national objectives in the shape of a programme budget. Such a budget would present several advantages:

- it would make a more effective contribution to the execution of the scientific and technological programmes of the national development plan and to monitoring their follow-up;

- since it implies interministerial co-ordination, it would be a way of harmonizing interdependent S&T activities being carried on in a number of disciplines or economic sectors, and of organizing inter-institutional projects in a more rational manner;

- it would improve the interdependence existing between the innovation function (here confined to S&T), the education function which supplies its manpower needs, and the functions related to the production of goods and services which use its results (see Section 10.2);

- being clear, it would stimulate a democratic and national budget debate on the government's S&T policy.

3. The various methods and procedures used in the preparation of a genuine S&T budget are described in Part III of this manual.

TO SUM UP:

- the State budget can and should be the main instrument of a government's S&T policy by providing all the finance for certain scientific and technological activities and by mobilizing additional extra-budgetary resources to back other activities;

- to this end, the State budget should permit the explicit identification of S&T activities in the form of programmes linked to national development objectives, and should make it possible to see immediately the total amount, its allocation to the various institutions, and the purposes to which the sums annually allocated to these activities are put.

CHAPTER IV — THE INSTITUTIONAL FRAMEWORK OF A SCIENCE AND TECHNOLOGY POLICY

INTRODUCTION

74. Having explained why the State budget can and should serve as an essential instrument of government policy in regard to S&T, the present chapter examines the institutional framework (15) which is involved in the elaboration, implementation and monitoring of this policy and which should therefore be involved in the preparation of a true S&T budget. Every country has structures, machinery and procedures* which form the framework within which a government's decisions concerning S&T are taken and put into effect. The institutions are usually organized at three levels - central, sectoral and executive - but actual practice obviously varies widely and, depending on the country's political and economic system and on how explicit and systematic its S&T policy is, there may exist a number of sub-systems.

4.1 The central framework of S&T policy

75. In central position are the agencies and institutions managing S&T activities as a whole (or that part of them open to State influence), that are concerned with the decisions of national importance or with interministerial co-ordination. In practice this means Parliament, the Council of Ministers and the national S&T policy-making body (STPMB).

76. Parliament and the Council of Ministers (either an interministerial S&T committee or ad hoc meetings of the ministers concerned).

They discuss and approve the overall S&T policy (see Section 2.4.2(a) above) as expressed in the medium- and long-term plan and the annual budget, prepared for S&T by the S&T policy-making body.

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* Government decision-making procedures will be examined in Part II of this manual.

77. The S&T policy-making body (STPMB)

The STPMB may be either a central government agency such as a Ministry, a State Department or a State Committee, or a special semi-autonomous body such as a National Science and Technology Policy Council or a General Delegation for Scientific and Technical Research. It comes generally under one of the supreme authorities of the State, in some cases the President of the Republic, in others the Prime Minister.

78. It is responsible for framing, implementing and monitoring the overall national S&T policy, or, more specifically for planning, programming and budgeting all national S&T activities. The responsibilities of the STPMB cover functions (i), (ii), (v), (vi) and (vii) as set out in Section 2.4.2(b) above. As an integrated "horizontal" structure, it co-ordinates S&T activities which come under the various technical ministries (vertical structure) and bears scientific responsibility for intersectoral projects and new fields such as energy, the environment, space and physical planning, which fall outside the scope of the traditional technical ministries.

79. It works in close touch with the government bodies responsible for preparing the national development plan and for preparing and implementing the general State budget (i.e. the Ministry of Finance or the Exchequer), and includes various representatives from the world of science and technology (see Section 11.1, paragraph C).

4.2 The sectoral framework of S&T policy

80. The sectoral framework includes all the agencies and institutions responsible for co-ordinating, financing and promoting a specific sector of S&T. Depending on the country, such sectors are defined in relation to:

- scientific field, e.g. natural sciences, medicine, agricultural sciences, technology (engineering sciences), social sciences and the humanities;
- branch of the economy, e.g. industry, agriculture, construction, transportation, telecommunications, services, etc.;
- type of research, e.g. fundamental, applied, experimental development;
- R&D executing institutional sector, e.g. higher education institutions, public R&D or STS institutions, productive enterprises;
- certain major R&D programmes, e.g. nuclear research, space research, oceanographic research, etc.

81. These sectoral agencies provide the necessary linkage between the central agencies, which deal with S&T policy, and the full range of institutions and services away from the centre, which carry out the relevant activities. Their usual job is to see to the organization, financing and institutional distribution of R&D and STS activities in a given sector. Their responsibilities cover functions (ii), (iii) and (v) as set out in Section 2.4.2(b). In actual practice the sectoral framework includes agencies and bodies such as:

(a) the science departments of the technical ministries (in the Ministry of Education, however, owing to the fact that universities often enjoy an autonomous status and in view of the sheer quantity of university research, this department often takes the form of a State Secretariat or Committee); these departments, in conjunction with the STPMB, frame and carry out sectoral S&T policies, i.e. that part of the plan and S&T budget involving their particular ministry;

(b) the national research councils (medical, agricultural, industrial, etc.), which employ incentive schemes or special funds (see Section 3.3.2) to finance specific projects that contribute to national development objectives. By means of subsidies, they are able to steer towards these objectives the research undertaken by autonomous or private institutions, for example university research (which is traditionally discipline-centred) or technological innovation work undertaken by productive enterprises (which are generally profit-centred).

4.3 The executing agencies of S&T

82. The executive level includes the institutions, laboratories, research units* and individual research workers who carry out R&D and provide STS support; the responsibilities of these bodies cover functions (iv) and (v) described in Section 2.4.2(b).

From these come the R&D expenditures and the requests for public funds which are examined by the central and sectoral S&T policy bodies. This level includes the following bodies and institutions:

- the R&D and STS laboratories in universities, faculties of science and schools of engineering;
- State R&D and STS institutions;
- the R&D and STS laboratories in private and nationalized industries;
- learned societies and engineers associations.

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* The "scientific and technological unit" (of R&D and STS) can be defined as follows:

(i) it should be attached to an institution, all or part of the activity of which can be considered as scientific and technological and which constitutes a legal entity under current national legislation;

(ii) its staff should comprise at least one chief and three research workers who devote at least eight hours per week to the R&D and STS activities of the unit;

(iii) its total anticipated life-span should be at least one year.

TO SUM UP:

- the agencies and bodies with an important role to play in the budgeting of national scientific and technological activities are:

    - the institutions, laboratories and units which execute S&T activities and which submit requests for financial support, in particular public appropriation from the General State Budget;

    - the technical ministries and the National Research Councils, which prepare their sectoral S&T budgets for inclusion in the General State Budget;

    - the science and technology policy-making body which, in conjunction with the technical ministries, national research councils and the Department of the Budget (Ministry of Finance), prepares the consolidated S&T budget;

    - the Council of Ministers and the Parliament, which approve this budget.

CHAPTER V — SOME DIFFICULTIES ENCOUNTERED BY AN S&T POLICY AND BUDGET

INTRODUCTION

83. The political and budgetary instrument and the government institutional framework needed in order to align national scientific and technological activities with the general objectives of development have now been dealt with (see Chapters II, III and IV). We now turn to the main practical difficulties which the public and private bodies involved in allocating finance to S&T activities in relation to national objectives may have to overcome. These difficulties are of three broad types:

(a) the constraining economic and financial situation;

(b) the complexity of the programme budgeting process;

(c) the specific features and requirements of S&T.

5.1 The constraining economic and financial situation

84. The executing agencies, in submitting requests for public or private funds for S&T, must realize that financial resources, whether made available by the State budget or by the industry of a country, are limited.

85. The provision for an innovatory policy is generally a small fraction of the total State budget, corresponding to what is left over when all government departments have received the funds they need to continue their operations. As this is quite small, it is naturally extremely vulnerable to any variation in government revenue. During periods of austerity, very exacting criteria are applied in making any choices and it becomes impossible to add new items of expenditure to the budget unless strong arguments are advanced proving that they are profitable and can contribute to the priority objectives of development (16). The more difficult the choice and the more specialized the field, the more the public authorities tend to rely on the opinions of experts, often economists, as they can advance credible arguments acceptable to taxpayers in particular and the nation in general. This attitude gives an advantage to

research offering an obvious or immediate return on investment as compared with research which, although equally essential to development, is like S&T in that it is more difficult to quantify and less certain to produce results (on this subject, see Sections 5.2 and 5.3 below).

86. The political need to make choices, set limits and exercise control is a fact of life which weighs heavily on all State expenditure. At the same time, the State is required to take on more and more responsibilities, whilst resources are limited by the very pace of development, the level of taxation and the national debt. Although S&T helps to promote economic and social development, it should not be forgotten that such development makes it possible to strengthen the country's S&T potential and stimulates the national demand for scientific and technological progress from industry. The development of S&T itself and development by means of S&T are two parallel and interdependent - not sequential - processes (17).

87. In this respect, the burden on the State budget is proportionately higher in developing countries than in developed countries because industry does not shoulder enough of the cost of S&T. Indeed, the industrial infrastructure of these countries is not sufficiently developed to finance certain fields and phases of S&T activity. In addition, some of the firms constituting this infrastructure, the number varying according to the country concerned, are the subsidiaries of transnational corporations. It is a well-known fact that most of their R&D is carried out in their country of origin near the headquarters of the parent company. If any R&D is done by subsidiaries, it is low-powered and fragmented, hence very dependent on the central laboratories, and difficult for host-country governments to guide and control.

88. Clearly, then, the executing agencies of S&T must take certain economic and financial difficulties into consideration when they submit requests for funds from the State budget.

5.2 The complexity of the programme budgeting process

89. In countries where annual and pluri-annual programming is applied to activities of the public sector in relation with the objectives of the National Development Plan, activities in the field of S&T (i.e. R&D and STS activities) are composed (see Section 8.4.2):

(a) of S&T sub-programmes inside "vertical" socio-economic programmes, contributing to development objectives; in these programmes, S&T is considered as merely one means among several for achieving the objectives in question; and/or

(b) of specific S&T programmes which are "horizontal" and which serve several sectors of national activity or several socio-economic development objectives, or indeed the objective of promoting science in general.

90. In practice, the programme budgeting of S&T may come up against certain difficulties inherent in programming itself. Amongst these difficulties, mention may be made of:

(a) the lack of relevant data;

(b) an unclear definition of objectives and needs;

(c) the different treatment required by the public and private sectors;

(d) institutional pressure upon multi-annual programmes;

(e) the weak rate of technological innovation in socio-economic programmes.

5.2.1 Lack of relevant data

91. Although a realistic programming of development is impossible without a minimum of data on the country's economic, social, scientific and technological situation, it is rare, even in developed countries, to have an adequate and above all homogeneous set of data ready to hand, either because no such data exist or because those involved in the programming process, and especially the S&T executing agencies, cannot gain access to them. It is thus necessary that the STPMB set up:

(a) a complete and regularly updated survey of S&T potential (18) and

(b) a documentation centre concerning the national S&T policy.

5.2.2 Unclear definition of objectives and needs

92. Drawing up good programmes also requires a clear view of what (see Section 7.2.4) they are meant to achieve and an adequate definition of the objectives and priorities they are expected to translate into reality (16). Experience, however, shows that such definitions have to overcome political and technical obstacles. Governments are often reluctant to supply details that can be expressed in operational terms, and competition makes industry hesitant to provide clear statements of its future needs. Lastly, some objectives are hard to quantify because the activity involved is of an academic nature. Nevertheless, S&T executing agencies must attempt to fit their research and the arguments supporting their requests for funding into the framework of those objectives. However the objectives are formulated, this is quite easy for experimental development to do, somewhat more difficult for applied research, and impossible by definition for fundamental research. As for the sectors consuming R&D products, i.e. the government and industry, they have everything to gain from spelling out their objectives and needs in understandable and operational terms.

5.2.3 Different treatment required by the public and the private sectors

93. In market or mixed economy countries, where public and private sectors coexist, it is difficult to programme large-scale projects involving a number of institutions and calling for concerted efforts on the part of both sectors. The co-ordination necessary will be hampered by the different ways in which the public and private sectors have to be treated where programming is concerned: "normative" for the first and "instigative" for the second.

94. For the private sector, the government usually proposes a general frame of reference for each productive branch or sub-branch of the economy and tries to ensure co-operation by offering incentives. Each private company remains responsible for its R&D strategy, which is largely dictated by the particular rules governing the interplay of market forces on which its survival depends. Planning can only have a general and instigative nature.

95. In the public sector, planning is detailed and normative: the S&T executing agencies have to observe precise guidelines and standards which must filter down, through however many intervening institutions and bodies, to the individual S&T unit.* This is the level, in fact, at which the immediate responsibility lies for carrying out the S&T work.

96. Putting into effect a coherent programme consequently calls for the joint participation of both the public and the private sectors; and this means either that the latter must have co-operated in drawing up the programme, or else that the Government has taken market realities into account.

5.2.4 Institutional pressure upon multi-annual programmes

97. Each programme has a life of its own. It is born, it grows and it ceases to exist once the objective has been reached. The problem here is that programmes are undertaken by agencies, bodies, institutions or departments which all aspire to perpetuate themselves. They therefore have to justify their continued existence by an effective linking together of the programmes entrusted to them.

98. This is a problem for all programmes, however long they last, but it affects programmes lasting several years more than short-term ones, annual programmes for instance. After a certain lapse of time, the executive structures concerned take on a certain rigidity, adopt conservative working attitudes, and acquire a tendency to defend budgetary demands designed to ensure their survival and indeed development without direct reference to the missions which they are supposed to fulfil vis-à-vis society. When this happens, the implementation of the programme gets distorted by the independent existence taken on by the institutions which are carrying it out. This makes it all the more vital to provide for strict supervision of the programme as regards both costs and effectiveness by reference to national objectives.

99. Another problem which is peculiar to programmes lasting several years is that of forecasting costs and the difficulty of keeping the corresponding expenditure under control. It is now well-known that the more a programme involves advanced technology the greater becomes the risk of miscalculating expenditure, and very often of underestimating it (see paragaph 1, Section 5.2.5). This suggests that there must be very strict procedures for studying on a permanent basis discrepancies in expenditure and why they have come about, and thus for enabling the programme to be cut back or modified and, if necessary, halted altogether if its future development cannot be kept under control. It seems that such procedures are being tried out and applied more and more often but none of them has as yet won acceptance (see Chapter VII).

5.2.5 Weak rate of technological innovation in socio-economic programmes

100. To draw up R&D sub-programmes within a socio-economic programme, it is necessary to translate the latter's socio-economic objectives into scientific and technological objectives to be attained by R&D. This translation is often a difficult process because of the unclear definition of socio-economic objectives (see Section 5.2.2) and because of the difficulty of foreseeing

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* See footnote page 49

with any certainty what new technologies may emerge over the middle and long-term span. This uncertainty makes it impossible to foresee precisely the total cost of the socio-economic programme in question.

101. These are the main reasons why the rate of technological innovation of socio-economic programmes is a weak one. Indeed the rate is even weaker when the socio-economic programmes have a fixed horizon (e.g. construction of a dam) and are characterized by firm deadlines which are incompatible with the imprecise lead-times needed for perfecting the necessary technologies. Thus it is to be observed that socio-economic programmes figuring in the National Development Plan are generally conceived on the basis of "constant technology" (i.e. known technology).

102. It is accordingly essential that the National Development Plan should reserve an appropriate place for programmes which are strictly scientific. Later in this manual it will be seen that the identification of such S&T programmes in the General State Budget requires that this latter includes an explicit and first-level category for S&T in one of the budgetary classifications used (see Section 10.1).

5.3 The specific features and requirements of S&T

103. S&T has certain particular features and requirements that necessitate specific programming in an appropriate form. The main features and requirements are as follows:

(a) the unpredictability of results, the flexibility of the planning and the continuity of the efforts involved;

(b) the continual increase in costs;

(c) the coherence of multi-institutional and multidisciplinary programmes;

(d) the interdependence of, on the one hand, science and technology, and on the other hand fundamental research, applied research and experimental development;

(e) the interdependence of the educational, the scientific and the productive systems.

5.3.1 Unpredictability, flexibility, continuity

104. Since, by nature, scientific research involves a large measure of uncertainty and the unknown, a high proportion of its discoveries and inventions cannot be foreseen. The scientific discoveries made by fundamental research depend on the creativity of researchers and on further refinements to their scientific equipment and instruments, while the equipment and instruments depend greatly on technological innovations. Conversely, discoveries concerning the basic principles of nature give rise, in unforeseeable ways and after an equally unforeseeable length of time, to technological innovations that can offer varied and effective solutions to the social and economic problems of mankind. Fundamental research is founded on this belief,

which history has repeatedly confirmed. These facts have very important implications on predictability, flexibility and continuity, although they vary according to the extent to which the research in question is linked with its practical application.

105. Unpredictability is low in the case of experimental development (see Section 10.2.3), as research is carried out as part of clearly defined programmes for the production of goods and services. Within these programmes, the anticipated results are set out quite clearly in the specifications and the experimental development work has to be carried out with an eye constantly fixed on a specific goal.

106. On the contrary, unpredictability is high in the case of fundamental research (see Section 10.2.3), for which no specific targets at all are laid down in advance and which is not linked to the general objectives of economic and social development and even less to specific goals and programmes. At most, certain research topics may possibly be agreed upon at the suggestion of the research teams concerned. Here a rigid framework would make very little sense, though this does not mean to say that the direction taken by research cannot be influenced in other ways, for example, the opinion of scientific circles, or the disciplines chosen to receive financial support.

107. Applied research (see Section 10.2.3) falls between these two extremes. Research of this type is oriented towards short- and medium-term objectives relating to the production of goods and services. The results expected are not strictly defined and it is not easy to lay down precise criteria of efficiency or profitability. The research can be questioned only it it manifestly strays away from the broad guidelines which have been provided. Nevertheless, to call it in question could easily lead to the disrupting of a scientific and technological potential which continuity in the life and work of research units has helped to build up.

108. S&T is more exposed to uncertainty than many other activities. If its results could be wholly determined and quantified in advance, that is, if all of them could be reliably predicted or even simply estimated as highly probable, it would lose much if not all of its purpose, which is to relieve the pressure of the unknown. We have already seen how it is becoming increasingly difficult to predict how the world will develop because of the diversity, the non-linearity and the strength of the interactions existing in the complex system constituted by mankind. In these circumstances, the only way of coping with the situation is through a flexible planning of S&T which emphasizes strategy, keeps as many options as possible open at all times and allows scope for imagination and participation. It must be made clear that a strategy does not state what will be done tomorrow and where. It merely provides a number of rules to cope with future uncertainties (see Section 7.1.1).

109. Planning of this type must also tackle problems by making deliberate use of a systemic approach (see Section 1.2.2) so as to take the interactions between the various components into account, develop an overall approach conducive to interdisciplinary solutions, integrate the factors of time and irreversibility, and supplement the arguments based on linear causality - whose shortcomings are now recognized - with arguments founded on a circular causality (i.e. the cybernetic or feedback system) and on the idea of purpose (10). This represents a restriction that the programme budgeting of S&T cannot afford to disregard if it is to enable R&D and STS to adjust with flexibility to the unexpected changes brought about by new technologies and to deal effectively with the economic, social, cultural and moral aspects of the new and increasingly complex problems they are called upon to solve.

5.3.2 Continual increase of costs

110. Over the last few years, the cost of S&T activities has continued to rise rapidly while available resources have been limited (see Section 5.1). Some of the reasons for this trend are:

(a) the complexity of R&D and STS work grows as the bounds of knowledge are pushed back, and this calls for increasingly complex and thus increasingly expensive scientific instruments and equipment;

(b) the rising standard of living of research workers and laboratory technicians, as a result of the acknowledgement of their status;

(c) the increasing cost of administration and co-ordination, especially in major inter-institutional programmes.

111. Two of the consequences of this situation are:

(a) difficulty in liberating supplementary funds for coping with rising costs. When costs go up it is by no means clear, at least to the funding sources, that the cost-effectiveness of S&T activities will follow the same curve, especially since this curve is difficult to predict and quantify. Thus the reasoning behind requests for supplementary financial support will become less and less self-evident and approval increasingly difficult to obtain. This consequence, however, is offset by the increasing needs for scientific explanations and technological solutions able to cope with more and more complex problems which the political, economic and social measures above are unable to solve;

(b) ineffectualness of programmes below a certain level of financial support. There exists a minimum level of financial support, which varies according to the scientific field and the problem to be solved, below which an R&D or STS project becomes impossible to carry through successfully. This threshold depends largely on how much interdisciplinarity is involved and on the type of scientific instruments and equipment required. The increase of costs involves a raising of the value of the threshold, and thus an apparent reduction in the finance allocated to the programme, other things being equal. So long as these resources do not fall below a certain level, only delays will occur in getting the expected results; but at and below that level these results will not be achieved. This means that reducing the share of the State budget allocated to national S&T activities will not just slow down these activities in general but halt some of them altogether and thus completely write off previous investments.

5.3.3 Coherence of multi-institutional and multidisciplinary programmes

112. By its nature, as Chapters VII and VIII will make it clear, a budget has an institutional form, and the listed institutions - those officially authorized to incur expenditure - are to varying degrees participants and in some cases negotiators in the budget process. When an entire programme is undertaken by one of these institutions, the institution will defend it wholeheartedly since the programme represents both a proportion of its resources and part of its *raison d'être*.

113. A large-scale programme almost invariably involves several institutions. For one thing, there seldom exists a single institution big enough to take it on and, for another, the variety of disciplines brought into play is hardly compatible with the specialization of the executing agencies. Here the problem of allocating resources is even more difficult than the already difficult task of working out how much to allot to each programme, and raises the complex issue of how this sum should be apportioned among the various agencies participating.

114. Thus, when a programme is divided between a number of institutions, their individual contributions are meant to be complementary. In the actual preparation of the budget, however, this complementarity may well carry less weight than the bargaining power of the institutions concerned. In joint programmes, the institutions defend first the part ascribed to them. This can undermine the rational distribution of resources and diminish the cohesion of the programme since there is no reason why, during the budget preparation process, the bargaining power of each institution should coincide with the demands of an integrated programme.

115. Secondly, there is a recent awareness that the concept of a comprehensive and interdisciplinary approach could prove as beneficial for applied technological research, which has to measure up to the complexity of economic and social problems, as for fundamental research faced with the complexity of natural phenomena. This is why such a wide range of scientific disciplines are marshalled for a major programme. But the results of some disciplines are easier to quantify than those of others. It is conceivable that, in the budget negotiations, the most apparently objective arguments, and especially those based on plausible figures, will gain the upper hand even though there is no reason to believe that those aspects of a programme which are hard to quantify are precisely those which are of little importance in the project as a whole. Though research in the social sciences tends to be of a more qualitative nature, it is nevertheless essential to the successful integration of an innovation into the collective heritage without loss of identity.

116. A further point is that the execution of major programmes usually involves sectors of national activity whose relative importance is hard to weigh up. How, for example, in a large-scale research programme on improving the health of a given population, would it be possible to rate work on areas such as measures to combat a certain type of epidemic disease, drinking water supplies or the improvement of housing, other than on the criteria of urgency, if urgency there is?

117. This brings out clearly the need for special institutions to deal with the sectoral financing of S&T. They would be able to align the process of allocating resources, and hence budget preparation and the corresponding negotiations, on the real factors which govern the efficient implementation of a large-scale programme. These factors could be the sequence of operations, the minimum standards of efficiency for operational units, procedures for co-ordination between the parties concerned, etc.

5.3.4 Interdependence of science and technology and of fundamental research, applied research and experimental development

118. Within the innovation process, there exist powerful interactions between science and technology. Although progress in science partly depends on progress in technology and vice versa, these two types of activity are nonetheless different in kind. The purpose of science is to learn about reality, that of technology to transform reality. As a body of knowledge, science is

objective and neutral with respect to the reality being studied, though this does not mean to say that the process of generating knowledge - i.e. scientific research - is neutral. Indeed, it is given much of its direction by the dominant social forces. The outcome of scientific investigation, however, remains essentially "open" and is made known relatively freely within the scientific community which alone can confirm its universal value.

19. Technology, on the other hand, is never neutral with respect to the recipient culture but reflects what appears to be the most effective and appropriate way in a given society to arrive at a desired result. In contrast to science, it tends to be secretive and to shelter behind legal or other forms of protection. The exchange and international communication of technology thus raises radically different - and singularly more complex - problems than in the case of science. The tendency to attribute to technology the qualities of neutrality and universality which belong to science accounts for the disillusionment caused in the past to countries with no local scientific potential by technological transfer on a purely commercial basis. In the programme budgeting of S&T, therefore, it is important to handle these two forms of knowledge with due regard for what unites them when they are generated and what sets them apart when they are put to use.

20. The fact that science and technology are interdependent refutes the argument that innovation follows a linear process whose sole point of departure is fundamental research, but it also condemns an exclusive reliance on applied research, and even more so on technological transfer. Because of this interdependence, countries - and especially developing countries - must participate simultaneously in fundamental research, applied research and experimental development. Greater capability in fundamental research will add to their capability in applied technological research, and vice versa. Preparing the ground for new technologies to emerge requires this two-pronged effort, which will enable the developing countries themselves to generate more appropriate technologies, and adapt technologies originating in industrialized countries so that they can be wisely used.

5.3.5 Interdependence of the education system, the scientific system and the productive system.

21. It should also be noted that S&T activities constitute an intersectoral instrument and hence the orientation given to them has an immediate effect on the whole series of development objectives rather than on any one of them in particular. Public expenditure on S&T cannot afford to concentrate only on those activities included in S&T, which are set out in detail in Section 10.2. Upstream of S&T in the process of which it forms an integral part there are other systems, in particular the education system which produces the future research workers who are clearly vital. As training is long and costly, allowance must be made for it, and for all its specific characteristics, in decisions concerning national expenditure on S&T. Downstream from S&T there are the industrial, medical and agricultural systems, which are the main consumers of the results of S&T activities, those of mission-oriented research in particular, and which must also be taken into consideration. We shall return to this point, which has already been touched upon from a different angle in Chapter I, when we look at (Section 10.2) the scientific and technological activities that should be identified in the Budget.

TO SUM UP:

The two main negotiating partners in the allocation of public funds to R&D and STS must take a realistic view of certain economic, budgetary and scientific difficulties and restrictions:

- government authorities need to consider the inherent characteristics and requirements of S&T (unpredictability, flexibility, continuity, interdependence, increasing complexity) so as to make efficient use of the national scientific and technological potential;

- scientific institutions need to consider the country's economic and financial situation (limited resources) and the complexity of the programme budgeting process (lack of relevant data, precise nature of objectives, duration and cost of programmes) so that they can submit reasonable and well-argued requests for financial support.

Part II

Government decision-making and budgeting processes

Part I has shown the need for an active policy and explicit budget for S&T. Before studying the ways and means of preparing such a budget it is important to examine the underlying conceptual and operational framework. Part II of this manual, therefore, considers the conceptual framework used in the budgeting of S&T activities by first discussing "quantification" and then describing the operational framework of the budget process, dealing with the main government decision processes in general before turning to the State budget itself.

CHAPTER VI — THE CONCEPT OF "QUANTIFICATION" AND GOVERNMENT DECISION-MAKING AND BUDGETING PROCESSES

INTRODUCTION

22. In government decision-making, a great deal of importance is attached to the quantification (20) of resources and to the quantification of the actual work involved in, and the results of, the activities to which such decisions seek to give direction.* This chapter examines the conceptual framework of, and different possible approaches to, quantification (quantitative evaluation). It also considers the connected issue of qualitative evaluation, and relates budgeting to these numerous complementary procedures. More specifically, we shall deal, in order, with the methods, cycle and levels of evaluation. The various approaches to the quantification of S&T activities are charted in Figure III.

6.1 Methods of quantification

23. Evaluation is the process whereby, with a greater or lesser degree of accuracy, the quantity or quality of an object or phenomenon or the relationship between two or more objects or phenomena, is ascertained:

- "quantity" being the property of anything which can be measured or expressed numerically, and of anything which can be increased or decreased;

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* The important role of S&T was confirmed by Resolution 1901 (LVII) of the United Nations Economic and Social Council entitled "The Quantification of Scientific and Technological Activities related to Development". In 1976, in response to a request to Unesco contained in this resolution, the Organization prepared a Report describing among other things its current activities relating to methods and assistance in this matter (20).

- "quality" being the property determining the nature of an object or phenomenon. It is to be distinguished from relation and from quantity (of which it is the content) which are extrinsic to the actual nature of the objects or phenomena;

- "relation" being the property of two or more objects of thought as embraced in a single intellectual act. It may be a relation expressive of analogy, membership, causality, coexistence, correspondence, identity, interdependence, and so on.

124. Such an evaluation can be achieved by means of two essential and complementary methods - quantitative methods and qualitative - since it is possible to evaluate:

- quantity by either direct or indirect quantitative methods,

- quality and relation either by indirect quantitative methods, or by qualitative methods.

6.1.1 Quantitative methods

125. Quantitative methods of evaluation consist of physical measurements and enumeration. They are a means of obtaining cardinal numerical data in the form of absolute values or relative values (ratios). Statistics gathered internationally and nationally and made public have hitherto been based mainly on this type of measurement.

(a) Direct quantitative methods

126. The objects or phenomena (whether the complete set or population, or a sub-set or sample) which one wishes to assess can be measured directly. One can, for example, count the number of researchers in an S&T unit.*

(b) Indirect quantitative methods

127. Should such a direct measurement be impossible, the measurement can be made indirectly:

(i) either by the use of estimates based on available knowledge of the objects or phenomena to be measured;

(ii) or by measuring a phenomenon different from the one which is related to it either causally or on a basis of interdependence. In this case, the data obtained, to which is attributed a power of representation within a given system, are called "indicators" and are often presented in the form of ratios. For example, the total per capita GNP has long been taken as an indicator of the standard of living of a country's population. Indicators can be used for the quantification of objectives within the planning and budgeting framework, for assessing within projects those costs and benefits which cannot easily be evaluated in monetary terms or for evaluating the harmful effects of certain kinds of technology on the environment and on social conditions.

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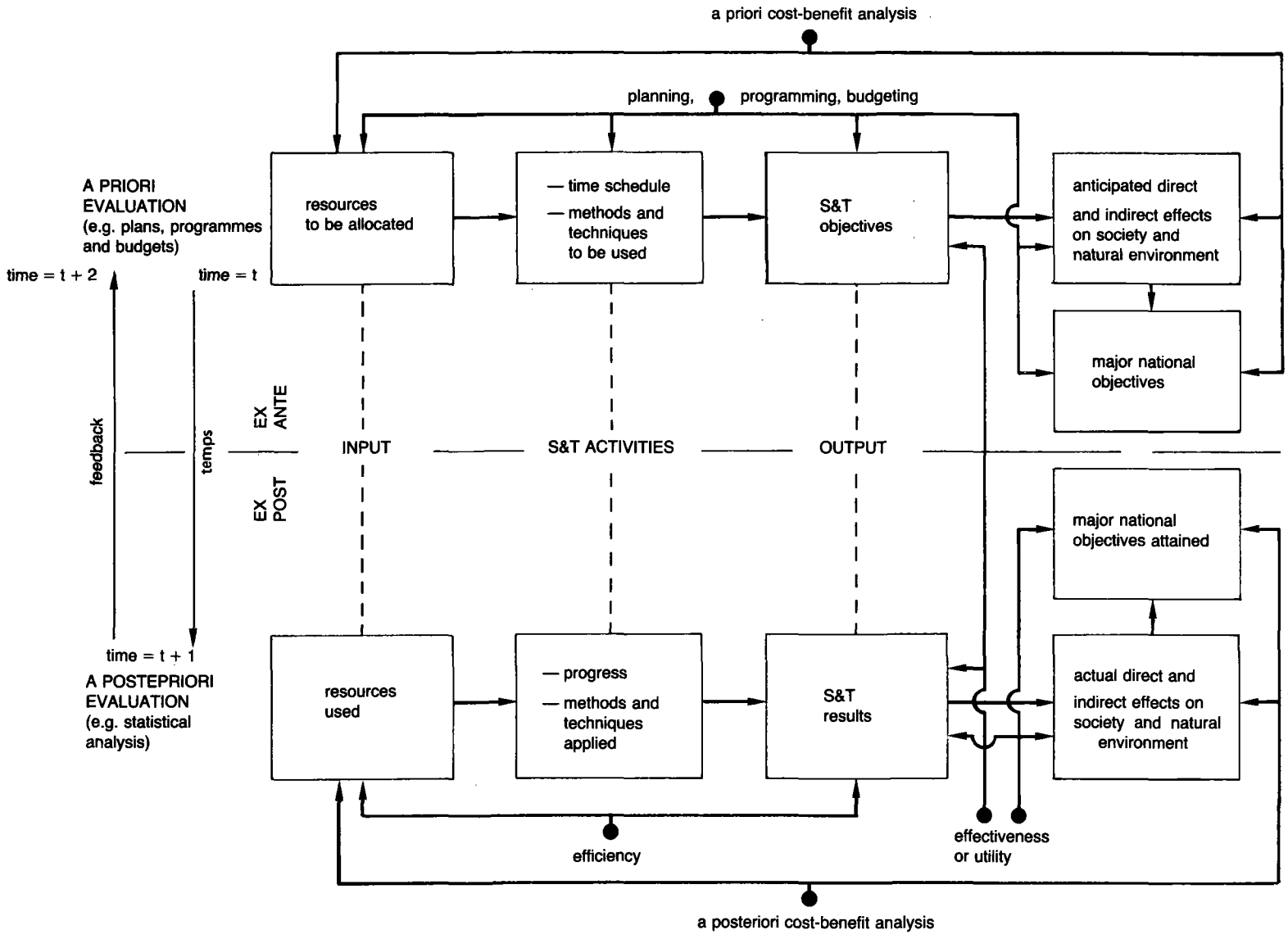
* See footnote page 49

Figure III - QUANTITATIVE AND QUALITATIVE EVALUATION OF SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES



6.1.2 Qualitative methods

128. Qualitative methods of evaluation consist in the main of perceptual measurements and qualitative and relational analyses. They are a means of obtaining ordinal numerical data and nominal descriptive data. Other types of qualitative methods, such as comparative analysis, which are only very indirectly related to quantification, will not be dealt with here.

(a) Perceptual measurements

129. Perceptual measurements consist in determining the degree of satisfaction, the preferences or the opinion of a group of persons with regard to the object, phenomenon or situation which is to be assessed. Such perceptual measurements are usually expressed by means of an ordinal scale. These ordinal perceptual data, which are indicators of the qualitative type, are generally obtained through interviews and questionnaires, usually taking the form of opinion polls. They have been successfully used for a number of years in market research and, more recently, in evaluating the external effectiveness (or utility) of organizations in the tertiary sector (i.e. the services) or of S&T units.

(b) Qualitative and relational analysis

130. Qualitative and relational analysis - as a method of evaluation - consists in representing by the use of key words (or descriptors) or symbols the characteristics determining the nature of an object or the relations between persons or things. These key words may be selected from the natural language or, as is more generally the case, from artificial and controlled languages such as classifications, typologies and thesauri. Nominal descriptive data are obtained, often codified in the form of alphanumerical symbols, and serve either to describe and estimate the quality of an object or phenomenon (e.g. the information content of a document), or to arrange the components of a set (of objects, phenomena, data) in homogenous classes or categories so as to make them readily comprehensible and thus facilitate decision-making or statistical analysis. As we shall see in Chapter VII, classifications play a vital role in planning, programming and budgeting.

6.2 The cycle of quantification

131. In evaluating living phenomena such as scientific and technological activities it is important to determine the relative situation, in time, of the evaluation and of the activity to be evaluated. It is possible to evaluate a phenomenon or activity before, during or after it has been completed, evaluation of facts before they occur being termed *ex ante* or *a priori* evaluation and evaluation after being termed *ex post* or *a posteriori* evaluation. Evaluation carried out during completion of the programme activity will be termed *a priori* or *a posteriori* depending upon whether it is directed to that which remains to be done, or that which already has been done.

132. Forecasting, planning, budgeting, results of operational research and mathematical models (in particular, econometric models), market research and industrial feasibility studies are *a priori* evaluations. Statistics on the national R&D and STS system, the survey of national scientific and technological potential at the S&T unit level and the collection of data generally (by means of interviews, questionnaires etc.) are *a posteriori* evaluations.

133. These two types of evaluation are mutually complementary. In the case of recurrent or cyclical activities such as planning or budgeting, *a posteriori* evaluations often provide the basis, through the extrapolation of trends, for *a priori* evaluations which, for their part, can be refined by taking into account past errors shown up by the comparison of forecasts (*a priori* evaluations) with actual achievement (*a posteriori* evaluations), during the preceding periods. The sum total of budgetary appropriations in a given year is thus generally arrived at by taking into account statistical data on expenditure during the preceding years and previously noted errors in budgetary forecasting.

134. It should be noted that some of the methods of quantitative and qualitative evaluation described above (see Section 6.1) may be applied to both *a priori* and *a posteriori* evaluation, for example, estimates or perceptual measurements.

6.3 Level of quantification

135. The evaluation of scientific and technological activities can be made at three levels, that of "input" in terms of resources, that of the execution of the activities themselves, or that of "output" in terms of results. At each level, evaluation may be either *a priori* or *a posteriori*:

- *a priori* evaluation
  - of the input determines the resources to be allocated;
  - of the execution determines the time schedule and the methods and techniques to be used;
  - of the output determines the expected results, for example the scientific and technological objectives.
- *a posteriori* evaluation
  - of the input determines the resources used;
  - of the execution determines progress made on the project and the methods and techniques applied;
  - of the output determines what has been achieved.

136. Input should be taken to mean principally resources in terms of personnel, funds,* equipment and facilities, information, and institutions used for scientific and technological activities. Output should be taken to mean scientific publications, new products and processes, patents registered, royalties received as a result of the exploitation of patents, the contribution of STS to the spread and application of science and technology, the contribution of R&D to the attainment of economic, social and cultural objectives, and secondary or indirect effects on the physical and social environment (see Figure III).

137. There have been countless studies concerned with R&D and STS systems both in countries with planned economies and in market or mixed economy countries. Although national evaluations of R&D display certain features peculiar to their own economic systems, it may be said that two major concepts have gradually emerged in this respect. Very generally speaking, efficiency may be regarded as a concept intrinsic to science and technology which measures, after a reasonable lapse of time, the productivity of the investments in R&D, normally by relating input to output. Effectiveness, on the other hand, is a concept extrinsic to science and technology which measures the qualitative and quantitative output of R&D in relation to the socio-economic goals or objectives (21 and 22). Qualitative evaluation of R&D is generally done by peers independently of the institutionalized book-keeping controls built into public procedures and structures; and this qualitative evaluation is therefore of a quite different nature from quantitative evaluation measured in terms of expenditure.

TO SUM UP:

- Budgeting is an important means of quantifying *a priori* scientific and technological activities;

- For budgeting to be effective it must be based on quantitative and qualitative, *a priori* (forecast) and *a posteriori* (statistical) evaluations of inputs (resources) and outputs (results), and it must take into consideration internal effectiveness (efficiency) and external effectiveness (utility).

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* In regard to financial resources, the terms "appropriations" and "grants" will be used in the case of *ex ante* or *a priori* evaluation (e.g. budgeting) as against the term "expenditure", which will be preferred where *ex post* or *a posteriori* evaluation (e.g. statistical analysis) is concerned.

CHAPTER VII — RECENT CHANGES IN GOVERNMENT DECISION-MAKING AND BUDGETING PROCESSES

INTRODUCTION

138. As we have seen, having an active S&T policy implies providing the means for its full expression and, in particular, a real S&T budget. To be operational, these means must form an integral part of the government decision-making machinery but must not disrupt it and must show due regard for the specific features of the field in question. It is thus vital for participants in S&T budget preparations to be familiar with this machinery. This chapter begins by describing the procedures, methods and instruments essential to government decisions and then examines possible problems and solutions with special emphasis on the potential contribution of the functional approach to government decision-making.

7.1 Government decision-making and budgeting: procedures, methods and instruments

7.1.1 Planning, strategy and programme budgeting

139. Policy-making in a complex social organization, whether a State, an industry or an international organization, covers everything relating to the preparation and taking of decisions of concern to the social organization, together with the monitoring of their execution, evaluation of their results and any adjustments that may be required. A considerable proportion of government policy and decision-making is carried out through the formulation of strategies, planning, programming and budgeting, terms which are often interpreted in dissimilar or even contradictory ways. For ease of understanding, this manual will keep to the following concepts and definitions.

140. The terms planning and strategy cover two concepts of action that at once contrast with and complement each other. Planning is concerned with action exercised with a view to a definite or likely future, whereas strategies are concerned with finding the most adequate response to uncertainties:

- Planning, or making a plan, entails determining in advance, in both time and space, the positioning of a series of actions, events and decisions, arranged around objectives as a consistent whole. The purpose for which the means will be used is anticipated on the assumption that there will be no random factors to cast doubt on the plan or on its consistency.

- A strategy is a set of rules, independent of time and space, within the framework of which the means available will be used to gain momentary advantage over the adversary (which may be a natural calamity, an adverse economic situation or keener international competition). In spite of its theoretical independence of time, the strategy may be modified if, after a certain period of time, this set of rules proves ineffective.

141. These two definitions show that planning and strategy are not adapted to the same type of future. As part of the future is always certain, another part probable and the rest uncertain, planning and strategy complement each other. If the degree of uncertainty grows, strategy will doubtless have to be stressed more than planning. This, as we saw in Section 5.3(a), applies to S&T activities. When a government is called on to make actual decisions, planning and strategy are combined and even frequently coincide.* In countries with a decentralized socio-economic system (market or mixed economy), planning is of a general and instigative nature, and includes a high proportion of strategy to deal with the unpredictable behaviour of certain economic forces, the private sector in particular. In countries with a centralized socio-economic system, on the other hand, planning is detailed and normative, leaving little or no room for strategy since the behaviour of the economic forces can be determined by the government with reasonable probability, not to say certainty.

142. The purpose of budgeting is to give practical expression, in the form of an annual expenditure and funding framework, to the government's strategy and multi-year development plan. Budgets can only really fulfil this function if they are based on the translation of the strategy and the plan into programmes.

143. Programming ensures the link from the plan's multi-year continuity, free of institutional restrictions, to the annual breakdown of the plan by responsible institution that is to be found in the budget. "Programme budgeting", which culminates in a "programme budget", evolves tactics for the use of financial resources during a given financial year in relation to the aims and objectives laid down by the government. A programme is a series of integrated medium-term actions whose effects will contribute to the achievement of a national objective which may be linked to one of the political functions of the State. Programmes are usually multi-institutional and multi-year, many of them being rolling programmes subject to annual review. The programme description (see Section 8.4.2) stipulates, among other things, the resources needed, the number of type of operations to be performed, together with their timetable, the anticipated results and their contribution to its assigned objectives, and evaluation criteria.

144. These decision-making processes in fact (or should) back each other up. A multi-year plan should normally break down into a number of programmes which in turn should be divided into annual instalments so that the programme budget can be drawn up. Planning, programming and budgeting are basically a matter of tactics but obey the rules laid down by the strategy.

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* "Operational planning" is used for the kind of planning defined here and "strategic planning" to designate the formulation of strategies.

7.1.2 Nomenclatures and classifications in government decision-making

145. Nomenclatures and classifications play an important role in decision-making processes, especially in planning, programming and budgeting. Nomenclatures, and classifications (but classifications in particular), make for the homogeneous grouping of factual data (activities, programmes, institutions and appropriations, for example) so that they can be readily understood. They make analysis and evaluation possible and facilitate decisions and their execution.

146. A nomenclature, however, is a straight-forward organized list of the terms employed in a science or an art, or the items in a collection or the events of a certain period. A classification, on the other hand, applies precise criteria to the systematic distribution of concepts into classes or categories. These are often arranged in several levels and given a code (numerical, alphabetical or alphanumerical) that reflects this structure. In this manual, the alphabetical listing of a country's government institutions and departments will be called a "nomenclature" (in this case institutional) whereas "classification" will be used for the instrument by means of which they can be ordered in accordance with a given criterion, or their expenditure broken down by field of activity, nature or purpose (see Section 8.3.2 below).

147. A policy is given practical expression chiefly in the form of a budget which authorizes legally or officially recognized executing agencies to obligate certain expenditure for a fixed period of time. The preparation of such budgets gives rise to a complex process of negotiation and consultation in which the funding sources and executing agencies are the leading participants. In budget preparation, as in budget implementation, one clearly essential nomenclature is the institutional nomenclature, which lists the central government agencies, e.g. Ministries and Departments of State, Parliament, Supreme Court, Audit Office, etc. Here there exist almost as many nomenclatures as there are countries (see Section 8.3.2 and Annexes IV.A and B).

148. It should be noted that institutional nomenclatures suffer from the serious drawback of having to change every time institutions and administrative units are set up, done away with or given different fields of competence. What is more, by breaking a given field down into the individual agencies responsible for it, the institutional nomenclature reflects a particular interpretation and a particular mode of action that are insufficient to enable the negotiation process to come to grips with real purposes. This is why an institutional approach to government decision-making is proving increasingly inadequate for national development, if this approach is not completed by a functional approach (see Section 7.2.4).

7.1.3 Methods to assist decision-making

149. In planning, programming and budgeting, many methods are employed, often side by side, to assist with decision-making. These methods change with the economic and social context, progress in knowledge and improvements in the quantitative and qualitative information available. They can be divided into two currents of thought (23) - active approaches, covering economic computation and multiple criteria methods, and the various types of negotiation.

(a) Active approaches

(i) Economic computation (24)

150. This method, which derives from neoclassical economic theory and belongs to the same current of thought as operational research, assumes the existence of a single criterion, the monetary criterion, in order to compare the advantages of alternative decisions. This criterion has been given different labels in different circumstances, e.g. surplus, rate of profitability, cost-benefits (quantifiable), overall financial costs, social financial costs and so on. For certain problems economic computation lacks credibility because of its theoretical foundations (unrealistic assumptions regarding the behaviour of economic forces) and the calculations involved (sensitivity to erroneous data and complicated mathematical treatment). When used in the budgeting process, it generally considers, among all the functions of the State budget (see Section 8.1.2), only the function of allocating the resources (objective: effectiveness), and leaves the function of regulating the economy (objective: stability) and the social redistribution function (objective: equity) to economic growth.

(ii) Multiple criteria methods (25)

151. These methods, which derive from PPBS and RCB (see Section 7.2.3) procedures and from systems analysis, are based on less restrictive assumptions than in the case of economic computation and take in widely differing and non-commensurable criteria and points of view in a more realistic fashion. Criteria are selected and weighted either by questioning the decision-makers or by noting their previous decisions. In this case, more attention is paid to consistency in the choices made than to whether they were the best possible choices in the circumstances. Methods of this type likewise often require the complicated mathematical treatment of unreliable information. This current of thought embraces various methods and procedures, such as cost-effectiveness studies (26), programme budgeting, zero-base budgeting (see Section 7.2.3)(27), relevance graphs, forward studies and market research, simulations and scenarios, etc.

152. In S&T, the multiple criteria method has proved particularly suitable for the selection of mission-oriented research projects. The fact is that research projects are difficult to evaluate using traditional economic methods but can often be broken down into major topics and linked to the general objectives of the organization into which they fit. At the same time, consideration must be given to other criteria, such as the likelihood of producing results by a fixed time horizon, economic repercussions, progress made in research, the availability of suitably qualified staff, cost, and interdependence with other R&D projects. The Unesco method of priority determination in S&T is related to multiple criteria methods (16).

(b) Negotiation

153. Negotiation refers to procedures which are not based on computation alone but which try to obtain a direct consensus between the various participants - citizens, local communities, industry, government departments and so forth. Instead of aiming for optimal or consistent decisions, the aim is to achieve social consensus. Procedures of this kind are somewhat backward-looking and even tend to turn away from mathematical aids to decision-making and from the traditional view of planning as a downward approach in which specific decisions have to conform to goals and to priorities fixed at the highest level. They give preference instead to a new form of upward planning which regards an effective policy as one that wins the support of the various parties concerned, even though they continue to disagree over goals. Examples of the negotiated approach are public inquiries, impact studies, contractual economies, participatory management, etc.

154. We shall conclude our remarks on these methods of assisting decision-making by first saying something about the person responsible for applying them:

- in the case of economic computation, he is primarily an economist who examines a project and then gives an opinion based on objective knowledge;

- in the case of multiple criteria methods, he is primarily an analyst who studies the decision-maker in an attempt to make him reveal his priorities;

- in the case of negotiation, he becomes a mediator or a lawyer with a brief, attempting to bring the interested parties round to his point of view and to come to a compromise acceptable to all of them. He may use mathematical arguments as a means of persuasion.

155. Lastly, we shall list a few factors to be taken into account when evaluating the suitability of a given method or procedure for inclusion in the decision-making process:

- clarity in use and good representativity in relation to real decision-making processes;

- value as a framework for discussion and negotiation;

- limited number of institutions involved and no questioning of their development, by the method;

- ease of inclusion in senior officials' timetables, without creating important additional work load;

- easy use as regards number of staff, amount of time and amount of computation needed;

- limited number of criteria and variables taken into account;

- availability of data required from a quantative and qualitative point of view;

- appropriate consideration of qualitative aspects, etc.

7.2 Government decision-making and budgeting: problems and possible solutions

7.2.1 The inadequacies of traditional budgeting procedures

156. With the growth in government responsibilities and the greater relative scarcity of available finance, the shortcomings of conventional budget procedures take on a new complexion. These shortcomings are chiefly the following (31):

(a) The fact that budgets are annual book-keeping operations explains why there is always a tendency to give prominence to short-term considerations and evaluate primarily the financial consequences of budget decisions, especially when the budget is not closely linked with the plan.

(b) Conventional budgeting procedures are centred on the application of resources, the necessary expenditure being identified by nature and executing agency rather than by aim or purpose. It is accordingly impossible to argue in terms of cost-effectiveness ratios about the actions undertaken by the government since the resources devoted to them cannot be broken down into identifiable units.

(c) Those who receive funds from the budget are always legally recognized institutions or departments. Since one of the latter's essential objectives is to expand, there is a constant pressure to revise budgetary appropriations upwards, sometimes independently of any justification in terms of public welfare and the government's objectives. The relationship between planning, strategy and budgeting (see Section 7.1.1) makes it clear that the budget cannot be the monopoly of government financial institutions, nor can it be an instrument in the service of the executing institutions.

(d) Conventional budgeting procedures attach very little significance to consideration of alternative solutions. Indeed, where there are no specific objectives to which reference can be made, it is virtually impossible to establish different possible combinations of resources. The solutions which one is then generally obliged to adopt tend to reproduce the conditions of the past, and this lack of flexibility on the part of the government apparatus has a particularly regrettable effect on an evolving field such as R&D.

(e) Control of the implementation of conventional budgets is exclusively of the book-keeping, legal type, in most cases *ex post* but occasionally *ex ante*. This is bound to be the case, since the executing institutions and agencies cannot make reference to any objective in order to evaluate their results. It is therefore difficult for government authorities to keep control over the operations set in motion. An increasing number of irreversible and uncontrollable situations arise, generating pointless expenditure.

7.2.2 Inadequate linkage between development plan and budget

157. A development plan is an integrated set of economic and social policies expressed in the form of quantified objectives and specific activities. A budget makes appropriations to agencies authorized to incur expenditure on behalf of the State and is thus potentially the primary instrument for executing the plan. Since planning and budgeting are mutually complementary, the plan must supply accurate data and detailed information concerning the selected objectives and planned activities, and the budget must translate these data and this information into appropriations and an expenditure framework. In practice, however, the transition from development plan to budget is rarely accomplished satisfactorily, partly because the two processes differ in certain ways that are hard to change and partly because of various weaknesses - many of which could be remedied - in their respective procedures, methods and instruments. The main practical differences are:

- different time horizons: pluri-annual for the plan, generally annual for the budget;
- different agencies in charge of their preparation and control: Ministry of Planning on the one hand, and Ministry of Finance on the other;
- different concerns (the plan seeks primarily for economic sense whereas the budget reflects the current political and financial situation);
- different attitudes to the future (a future that may be regarded as uncertain or likely, as against one that is certain);
- differences in degree of coercion (the plan reflects intentions* even if it is normative for the public sector, whereas the budget is strictly binding and book-keeping and administrative irregularities are penalized);
- the planned activities are broken down in different ways (a functional as against a structural, i.e. institutional, breakdown).

158. To remedy the weaknesses of the plan, which is often over-general and imprecise, and the shortcomings of conventional budgets as set forth in Section 7.2.1, and thus to pave the way for a stronger linkage between plan and budget, the following measures, to be adjusted to fit the particular conditions of each country, may be proposed:

(a) improvements to the planning process

- by ensuring the plan's internal consistency (balance between the economic variables, interdependence of certain sectors);
- by ensuring continuity in the planning process (preparation of an integrated series of long-term, medium-term and operational annual plans);

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* Except in countries with centralized planning, where its execution is strictly binding.

- by more flexibility (adjustment to changing economic and social conditions) through the inclusion of alternatives and the importance attached to strategy;

- by defining objectives in operational and quantified terms;

- by adopting a rational approach to project evaluation (priority determination, project selection, detailed costing, preparation of a schedule, phasing, deciding on what is to be achieved);

(b) modernization of the budget process

- by drawing up multi-year and especially two-year budgets;

- by adopting a system of budgeting by programme and by function;

- by introducing new budgetary classifications as a means of identifying the programmes, their objectives, the resources used and the outcome;

- by supplementing the conventional book-keeping control of expenditure with a system for evaluating the efficiency and effectiveness of the programmes financed;

- by improving the availability and quality of budget data needed to evaluate the impact on consumption, capital investment, income distribution, savings, etc., of government expenditure;

- by including, within the general State budget (principle of universality, see Section 8.1.3), accounts relating to the operations of government enterprises and autonomous public bodies (see page 92) which have to abide by the rules of public accounting;

- by avoiding appended budgets, special accounts and the allocation of certain resources to specific expenditure (principle of single exchequer, see Section 8.1.3);

(c) efforts to ensure close, direct and continuing co-ordination between planning and budgeting, by means of institutional arrangements and administrative measures, so that both processes can be involved in the preparation of the programmes to be included in the plan and the budget.

7.2.3 Attempts to improve budget preparation

159. Since the early sixties, a large number of developed countries and some developing countries have been experimenting with new methods of budgeting. These experiments followed two complementary approaches:

- direct action on the budget process itself, and

- indirect action through methods to assist decision-making.

(a) Direct action on the budget process

160. Every decision-making process is a mechanism for dealing with information by means of structures (the participants in the process) and procedures. It can be improved by taking action to influence one or more of these components.

161. In all advanced countries there is a general trend to introduce programme budget systems by means of which the plan and the budget are integrated in a consistent fashion within a multi-year time span. Although each country has its own terminology and procedures, their techniques and goals, if not identical, are at least very similar. These systems are based on two major assumptions, one being that it is possible to apply the management methods successfully used in American private industry since the forties, and the other that effectiveness would be improved by a more rational approach, which should reduce if not eliminate the arbitrary element in decisions, do away with all contestation about the allocation of public funds and facilitate a type of financial control that attaches more importance to substance (i.e. to utility or advisability of expenses) than to form (i.e. to budgetary and administrative regularity of expenses).

162. The essence of these systems is well expressed by the three terms used in the American "Planning, Programming, Budgeting System" (PPBS), which has served as a model (both helpful and unhelpful) for other countries, particularly in Europe (28 & 29):

- Planning, which represents the strategic and forecasting element,* the taking into consideration of the major long-term objectives of the State's activity, that is to say, its major functions directed towards ensuring the survival and development of the society;

- Programming, which is the tactical element, the formulation of alternative programmes directed towards the objectives of the Plan, and their selection with the help of cost-benefit and cost-effectiveness analysis;

- Budgeting, which is the translation into monetary terms of all the selected programmes, the programme structure, and those parts of the programme to be carried out each year under the State budget (see Figure IV).

163. The American PPBS system (1961-1970), adopted with some changes by Canada and the Federal Republic of Germany, opened the way for other budgeting systems. From the United States emerged "Management by Objectives" (MBO) in 1973 and "Zero-Base Budgeting" (ZBB)**

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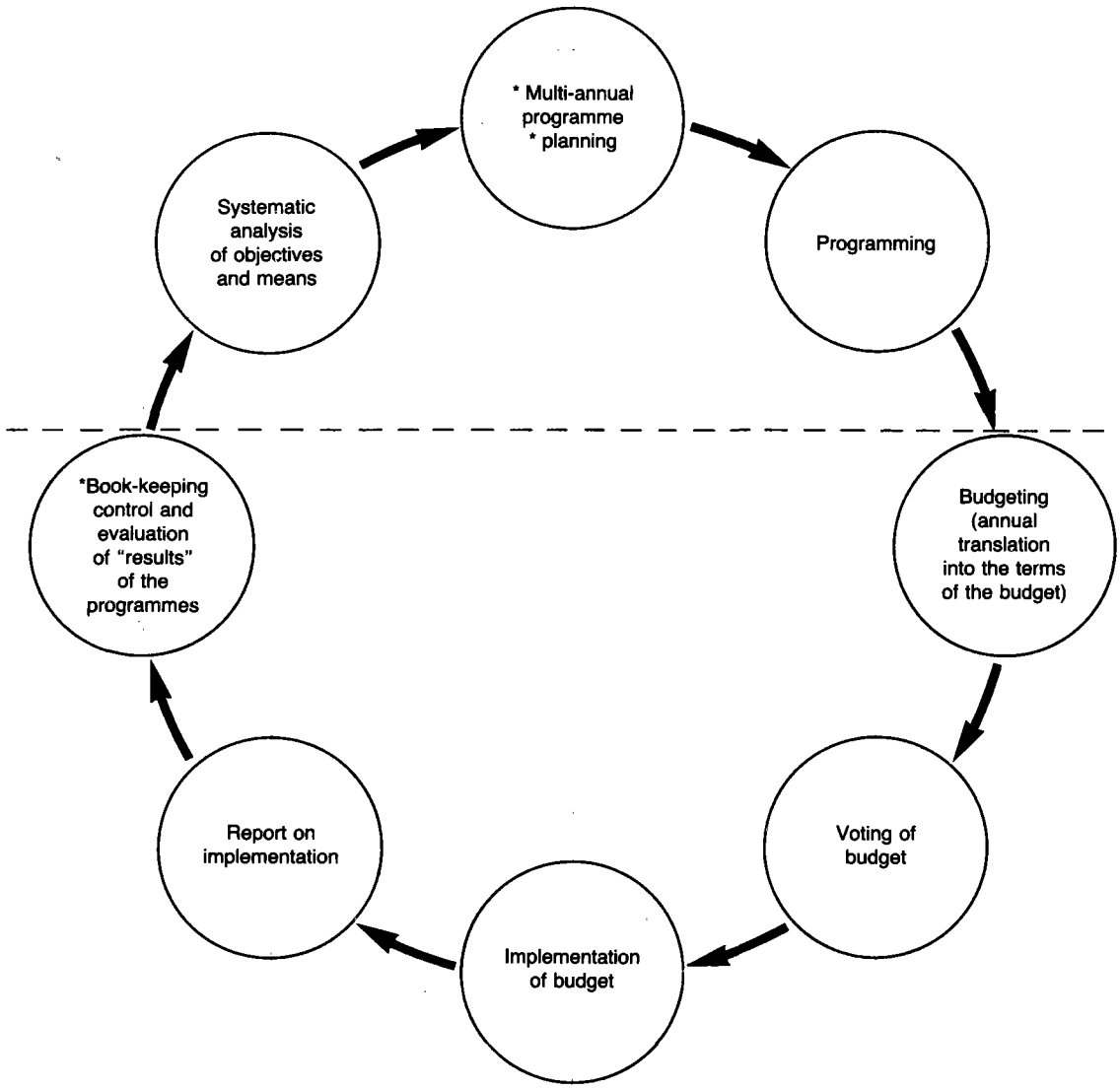
* More stress on strategy than on forecasting in market or mixed-economy countries; more stress on forecasting than on strategy in planned economy countries (see Section 7.1.1).

** The American procedure known as Zero-Base Budgeting (ZBB) breaks with the traditional principle of a cumulative budget drawn up on the basis of the previous budget. It examines neither the increase nor the decrease of appropriations for a programme since the previous year but always starts from zero and examines the total sums allocated in relation to the programme's effectiveness and priority rating (27).

Figure IV - CYCLE OF THE PLANNING, PROGRAMMING, BUDGETING SYSTEM

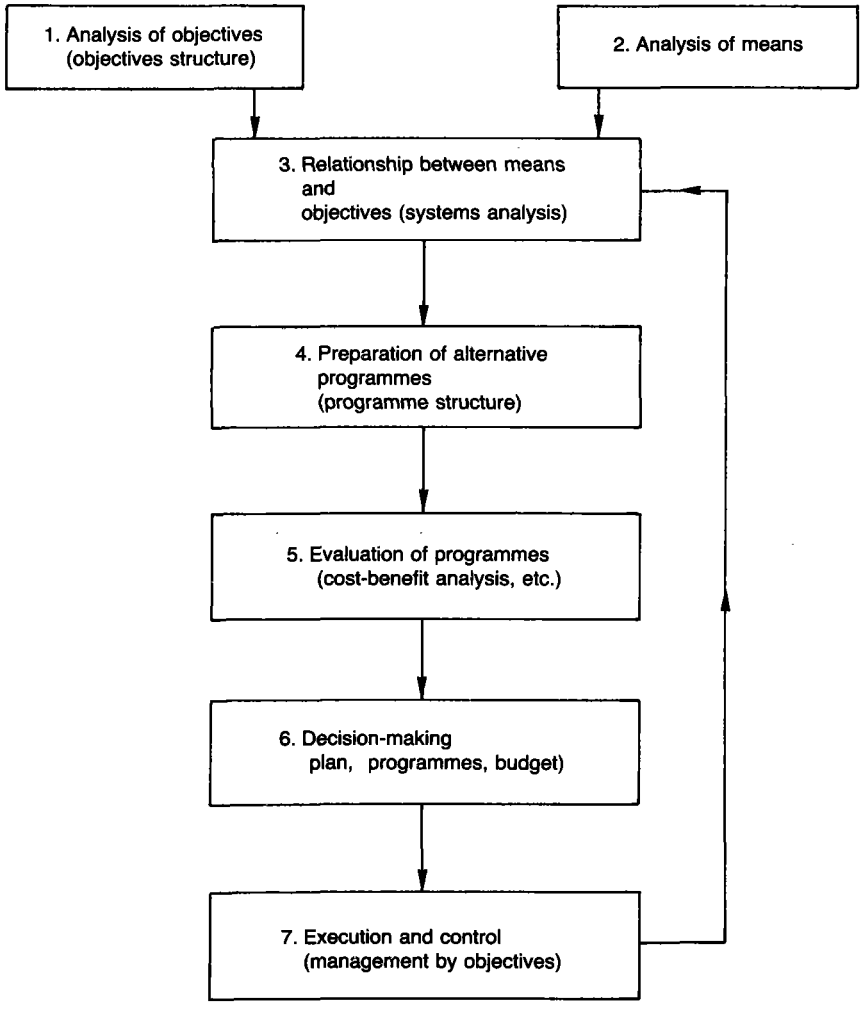
Top half: Analysis, decision-making and programming
(not necessarily on an annual basis for all programmes)



Bottom half: Budgeting-Implementation-Control (annual cycle)

Source: American textbooks

Figure V - STAGES OF A PROGRAMME BUDGET SYSTEM



Source: French textbooks

in 1976 (27); from the United Kingdom "Output Budgeting" in 1967 (28); and from France the *"Rationalisation des choix budgétaires"* (RCB) in 1968 (29). There is no need to dwell here on the technical details of each of these systems. A great many books, articles and reports have been published on them in the world's principal languages.*

164. Generally speaking, these systems go through the following phases (28) (see Figure V):

(i) analysis of objectives and definition of quantifiable indicators that will gauge the extent to which these objectives have been attained;

(ii) analysis of available resources in terms of manpower, finance, institutions, capital equipment and information. In the case of S&T activities, these resources are known through the survey of national scientific and technological potential (18) and national statistics on S&T (30);

(iii) the working out of relationships between means and objectives (systems analysis) that could possibly culminate in an econometric model;

(iv) elaboration of alternative programmes as an aid to reaching the definitive version of the programmes to be integrated in the programme structure (see Section 8.4.2);

(v) the *ex ante* evaluation of programmes** by means of the most appropriate method (economic computation, multiple criteria methods, or negotiation (see Section 7.1.3);

(vi) selection of programmes and determination of priority objectives, of the combination of means, and of financing regulations and modes for each programme, taking into account the information supplied by the analysis (see phases (i), (ii) and (iii) above) and the macroeconomic options of the Plan;

(vii) execution and control by modern methods (management by objectives and *ex post* evaluations of efficiency and effectiveness);

(viii) reappraisal of means and objectives in the light of any significant discrepancies detected between the costs or results and the forecasts (feedback loop).

165. Experiments of the PPBS type grew more numerous and widespread but did not distinguish themselves by any clear-cut success. The main difficulties and inadequacies appear to have been:

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* See the Bibliography in Annex I.

** See footnote page 77 concerning the Zero-Base Budgeting (ZBB) procedure.

- the disparate nature or lack of data and the difficulty of quantifying certain types of information (see Section 5.2.1);

- the difficulty of controlling multiple sources of finance (see Section 3.3);

- inadequate identification of objectives (see Section 5.2.2);

- lack of motivation and opposition to change from the parties concerned by negotiations (see Section 7.2.4);

- insufficiently forceful defence of inter-institutional programmes (see Section 5.3.3);

- lack of operational methods for evaluating the efficiency and effectiveness of programmes (see Chapter VI);

- the essentially economic character of these procedures (see Section 1.2).

166. The gradual introduction of programme budgets has been accompanied by efforts to improve the quality and increase the quantity of data by setting up comprehensive and homogeneous budgetary information systems (as in Sweden (28), for example) and to improve analysis of these data through better methods of public accounting and the use of computer processing. New budgetary classifications (see Section 8.3.2) based on a programme structure have made their appearance, among them the functional classifications, which sometimes represent the top level of this kind of structure (for example, Argentina, Belgium, Brazil, Canada, Colombia (see Annex VIII.D), Costa Rica, El Salvador, Federal Republic of Germany, Mexico, Panama, Spain, United Kingdom, United States, etc. (5 & 6), together with the models proposed by the United Nations in 1958 (see Annex VIII.A), 1968 (see Annex VIII.B), 1975 and 1978). (See Chapter XII.) The classifications are nevertheless often functional in name only and remain very close to the traditional classifications by institution. Furthermore, they are seldom satisfactorily integrated into the budgeting process. As we shall see in Section 10.1.2, one possible improvement to functional classifications would be to include the S&T category.

(b) Indirect action through methods to assist decision-making

167. The methods of assisting decision-making (i.e. economic computation, multiple criteria methods and negotiation), already described in Section 7.1.3 above, are vital to programme budget systems. In many cases, they were developed to meet the specific needs of these systems for optimal performance, clarity and consensus. They are, nevertheless, still misused and far from perfect. It would doubtless be more appropriate to consider them not so much for the quantified results they might supply as for the common framework and language which they can provide for the large number of active participants. This approach takes greater account of the reality of a budget process based on discussions, consultations and, above all, negotiations, and makes it possible for the arguments used by the negotiating parties to be improved without any profound changes in the structures and procedures.

168. If they are to be integrated into the budget process, the methods must be compatible with all its specific features. They must, in particular, fit into the timetable, adapt to the existing channels of information and introduce as few changes as possible into established arrangements and procedures. These restrictions disqualify standard-formula, ready-made methods in favour of an individual "tailor-made" package.

169. Lastly, integration will depend in great measure on the political importance the government attaches to any attempt to improve the budget process by including methods of a scientific character. The inclusion of such methods always has the effect of casting varying degrees of doubt on established systems, and even if these changes are kept to a minimum, a strong political will is always going to be needed to bring them about.

170. In conclusion, it is generally agreed that the main contribution of these experimental attempts to revitalize budgeting has been to reveal how little is in fact still known about the government decision-making process, to pinpoint large gaps in our knowledge and to suggest how this situation may be improved. There is little likelihood of a retreat since the present economic crisis demands an increasingly rational approach to government decision-making. The current of reform is world-wide and is now gradually reaching the more advanced developing countries. In this respect, the United Nations, in its proposed international strategy for development, recommends stronger links between the national plan and the budget, the introduction of programme budgets and the modernization of public accounting (31, 32 & 33).

7.2.4 The institutional and functional approaches to government decision-making

(a) The disadvantages of an exclusively institutional approach

171. Institutions (the bodies with responsibility) in any democratic society, whether they are ministries or government agencies, are actively involved in the preparation of government decisions which aim to translate policy statements into action. As leading participants in the negotiations which take place during this phase, they are highly tempted to act in such a way that the arguments advanced and the language used are those of their own field, thus narrowing the scope of discussion on the future shape and goals of society and all too often turning negotiation into something like horse trading.

172. This explains why negotiations tend to avoid any changes that might endanger the institution or certain of its members, and focus on means and the growth of means (appropriations). This makes for specific arguments that can be checked and leaves little room for opposition, at least during periods of steady growth in resources. Nevertheless, when resources grow more slowly, attention often turns instead to the programme concept which, when there are no powerful and independent references to the goals and future shape of society, and when there are no sufficient links between the plan and the budget (see Section 7.2.2), can provide the institutions with tactical openings to ensure their own development and supply a ready and convincing line of argument to justify requests for additional funds to attain pseudo-objectives.

173. An exclusively institutional approach in fact fails to put participants in circumstances in which they can use the goals and future shape of society as a yardstick. The result is that each one tends to remain engrossed in the world of his own particular institution and its immediate relations. Thus, although they sincerely state the opposite, they in fact attach secondary importance to the criteria of open-mindedness, co-ordination and co-operation between institutions, even though these criteria are essential if a country's system of government is to contribute efficiently to the development of society.

174. Although the practical consequences of diverting the government decision-making process from its proper function by using an exclusively institutional approach are probably impossible to put into figures, they are nonetheless very real:

- constant pressure to increase the individual budgets of institutions more to promote their own development than to do the work allotted to them by society;

- concentration of negotiations on a limited portion of the budget, usually the actual increase in appropriations, on the grounds that ongoing efforts should be continued and the institutions kept going, with the result that it becomes virtually impossible to halt a programme underway;*

- because there is no reference to specific objectives, alternative solutions based on different possible combinations of resources are not considered, and there is a tendency to assess the financial and short-term consequences of decisions through controls of the book-keeping or legal type rather than to assess their socio-cultural effects and long-term impact;

- the activities of institutions drift towards areas of doubtful cost-effectiveness or of less relevance to their particular missions;

- establishment of routine attitudes that are particularly inappropriate when socio-economic contexts are changing and when certain fields - such as S&T activities - require a high degree of flexibility;

- a growing number of co-ordination procedures and systems to make good the deficiency between the rigid division into executing agencies incapable of satisfactorily serving society's goals and plans, and the complex series of multidimensional, constantly interacting and ever-changing problems that have to be solved;

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* The American Zero-Base Budgeting (ZBB) procedure was introduced to counter this tendency (see footnote page 77).

- the frequent ineffectiveness of these co-ordination systems which, likewise incapable of satisfactorily serving society's goals and plans, are not strong enough to stand up to the steady pressure of the institutions responsible for executing government decisions;

- and, as the final consequence, the relative ineffectualness of government decisions in relation to the society's goals and plans.

(b) The functional approach to government decision-making

175. The ultimate goals and future shape of society, which the political discussions that prepare the way for government decisions ought to use as a frame of reference, are themselves set in the multidimensional context (which includes economic, social, scientific, technological and cultural factors) of individual and social development. If all these factors are to be taken into account in strategy formulation, planning, programming and budgeting, development must not be managed on the basis of a partial view, limited in time and space, of its vital processes. For our purposes, a process is a complex series of actions or events involving a multiplicity of participants in various kinds of relationship, the linking of which produces effects that are quantitatively and qualitatively different from what the sum of individual parts would lead one to expect (synergy). Finding a standpoint from which, within a given process, the zones of multiple and intense interactions between participants can be discerned is tantamount to being able to distinguish the functional aspect which lies behind the architectural or structural order of the institutions.

176. At this point, we must return to the systems analysis of development given in Chapter I. Like every complex open system, a State cannot exist without an architecture composed of specialized and co-ordinated agencies and individuals which exercise, within a large number of processes, a series of basic and vital functions in order to carry through the explicit and common project of society.

177. Each function should correspond to a group of activities which is vital to society as a whole and which produces a result that is essential though not enough in itself for the project's success. This result can be distinguished and isolated but it must also be integrated with the results of other functions. If policy-makers are to be provided with a clear and organized view of their responsibilities, a functional breakdown of the processes comprised in socio-economic development should be made such that a threat to any one of these functions calls in question the entire future shape of society, that is to say, its very survival and development. A functional breakdown of development is the only way of providing institutions with a frame of reference that distorts neither the strategic principles derived from the general vision of society's future shape nor the corresponding plan of action. In consequence, when one particular function is referred to, the whole future shape of the society is implicated.

178. Each function, and hence each group of activities, is exercised by a series of interdependent agencies and individuals called structures, decision-making authorities, executing agencies, responsible institutions or simply participants, as the case may be. The contributions of all these agencies and individuals must be co-ordinated so that they can all be integrated in a well-ordered manner into the function, such co-ordination leading to a host of conflicts and negotiations. In this case, the criterion for determining the outer limits of the function is based on the number and intensity of relationships between participants - whether they are concerned with integration, co-ordination, conflict or negotiation. A decrease in the number and intensity of these relationships may be regarded as a strong indication that the outer limit is being reached. This limit should be imagined as a frontier zone rather than as a strict dividing line since distinctions here are inevitably somewhat blurred.

179. The functions resulting from this breakdown are probably the same for all socio-economic systems and stable in time, since it is possible to pinpoint within each of these systems, whose ultimate purpose is survival and development, the same functions in different architectural guises. In as much as the functions are related to stable characteristics such as the system's ability to reproduce itself, adapt to new circumstances and evolve, time has almost no effect on them. At government level, the system's architecture will always be open to negotiation (dividing line between ministries, attribution of responsibilities, reorganization of institutions, etc.) around a constant, namely, the series of functions determined by the society's ultimate goals of survival and development and by its inherent ability to reproduce itself, adapt and evolve. An exclusively institutional approach to government decision-making, i.e. one that is based solely on the system's architecture, often leads that part of the overall structure which we call an institution to become itself a system whose final purpose is simply to survive. It can do this either by losing sight of its true role within the socio-economic system or by influencing the co-ordination structures and procedures so that the area covered by the function is defined in relation to its own current activities and not in relation to the future shape of society.

180. Thus, unlike institutional nomenclatures, a classification by function constitutes an invariable and non-negotiable whole. While on this subject, it should be recalled that a given function may be assumed by quite different sets of institutions, depending on the economic system, the culture, the country or period concerned; a single, standard, functions/institutions analysis table is out of the question. More specifically, a table in which each function is related to a single institution, and vice versa, would be impossible to believe since one would be obliged to deduce one of two equally paradoxical alternatives viz. either that the institutional structure is stable over time and the same for all countries - which is not true, as we have seen - or that the functional structure changes with each modification of the institution's field of competence, which is at odds with the image of a function as described here.

181. The institutional approach and the functional approach are two different ways of looking at the same thing. The first considers the participants alone whereas the second focuses on the relationships between participants, on the processes involved and on the ultimate goals. Concentrating on the participants (institutions) diverts a great deal of attention from the relationships between them and, above all, makes it impossible to observe the active and very complex processes of which they are a part. As implied by our definition of the term "process", dealing separately with each participant involved in a process is almost certain to obscure one's understanding of the essential and vital aspects of the system one wants to influence, namely, the functions in which the participating institutions, as members of an architecture that can vary, co-operate with one another within processes. To express the matter as a simile, neglecting processes is like examining a sentence by considering each word separately without allowing for its position in the whole.

(c) Linkage between functions, objectives and programmes

182. A one-level functional classification could be insufficiently detailed and specific for use in government decision-making processes. In theory, however, a function cannot be broken down into sub-functions - since functions cannot be put in order of importance as all are vital to the system constituting a nation - or into responsible administrative units, since there exist no hierarchical and univocal relationships between the functional order and the architectural or structural order.

183. On the other hand, a function may be sub-divided into medium-term objectives. A function is linked to the overall plan and strategy of the society, is unaffected by time and space and can only be expressed in general and qualitative terms, but an objective belongs to the sphere of tactics and thus to planning, programming and budgeting, occupies time and space, and can be given specific expression and quantified. It can be said that an objective is a representation of a function expressed in the form of results to be achieved. For example, the objective "struggle against illiteracy" is part of the "education" function while "eradication of malaria" belongs to the "health" function.

184. As we have seen, every socio-economic system possesses a vision of its future shape together with a strategy which finds practical expression through the development process. The first stage in translating this vision of the future society into actual development is to divide it into functions and objectives without masking or distorting the society's overall plan and strategy. The second stage is to translate the series of possible activities comprised in a given function into operational data that are comprehensible to the executing agencies and compatible with their resources. This step entails a breakdown in terms of time and space, by convention called a "programme", which is then allocated for execution to one or more institution exercising the function in question.

185. Following the example of our functional definition of an objective, a programme may therefore be defined as a materialization of a function expressed in the form of actions and means, or as a tactical operation which, via a particular function, expresses that system's strategy in the use of available resources to deal with a given situation. Thus, like the objective with a fixed time horizon which it serves, a programme is something which by nature is alternative and provisional. This functional definition of a programme supplements and casts new light upon the traditional definition given in Section 7.1.1 above. In this respect, the function/programme link is glimpsed but not systematically explored by the United Nations, which defines a "major programme" as "a function of an organization for which one or more objectives may be set" (65).

186. Programmes have of course three principal phases: elaboration, execution and evaluation. Theoretically, two different strategies may be applied during the lifetime of a programme. The first is the strategy of the whole socio-economic system, expressed through a number of functions; the other is that of the institution responsible for executing the programme. This latter strategy should however be reserved for the phase of programme execution and should not take the place of society's strategy, either during the formulation and selection of programmes or the evaluation of their results.

TO SUM UP:

- any reform designed to rationalize government decision-making in general or in a particular field such as S&T must integrate harmoniously with the existing methods, procedures and instruments of government decision-making, making allowance for their qualities, defects and possibilities of change;

- programme budgeting is a means of integrating the national development plan and the State budget into a well-knit system covering a number of years;

- the functional approach to government decision-making brings out the importance of relationships and future possibilities, facilitates programme budgeting by focusing the negotiations on goals and by providing an outline programme structure, and makes it possible to devote appropriate attention to certain new intersectoral or horizontal fields, such as S&T.

CHAPTER VIII — THE GENERAL STATE BUDGET

INTRODUCTION

187. We have now completed our brief account of the present situation and probable future trends regarding the main processes involved in government decision-making. If the budgeting process and its end-product, the Finance Act, are to make due allowance for S&T activities, a more thorough knowledge of the main features of this process and Act is required. This Chapter, therefore, makes a more detailed and complete examination of the nature, institutional coverage, structure and forms of presentation of the State budget, ending with the process of preparation, approval and implementation (28 & 34).

8.1 Nature and functions of the State budget

8.1.1 Definitions

188. It is possible to give several different yet complementary definitions of the State budget,* depending on whether it is regarded as a book-keeping document, a legal document or a policy document.

- As a book-keeping document, the budget is made up of all the accounts of the State's total resources and financial liabilities for a civil year (in a few cases two years).

- As a legal document, the budget is the official instrument by which the State revenue and the maximum expenditure of public institutions are estimated and authorized.

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* In the case of federations, this manual is concerned with the budget of the Federal State and not with those of the federated States.

- As a policy document - the most recent definition - the budget describes all the actions which the State promises to carry out with the means at its disposal in order to achieve specific objectives; it is "governmental policy in action".

189. The State budget is prepared by the Executive (the government) following a complex process of evaluation and negotiation during which the main active participants are public institutions in their capacity as executing authorities. It is then usually discussed and approved by the Legislature (Parliament) as a "Finance Act", the official instrument which authorizes the budget (see below, Section 8.5).

8.1.2 Functions of the State budget

190. Generally speaking, the State budget fulfils four functions:

- an allocation of resources function, i.e. contributing directly or indirectly to the allocation of the means of production, the objective being effectiveness;

- a regulation of the economy function, i.e. it maintains the principal economic equilibria such as foreign trade, employment, prices and the currency, the objective being stability;

- a social redistribution function, i.e. it adjusts the distribution of income and property with a view to attaining certain political objectives related to equity;

- a political participation function, i.e. it provides the general public and Parliament with an especially useful means of obtaining the information about examining and influencing "policy in action", the objective being democracy.

191. To fulfil this last function, the State budget must be transparent and allow the explicit identification of the budgetary appropriations and corresponding activities which translate into action each sectoral policy derived from the general policy on national development.

8.1.3 Principles applied in the State budget

192. Traditionally, the State budget must respect a certain number of principles proper to budgetary law. These principles, enshrined in somewhat different language depending upon the country or the work of references which one chooses to consult, may be summed up as follows:

(a) Budgetary universality and unity

All the State's revenues and all the State's expenditures must appear in a single document, the State budget (or Finance Act). Consequently, no extra-budgetary accounts or appended budgets - often such as those relating to public enterprises - ought to exist outside the State budget.

(b) Single coffer, or non-allocation receipts or expenditures

All the State's revenues, both ordinary revenues and capital revenues, must form a single aggregate serving to finance the totality of the State's expenditures, whether these be current expenditures or capital expenditures. This aggregate is generally known as the Public or the National Treasure (or Coffers).* Consequently, inside the State budget, no special Treasury accounts should exist, neither should there be special funds into which specific revenues are entered.

(c) Non-offsetting of receipts against expenses, or the gross-amounts budget

The whole amount of proceeds must be recorded in the State budget as revenue, without set-off as between expenses and receipts.

(d) Annual periodicity

The State budget must be prepared and voted each year, and each such budget must cover a period of one year.**

193. Exceptions to these rules which are often at odds with actual practice, explain the differences between countries as regards the institutional and financial scope of the State budget (see Section 8.2).

8.2 The institutional and financial coverage of the State budget

194. In most of the countries whose budgetary situation has been analysed by Unesco for the purpose of preparing the present manual (5 & 6), the State budget concerns only the resources of the Public Treasure; frequently, this latter includes a number of budgetary accounts to facilitate the management of these resources: the accounts relating to the general budget (GSB), and other accounts such as appended budgets and special accounts. Moreover, some of the public institutions financed by the State budget fall outside the ambit of the financial programming of the Treasury; the resources proper to these institutions - own funds - do not in general appear in the State budget. Thus in reality the budgetary principles of universality and single exchequer (see Section 8.1.3, paragraph 1) are rarely respected.

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* The Public Treasure (or the coffers of the State) is not a legal entity but rather an abstraction: it is the State itself performing its function of banker, which consists of the daily task of procuring funds to meet bills corresponding to the expenditure arising in part from the Finance Act. The Treasury (or the Exchequer) is the service responsible for administering the Treasure itself.

** Annual periodicity is contradicted in real life by the necessary continuity of public services and by the authorizing of multi-year programmes.

195. This of course makes for difficulty when it comes to identifying the amount, the institutional distribution and the object of public appropriations allocated to S&T. Hence it becomes necessary from the very outset to determine the types of institutions and the types of resources covered by the State budget (see Figure VI). It will be seen that the breadth of this institutional and financial coverage depends in very large measure on the question of how independent the public institutions concerned are, vis-à-vis the Central Government.

196/7. In this manual, the institutions and the other economic units receiving government appropriations or grants, are arranged according to the following categories which are close to the categorization and the definitions proposed by the United Nations in its budgetary and accounting manuals (35 & 43):

I. PUBLIC SECTOR:

1.1 CENTRAL GOVERNMENT

1.1.1 Central government agencies:

- Organs of State: Legislature, Supreme Court and Head of State.

- Ministries or Departments: all other bodies receiving direct appropriations from the Legislature.

- Offshoots of Ministries: Boards, Trusts, Councils, Commissions, and other special administrative authorities which come under public law, keep their accounts within the State budget either appearing explicitly or not, and provide services directly to the public, free or for a nominal charge without some clear intention of making a profit, e.g. national research councils,* government R&D centres, State schools, museums and public hospitals.

- Extra-budgetary funds and accounts: other than for finance of enterprise activities, e.g. social security funds. Sources and uses of funds are determined by Legislature.

1.1.2 Government ancillary agencies: bodies which are separately organized to supply goods and services for the use of individual government agencies but which do provide services directly to the public, e.g. naval dockyards, munition factories, repair shops, printing establishments, central purchasing offices, legal advice agencies and government mint. They are not subject to market forces and are governed by the same legal and accounting rules as offshoots of Ministries.

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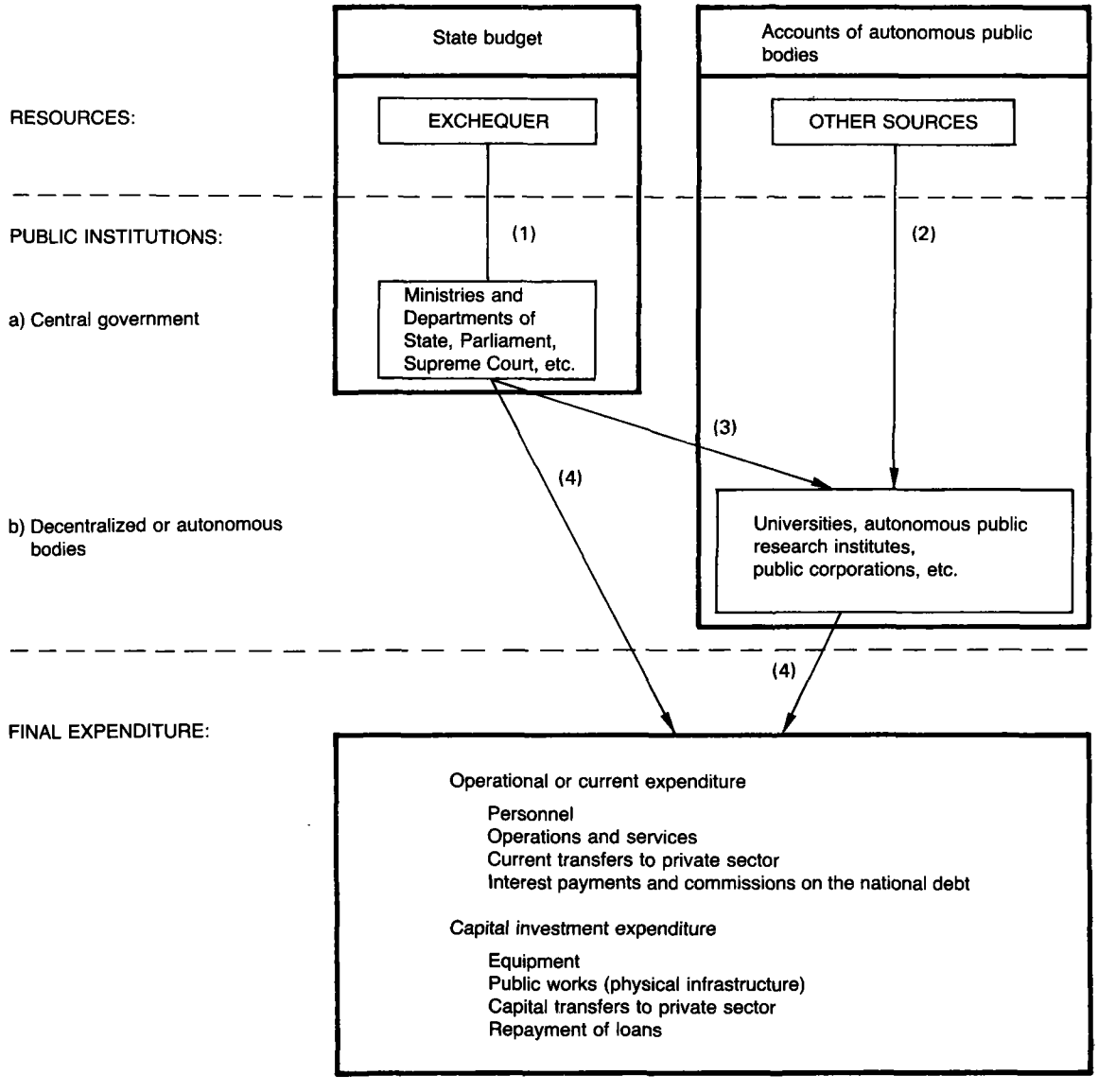
* In some countries, national research councils are considered as Ministries or Departments.

Figure VI - INSTITUTIONAL AND FINANCIAL COVERAGE OF THE STATE BUDGET



References for financial flows

(1) - Resources subject to financial programming of Treasury: allocations (budgetary appropriations) to be returned to the Treasure at the end of the fiscal period if the funds have not yet been obligated

(2) - Independent resources of autonomous public bodies, exempt from the rules of universality, a single exchequer and the non-allocation of receipts

(3) - Transfer expenditure: allocations (subsidies, grants, borrowing, etc.) not to be returned to the tutelary institution at the end of the fiscal period, even if the funds have not been obligated

(4) - Final expenditure.

1.1.3 Government trading and financial enterprises: agencies which produce goods and services for general sale, trade in commodities, are engaged in the leasing of fixed assets and purchase or sale of financial claims, which are subject to market forces, which are subordinated to political decisions regarding the price and interest rate policy they follow and the activities they perform, which are often obliged to surrender any surplus income to the general State budget (i.e. the Treasury) from which they are dependent for their cash requirements, and which are governed by public accounting rules and sometimes keep a parallel system of commercial accounts, e.g. postal services, public transport services, water supply services and the central bank.

1.2 DECENTRALIZED OR AUTONOMOUS PUBLIC BODIES

1.2.1 State and local government: departments, offices, establishments and other public bodies which are agencies or instruments of state or provincial, district or county, municipal, town or village government. They may be covered in the central budget of the State.

1.2.2 Autonomous public bodies: independent public institutions and enterprises which are legal entities set up and accorded financial autonomy by statute and which have independent resources which may not be subject to the financial programming of the Treasury. These bodies include:

(a) autonomous public institutions: independent and non-trading bodies which are sponsored by government authorities, carry out public policy and are not answerable in detail for the conduct of their activities, which come under public law and are therefore governed by public accounting rules and which are financed partly by grants from the general revenue of the Treasury and partly by independent contributions and sources of income; in the case of public universities, academies of sciences, autonomous public R&D institutes and some scientific and technological services (STS), these grants constitute the main part of their resources.

(b) autonomous public enterprises (or public corporations): independent trading organizations which are responsible to government authorities for broad policy but are free of detailed control, which usually come under private law, are only

subject to commercial accounting rules and are thus not covered in the State budget, but which can on an exceptional basis receive government grants to finance an involuntary commercial loss, e.g. public transportation companies, incorporated public banks or insurance companies and public power companies.

II. PRIVATE SECTOR

The private sector includes, inter alia, corporations, joint stock companies, limited liability partnerships, ordinary partnerships, sole proprietorships, non-profit-making institutions and associations (e.g. private universities and schools, private clubs, trade unions, learned societies, associations of engineers, professional scientific organizations and private R&D institutions serving an economic sector) and resident households. They may receive grants or allocations from the State.

198. The State budget should, in strict theory, include the totality of the budgets of institutions which form part of the Central Administration, as well as those of the autonomous public institutions (i.e. Category 1.2.2(a)) and should mention each one of these institutions explicitly. In reality, however, the situation is otherwise. The autonomous public institutions constitute, in fact, a special case and their resources deserve to be stated in greater detail because a large part of publicly-funded S&T is carried out within these institutions.

199. Depending upon national practices, the autonomous public institutions may or may not figure explicitly within the institutional budgetary nomenclature (see Section 8.3.2(a)) and thus in the General State Budget (GSB) (see Figure VII). The two cases will now be examined in turn:

(a) the case where autonomous public institutions are explicitly mentioned in the institutional nomenclature of the GSB

In this case, the resources (i.e. the appropriations allocated by the Treasury, as well as resources proper to the institutions themselves) and the expenses of these institutions are integrally accounted for and are indicated in an explicit and detailed manner, just as in the case of institutions of the Central Administration. The degree of independence of these institutions vis-à-vis the Central Administration is weak (Case No. 4 in Figure VII). It will be seen that this situation helps in identifying the public funds allotted to S&T (see Sections 9.3 and 10.3).

(b) the case where autonomous public institutions are not explicitly mentioned in the institutional nomenclature of the GSB

In this case, the institutions in question are treated for budgetary purposes in the same way as are autonomous public enterprises or private institutions. Such subventions as they receive from the Treasury represent "transfers", having as their source one of the categories (tutelary Minister or ad hoc budgetary line) within the institutional nomenclature of the GSB, and they are considered as final expenditure. The resources proper to these institutions are not expressly accounted for and published. The degree of independence of these institutions vis-à-vis the Central Administration is

high (Case No. 1 in Figure VII). It will be seen that this situation makes it difficult to identify precisely the public funds allotted to S&T (see Sections 9.3 and 10.3).

200. In the case of some countries, it is possible to identify the totality of the resources and the expenses of these autonomous public institutions, without this resulting in their losing all independence vis-à-vis the Central Administration (Cases Nos. 2 and 3 in Figure VII). The way this is done is to mention these institutions by name and to account expressly for their resources and expenses in the form of an appended budget; this annex to the SSB may indeed be called "budget of the autonomous institutions". This procedure could be extended to autonomous public enterprises receiving State subventions. The GSB, and this appended budget, are approved by Parliament either in the form of a single law when they are presented in one sole document,* or else in the form of two different laws, when they are presented in two separate documents.** A good approximate idea of the scale of the public funds allocated to S&T can be obtained by totalling the budgetary appropriations assigned to S&T in the GSB and those in the appended budget, deducting however transfers from the GSB to the appended budget.

8.3 Structure of the general State budget

201. In addition to the authorizations and instructions addressed to the Executive regarding implementation, the general budget of the State, as found in the Finance Act voted by the Parliament, contains recapitulatory analysis tables which use various budgetary nomenclatures and classifications to arrange the information on estimated receipts and expenditure according to legal, book-keeping, economic and political criteria. The general term for the information on expenditure is the budget line.

8.3.1 The budget line

202. The budget line is the authority given to a ministry, a government department or a public institution to carry out a given type of operation up to a certain sum and in accordance with certain rules. Every budget line concerned with expenditure accordingly contains three factors, the last one being defined with varying degrees of precision:

(a) the institution (or department) authorized to carry out the operation (or unit of approval of payment);

(b) the maximum sum authorized for the operation (or budgetary appropriations***);

(c) the object of the operation, which may be identified, depending on the type of budget (see Section 8.4) by:

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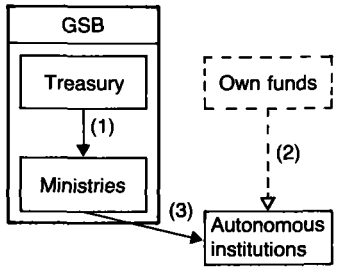
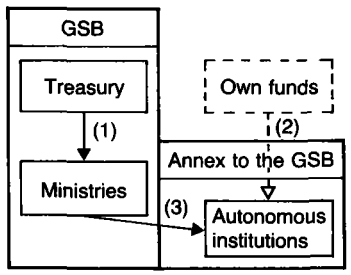
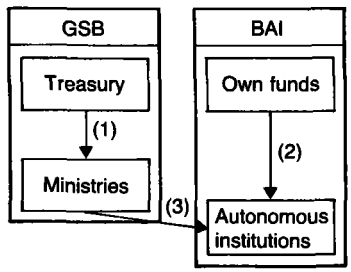
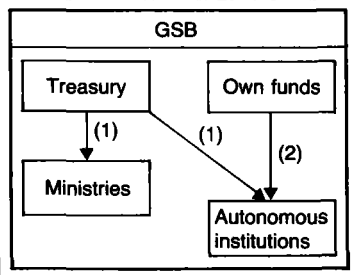
* This is Case No. 2 in Figure VII and corresponds for example to the situation obtaining in Brazil.

** This is Case No. 3 in Figure VII and corresponds for example to the situation obtaining in Colombia.

*** See footnote page 68.

Figure VII - BUDGETARY CONSEQUENCES OF THE INDEPENDENCE LEVEL OF AUTONOMOUS PUBLIC INSTITUTIONS

Level of independence	Financial flows — funds accounted for in the GSB - - - funds not accounted in the GSB	Modalities of financing applied by the treasury for autonomous public institutions		Application of the some budgetary rules as for the Central Administration	Number of budgetary lines by autonomous public institution	Mention of the names of autonomous public institutions in the institutional nomenclature of		Indication of the resources proper to the autonomous public institutions in	
		Appropriations	Transfers			The GSB	The BAI	the GSB	the BAI
HIGH 1		NO	YES	NO	ONE (lump-sum transfer)	NO		NO	
MEDIUM 2		NO	YES	YES	SEVERAL (by programmes)	NO	YES	NO	NO
MEDIUM 3		NO	YES	YES	SEVERAL (by programmes activities and projects)	NO	YES	NO	YES
WEAK 4		YES	NO	YES	SEVERAL (by programmes activities and projects and by nature of expenses	YES		YES	

GSB: General State Budget

BAI: Budget of the autonomous institutions

(i) the nature of the goods and services involved in the operation (either in general terms, such as wages and salaries, pensions, consumer goods and services, studies, capital equipment, public works, stocks and shares, etc.; or in great detail, such as hours of work, gallons of petrol, minutes spent on the telephone, square metres of land, etc.);

(ii) the financial arrangements concerning the expenditure, and its economic repercussions (consumer expenditure, subsidies, income transfers, gross capital formation, financial investment, capital transfers, etc.);

(iii) the objectives* (or mission, goals, target, result to be achieved, etc.) of the operation, which is often represented by means of the programmes contained in the national development plan (e.g. combating illiteracy, construction of a dam, better road-traffic conditions, eradication of malaria, etc.). It is laid down in terms of time and space, and should be expressed in specific terms and quantified (a scale of measurement may be associated with it);

(iv) the political function* (or purpose or ultimate design) which the State performs on behalf of its citizens in carrying out the operation (for example, general administration, preservation of health, exchanges with the natural environment, production, communications, social regulation, innovation, the collective heritage, defence, etc.). As we saw in Section 7.2.4 above, the political function is vital for the nation as a whole and can only be expressed in general and qualitative terms.

As the object of the operation is seldom defined unambiguously in the budget (especially if the operation is a transfer) and often gives rise to disagreements between experts, this manual will, from now on, keep to the foregoing definitions.

203. The budget line thus constitutes the fundamental unit of information on the basis of which computer processing makes it possible to produce, very quickly and in the form of analysis tables, the many different presentations of the budget which are required for its preparation, examination, management and control.

8.3.2 Budgetary nomenclatures and classifications

204. To make it possible to construct the recapitulatory analysis tables and carry out the other types of budget analysis needed for public administration, nomenclatures and classifications (see Section 7.1.2) should be used which lead, by means of codes, to all the budget lines. To achieve this, the classifications must satisfy the following conditions:

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* The general term "destination" is sometimes used to designate both the objective and the function of an operation.

- they must be intrinsically homogeneous, that is to say, based on one single criterion of distribution (for example, the institution, the nature of expenditure, the sector of economic activity or the socio-economic objective);

- they must be exhaustive, that is to say, they must be applicable to all budgetary lines, without the possibility of there being either omissions or duplications;

- they must be balanced, that is to say, they must obtain a level of disaggregation or specificity which remains identical from one category to another;

- they must incorporate a numerical notation, reflecting in each case a hierarchical structure and making possible the coding and the computer processing of the budgetary data;

- they must be relatively stable in time with a view, in particular, to making it possible to analyse and compare different budgetary periods.

205. The most common budgetary nomenclatures* and classifications satisfying these conditions are:

(a) the institutional nomenclature (I), which comprises the central government agencies (Head of State, Ministries and Departments of State, Parliament, Supreme Court and Audit Office), broken down into administrative departments and units responsible for budget implementation. Annexes IV.A and IV.B give examples of an institutional nomenclature; the one employed for the Brazilian budget (IV.B) covers the central government only, while that of the Argentinian budget (IV.A) includes decentralized bodies or autonomous public bodies too;

(b) the economic classification of revenue and expenditure (E), in which revenue is classified according to the way in which it is obtained (taxes, duties, sales of goods and services, repayments, etc.) and expenditure according to its economic effects in the form of operating or current expenditure (consumption, subsidies, current transfers, interest payments, etc.), and investment or capital expenditure (gross capital formation, financial investment, capital transfers, debt amortization, etc.). This classification is essentially used, in conjunction with the system of national accounts, in carrying out macro-economic analyses of the effects of the budget on the composition and level of national income. Annex V contains, as an example of an economic classification, the one employed for the budget of Peru;

(c) classification of sources of finance (S), which is usually an aggregation of the above economic classification of revenue (Exchequer, borrowings, resources proper to autonomous public bodies, resources proper to local communities, funds from the private sector or from abroad, etc.). As a rule, this classification is used in budgets which include loans (internal or

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* Budgetary "nomenclatures" do not satisfy all the conditions mentioned above, in particular that of temporal stability (see also Section 7.1.2, paragraph 2).

external) whose purpose is to finance budgetary deficits, or the resources proper to all public institutions. That employed for the Budget of Bolivia is presented, by way of example, in Annex VI;

(d) classification by nature or item of expenditure (N), which is a breakdown of the above economic classification of expenditure according to the actual nature of the goods and services involved (staff, maintenance, public works, capital investment, etc.). It is often called, rather imprecisely, "classification by object of expenditure" although, as the previous section has shown, the object of any expenditure is not restricted to the actual nature of the transaction. This classification, associated with the institutional nomenclature, constitutes the basis of the ways and means budget (see Section 8.4). An example of this type of classification, as used for the budget of Peru, can be found in Annex VII;

(e) the functional classification or classification by purpose (F), which identifies the immediate or short-term destination of expenditure in relation to the political functions which the State is required to fulfil in order to ensure the survival and development of the nation (35). These functions - the purposes of government policy as implemented in the budget - may be expressed in a conventional way (general administration, education, health, agriculture, industry, social affairs, science and technology, defence, etc.) or in a systemic form (interfunctional co-ordination, exchanges with the natural environment, transformation and circulation, information, social regulation and protection, national heritage, innovation, etc.). This is the most recent classification and is used chiefly in programme budgets as the more aggregated level of the programme structure (this concept is defined in Section 8.4.2). Annexes VIII.A, B, C and D present, respectively, the functional classifications proposed by the United Nations in 1958 and 1968, and those employed by France and Colombia (see Chapter XII below);

(f) the classification by sector or branch of economic activity (B), which identifies the activities or institutions which produce goods and services (agriculture, mining, manufacturing, construction and public works, banking and insurance, public services, etc.). This classification is often used for the economic agents involved in transactions and to assess, in conjunction with the economic classification (E), the macro-economic effects of budgetary revenue and expenditure. Even though it is not exhaustive, homogeneous or internally balanced - all prerequisites of a budgetary classification - it was occasionally employed in the general State budget to classify major capital investment programmes, before the recent appearance of functional classifications. Certain so-called sectoral classifications are in fact functional classifications as defined above (France is a case in point: see Annex VIII.C). By way of example, Annex IX presents the categories of the first two levels of the "International Standard Industrial Classification of all Economic Activities" (ISIC).

206. Unlike institutional classifications (I) and classifications by nature of expenditure (N), functional (F) and economic (E) classifications have no legal status or book-keeping value but they enable a political and economic analysis of the State budget to be made.

8.3.3 The budget tables

207. By cross-tabulating two of the above classifications one can construct a series of recapitulatory analysis tables. The actual tables used make it possible to evaluate the content of the budget from a legal, book-keeping and political point of view, and also to judge how advanced the budgetary techniques used are. Capital letters are used to designate the classifications, as follows:

(I) Institutional nomenclature

(N) Classification by nature

(F) Functional classification

(E) Economic classification.

The following matrix identifies the most widely used tables:

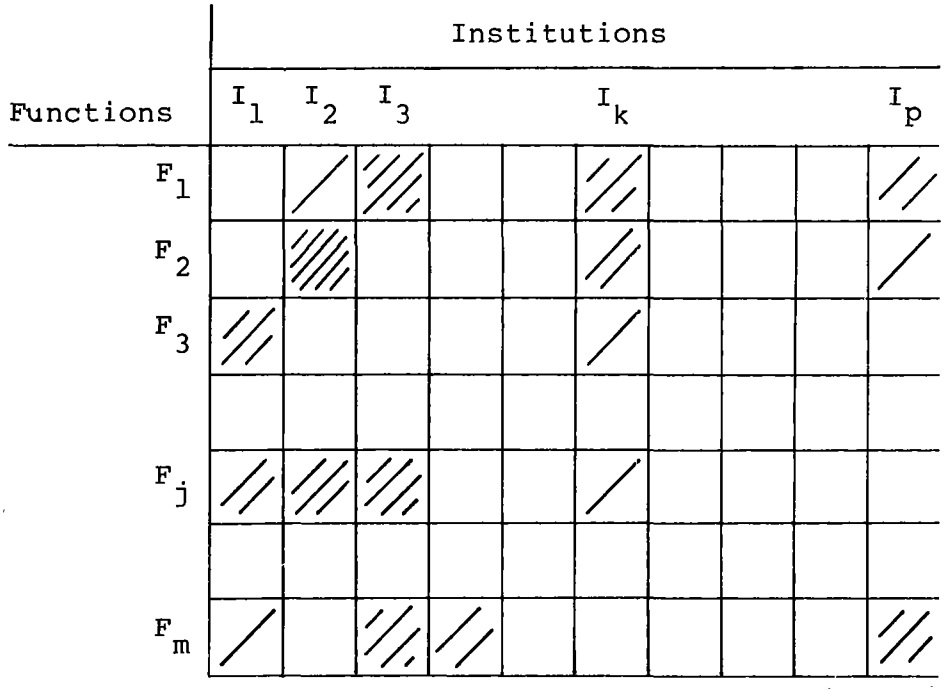
	I	N	F	E
I				
N	N/I			
F	F/I	F/N		
E	E/I	E/N	E/F	

208. The advancement of the budget, as indicated by the tables actually used, can be summarized as follows:

(N/I) Traditional administrative budget or book-keeping institutional budget: this budget is nevertheless indispensable for the implementation and control of expenditure.

(F/I) Advanced administrative budget: this table is essential to the identification of programmes and institutions to be co-ordinated, for the purposes of budgetary arbitration, negotiation and implementation. This supposes two conditions: the first is that each programme be attached to a function (i.e. the highest level of the programme structure is the function); the second is that each function should not be the exclusive responsibility of a single institution (i.e. the functional classification is not confused with the institutional nomenclature).

Table of appropriations by institution and by function



The above recapitulatory analysis indicates, for instance, that institutions I_1, I_2, I_3 and I_k contribute with different degrees of intensity (I, II, III, etc.) to function Fj and that they should consult each other in order to harmonize and co-ordinate the activities on which they are engaged on behalf of that function. The table therefore presents functional budgets for the various areas of State responsibility and makes for more effective interministerial co-ordination, procedures and bodies. As we shall see later, one of these budgets could be that of the S&T function (see Section 9.2.1 and Chapter XI).

(F/N) Advanced administrative budget: by demonstrating the nature of expenditure for each function, this makes it possible to evaluate the possibilities of evolution of the structure of expenditure within the function from one budget to another. In reality, of course, these possibilities are limited by the fact that it proves necessary to reintroduce year following year, provision for certain expenditures, such as statutory items (see Section 8.5.1, paragraph 3) and the pursual of multi-year programmes.

(E/I) Advanced administrative budget: this type of tabulation permits analysis of the economic effects of the government's policies on the sectors of activity defined for the system of national accounts.

(E/N) No corresponding table because E is usually an aggregate of N.

(E/F) Modern policy-oriented budget, which expresses the economic impacts of the government's policy statement. This type of tabulation shows the way in which expenditure on a given purpose - on the "education" function, for example - are broken down into the economic categories of the system of national accounts: consumption, subsidies, capital formation, capital transfers, loans, etc. It also shows how the expenditure classified in a given economic category - capital formation, for example - is distributed between the various functions assumed by the State in a development strategy (35). Figure VIII gives a table of this kind which, however, incorporates only the major economic categories of expenditure and the first level of a functional classification. Depending on the user's intentions, it may be presented in greater detail and may include the budgetary programmes under each function.

209. When the State budget contains a set of programmes (P) classified according to a programme structure (36), the recapitulatory tables incorporating this structure can usually take one of two forms. If the institution is the highest level of the programme structure (P=I), i.e. if each programme is undertaken by a single institution (mono-institutional programmes), the tables containing (P) are further breakdowns of the institutional tables (I-P/N), (I-P/E) and (I-P/F) and useful for the execution of the programmes by the departments concerned. If, on the other hand, the function is the highest level of the programme structure (P=F), i.e. if it is possible for programmes to involve two or more institutions (pluri-institutional programmes), these tables are further breakdowns of the functional tables (F-P/I), (F-P/N) and (F-P/E) and are essential to the inter-institutional co-ordinator of programmes during both preparation and implementation.

8.4 Types of budget

210. The different ways in which budget lines are classified and in which the object of the expenditure authorized in a budget line is identified lie at the root of the different types of budget.

8.4.1 The ways and means budget

211. In its most traditional form based solely on public accounting rules, the general State budget is made up simply of all the accounts of income forecasts and expenditure authorizations. This is the ways and means budget (sometimes called the administrative or institutional budget). In this type of budget, the object of expenditure is identified only by means of the institutional classification (I) and the classification by nature of expenditure (N). Hence there is only one cross-tabulation (I/N) of these two classifications, which shows the distribution by nature of the funding authorizations to government institutions.

Figure VIII - RECAPITULATORY TABLE OF BUDGETARY APPROPRIATIONS BY FUNCTION AND BY ECONOMIC EFFECT

Economic classification (E) / Functional classification (F)*	Operative expenditure							Investment expenditure								TOTAL
	Consumption of goods and services by the Central Government	Interest payments on the public debt	Subsidies allocated to		Current transfers to			Gross capital formation**		Capital transfers to			Loans and advances to			Repayment of the public debt	
			autonomous public institutions and enterprises	private institutions and enterprises	households	local government	foreign	government agencies	government trading and financial enterprises	autonomous public institutions and enterprises	Private institutions and enterprises	foreign	autonomous public institutions and enterprises	private institutions and enterprises	foreign		
A. General services																	
1. General administration																	
2. Justice and internal security																	
3. Defence																	
B. Innovation services																	
4. Science and technology																	
C. Economic services																	
5. Agriculture and non-mineral resources																	
6. Energy and mineral resources																	
7. Industry, commerce and services																	
8. Transport and communications																	
D. Community and social services																	
9. Education																	
10. Health																	
11. Town and country planning																	
12. Social security and assistance																	
13. Culture, sport and recreation																	
E. Expenditure not related to a function																	
TOTAL																	TT

* Each function may be sub-divided into programmes; see Section B.4.2

** Gross capital formation by the Central Government

8.4.2 The programme budget

212. In its modern form, the ways and means budget is supplemented by a programme budget (28, 29 and 37) describing all the actions that will be carried out with those means in order to attain given objectives. In this case, the object of expenditure is identified both by its function or purpose and by the programme with which the expenditure is connected. As we have seen above (see Section 7.1.1), only this type of budget, in which results are always associated with costs, establishes the link between government policy as expressed in the national development plan and the ways and means budget. The programme budget spells out, in fact, the functional approach to government decision-making (see Section 7.2.4).

213. A programme is a consistent series of actions which correspond to a State function, contribute to the achievement of a government objective and are implemented over a period of time generally exceeding the budget period. The section of a programme corresponding to a budget period constitutes the budgetary programme.

214. The framework for presentation of the programme budget is the programme structure (36), which consists of an ordered list of the programmes concerned, ranked in accordance with a variable number of levels, usually from two to five. For example, the following structure could be applied to each programme:

Level 0: political function (in the case of a functional programme budget) or central government institution (in the case of an institutional programme budget) (see pages 106 and 107)

Level 1: field, major objective, group of programmes or administrative unit

Level 2: programme

Level 3: sub-programmes

Level 4: programme element, i.e. project or activity.

215. At the most general level of the programme structure (level 0 in our example) which should be the level of the function, there is a strong temptation to put, for the sake of convenience, the administrative organization (institutional nomenclature) or, alternatively, the nature or economic repercussions of programme expenditure (economic classification of expenditure). The French programme budgets, for example, observe the division of responsibilities that exists between ministries but this raises awkward problems regarding the placing of "horizontal" (e.g. training, general administration, research and so on) or multi-institutional activities (in this case level 0 in our example would represent the ministry and level 1 the ministry's different departments). There is a danger that implementation of the programme budgets may be affected by changes in government organization or, conversely, that unsatisfactory programmes will be constructed because they are modelled on the current organizational arrangements. Splitting the cost of programmes and their elements into current expenditure and capital investment provides no definite indication as to the programme's future impact on national development, owing to the frequent use of changeable criteria for this split (see below, Section 8.4.3).

216. For the most specific level (level 4 of the example), which contains the programme elements, a distinction, useful for keeping control over the length of time programmes last, is often drawn between activities and projects. "Activities" refers to the continuing (or recurring) and routine provision of already existing goods and services (e.g. supervision of hygiene in regard to foodstuffs as part of a disease eradication programme) from one budget period to the next, whereas "project" refers to short-term actions carried out within a fixed and predetermined length of time - quite possibly far exceeding the budget period - with a view to providing new, higher quality or more goods and services (e.g. a vaccination campaign as part of the programme mentioned above).

217. Depending on the degree of liberty accorded to the institutions responsible for the management and execution of the programme, there may be one single budget line for the whole of the programme (the case of maximum liberty) or, at the other extreme, as many budget lines as there are programme elements (the case of minimum liberty).

218. Each programme of this structure is defined by the programme description, which states inter alia:

- its socio-economic objectives;
- the means to be employed, especially the appropriations authorized and the human resources needed;
- the institutions concerned;
- the nature and scheduling of operations, distinguishing between activities and projects;
- a quantification in time and space of what is to be achieved;
- the programme's interactions with the economic, social, cultural and natural environment;
- evaluation criteria for efficiency and effectiveness (see above, Section 6.3);
- etc.

219. This description is usually based on a model, though not always a formal model, which in turn is based on a battery of indicators (38 and 39) relevant to the programme (indicators of costs, results, impact, etc.) and on the relationship between variables which explain the internal operation of the programme and its interactions with its environment.

220. Depending on the kind of programme structure adopted, there are two types of programme budget:

(a) institutional programme budget: when budgetary programmes are linked only to a government institution through an institutional classification (i.e. P=I), it is termed an institutional budget organized by programmes, or simply an institutional programme budget. This type of budget, which makes it difficult to identify multi-institutional programmes explicitly, is always based on an institutional approach to government responsibilities, the weaknesses of which were noted in Section 7.2.4 above, and is at

best merely an enlightened corporative budget since it in no way modifies negotiations regarding the allocation of resources to the institutions responsible for implementing it. The latter, naturally seeking to build up their influence and power, always dominate a debate which can never truly concern itself with ultimate purposes, although these, being exterior to the institutions, ought nevertheless to decide the general direction of their action;

(b) functional programme budget: when the budgetary programmes are also linked in a budget to a State function through a functional classification (i.e. P=F), it is termed a functional budget organized by programmes, or more simply a functional programme budget. In this case, the budget line(s) representing a budgetary programme (P) are coded not only with the institutional (I) and economic classification (E) and with the classification by nature of expenditure (N) but with the functional classification (F) too. Consequently, this type of budget includes, among other things, a recapitulatory table of appropriations distributed by institution and by function sub-divided into programmes (I/F-P) and a table by economic category and by function likewise sub-divided into programmes (E/F-P). Discussion no longer focuses on the budget line but on the programme to be implemented within the framework of a specific function.

221. The functional programme budget, which is still not very widespread,* makes it possible to co-ordinate the actions of institutions with similar objectives or joint programmes and thus to formulate and implement efficiently pluri-institutional programmes. It is based on a functional approach to government responsibilities which restores to the budget discussions a genuine policy-making and strategic character at the national level. This approach recognizes that the social, economic, political and cultural system that a nation is cannot exist without a complete organic infrastructure embracing and integrating a number of functions vital for the development of society (see Sections 7.2.4(b) and 8.3.2(e)). Despite the diversity of the structures which these functions assume in the different countries, responsibility for them seems to rest essentially with the public authorities. Apart from the obvious public utility status of a good many of these functions, the fact that they are frequently "non-profit-making" means that they would not survive if they were the responsibility of organizations which did not have the financial backing of the State. The public authorities thus finance through the budget the functions that they assume, and it is therefore desirable to be able to establish a link between expenditure and functions. This could be done by means of a functional classification, which should be introduced into the budgeting process without upsetting the equilibrium of an apparatus that bears the stamp of its long tradition and highly complex procedures.

222. Although the "function" motivates government action in the highest political sense, it does not constitute an operational structure at the level of implementation. However, for reasons mentioned earlier, the process of allocating budgetary appropriations should relegate as far into the background as possible the drawbacks of the institutional debate. Programmes should therefore be determined by reference to the functions

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* Promising experiments are taking place in the Latin American region, for example in Argentina, Brazil, Colombia and Costa Rica (see Chapter IX below).

of the State and subsequently placed for implementation under the responsibility of the institutions.

223. The discussions concerned with the preparation of a functional programme budget would then take on a truly democratic and policy-centred complexion as they would be focused on seeing that the budget was consistently aligned with the general vision and purposes of the society. The central concern of budgetary decision-making would no longer be only the authorization to incur expenditure but also the obligation to carry out specific programmes. Budget management would aim at reaching a target, while the necessary financial control would cease to be an end in itself to become one of the conditions of programme implementation. Lastly, budgetary control would no longer be concerned exclusively with the before and after of financial transactions, i.e. obligation of funds, auditing of accounts (auditing control, see Section 8.5.3), but would also cover the management of the activities themselves and what they achieved (management control).

8.4.3 Operating budget and capital investment budget

224. In certain countries, the State budget in fact comprises two distinct budgets, the current budget and the capital expenditure budget. This sharp division in budget structure is mainly due to the fact that the task of budget preparation is shared between two institutions and two sources of finance:

- the current budget: the current or operative expenditure figuring in this budget is generally programmed by the Ministry of Finance and financed through the ordinary revenue of the Public Treasury (see post 1.0.0 of Annex V.A). This expenditure is identified by means of the institutional nomenclature (I), the classification by nature of expenditure (N) and the economic classification (E). The budget lines relevant to this expenditure are frequently - though misleadingly - referred to as "activities" (see page 106, paragraph 3);

- the capital expenditure budget: the capital or investment expenditure figuring in this budget is usually programmed by the Ministry of Planning and financed by specialized extraordinary revenue, such as borrowings (from the public, from private or international banks, or from foreign governments) or grants (from bilateral or multi-lateral aid). The budget lines relative to this capital expenditure, when not identified by means of the functional classification, are frequently coded by means of a hybrid nomenclature including, on the one hand, the sector of socio-economic activity (classification by branch of economic activity - see Section 8.3.2(f) and Annex IX - used in the National Development Plan), and on the other hand, the most aggregated economic categories of the system of national accounts (categories corresponding to capital expenditure, as used in the economic classification - see Section 8.3.2(b) and Annex V). These budget lines are also frequently - though misleadingly - referred to as "projects" (see page 106, paragraph 1).

225. This distinction has both advantages and drawbacks, in particular:

(a) it facilitates the financial management of investment projects figuring in the National Development Plan;

(b) it makes it possible to draw up a portfolio of investment projects requiring funds in addition to those of the Treasury, for example on the part of an international funding agency such as the World Bank;

(c) it makes for the possibility of errors in the analysis of the structure of expenditure since current and capital expenditure are not distinguished according to the criterion of capital formation alone. The direct impact on development of certain expenditure considered as current expenditure by the Ministry of Finance (e.g. health, extension work in agriculture or R&D) leads the Ministry of Planning to regard them as intangible investments in contrast to tangible investments such as capital equipment;

(d) development of the country's physical infrastructure has to rely on the uncertain availability of extraordinary revenue, which accounts for the enormous debts and economic dependence of certain developing countries;

(e) in the budget itself, it makes it difficult to use homogeneous and exhaustive classifications for coding the budget lines, thus hindering the ready identification of those concerning S&T activities, unless S&T is considered as an intangible investment. As we shall see in Section 10.1.2, the functional classification permits their identification and satisfies the requirements of the Ministry of Planning without the need to make questionable changes in the economic classification;

(f) it raises problems of co-ordination between the Ministry of Finance and the Ministry of Planning and, in the case of a programme budget, problems of financing between ordinary and extraordinary revenue. These programmes, which naturally have a direct impact on development, comprise both operating expenditure and capital investment. To return to the example of a disease eradication programme, the activity "supervision of hygiene in regard to foodstuffs" could include operating costs as well as investments, whereas the "vaccination campaign" project would in theory involve operating costs only. The transition from the programme structure to the economic classification can only be effected by means of approximate breakdowns which thus limit the reliability of the programming.

8.5 The preparation, approval and implementation of the general State budget

226. In most countries, the process of preparing, approving and implementing the budget is repeated each year. This does not, however, mean that the budget looks only one year ahead. Very often, where government responsibilities are concerned, medium- and long-term prospects have to be considered. The annual principle only

implies that the government and government institutions have to submit proposals for action, and hence requests for appropriations each year, with a view to achieving certain results and fulfilling certain functions.*

227. The preparation and approval of the budget is essentially a process of negotiation between various parties. It can be improved step by step so long as there are methods available which can be easily assimilated by those parties and incorporated without difficulty into the structures and procedures within which they work. Nevertheless, as we have already pointed out, the effectiveness of these methods depends on the relevance and quality of the basic data, on the level occupied within the hierarchy by the parties involved, and above all on their readiness to use advanced techniques for reaching more effective, consistent and generally acceptable decisions.

228. The following paragraphs will simply comment upon the basic, traditional aspects of the budget process. A simplified diagram could be drawn for each country, making it easier to visualize the different stages, participants and products of the preparation, approval and implementation of the budget. Figure IX is an example of a diagram of this kind.

8.5.1 Preparation of the budget

229. Responsibility for preparation of the budget lies with the government and its ministerial departments, the most important of which is the Ministry of Finance and its Department of the Budget. Preparation, unlike the parliamentary voting procedure, is not governed by official regulations but is organized by the Department of the Budget somewhat by rule of thumb by means of annual circulars and forms to gather appropriation requests and programme proposals.

230. Preparation begins some six to twelve months before the budget itself comes to be implemented, when the above-mentioned circulars and forms are sent to government institutions. At the same time, at ministerial level, a number of outline budgets for the coming year or two years are worked out. The latter take prior commitments, short- and medium-term economic changes, development plan priorities and any modifications imposed by political and economic restrictions into consideration. There are more of them when computer-processed economic and financial models are employed. They then serve to draw up an initial draft budget in greater detail which, for each ministry (and possibly for each function), lays down ceilings in regard to programmes and items of expenditure.

231. Then begins the negotiation and arbitration stage, the purpose of which is to see that the proposals of the government institutions are compatible with this initial draft, to check the revenue and expenditure forecast by each department, and to prepare in detail renewed measures (statutory items or Consolidated Fund Services**) and new measures to be included in the budget. This phase in particular brings out the usefulness of a programme budget system supplying the information and arguments needed for these negotiations e.g. quantified objectives, available means, relationship between means and objectives, alternative programmes, analysis of the cost-effectiveness of programmes, etc. After this, the Ministry of Finance

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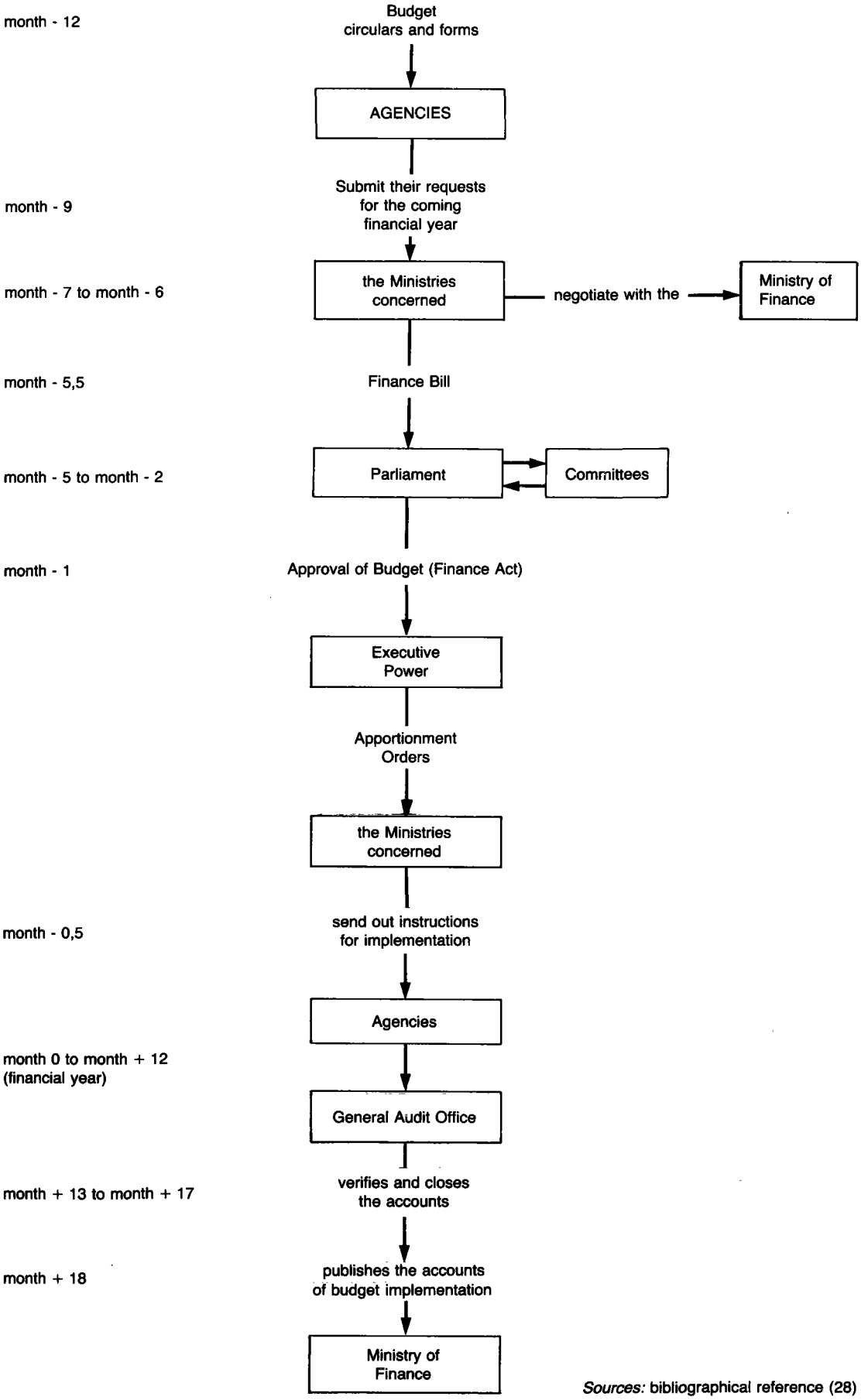
* The year is the period in which all seasonal variations cancel each other out.

** Minimum appropriation necessary for the continuing operation of public services as approved by Parliament the year before.

Figure IX - BUDGET TIMETABLE



Sources: bibliographical reference (28)

prepares the final draft of the budget together with the various documents which make up the finance bill. Figure X illustrates a possible decision-making procedure for a ministry's annual research budget.

8.5.2 Examination and adoption of the budget

232. The examination and adoption of the budget, at first by the Cabinet and later by Parliament, is a vital stage in the budget process whose details vary with the political system of each country. As a rule, the finance bill is submitted to Parliament three to five months before it is due to come into force. The Parliament sends it to be considered by several parliamentary committees, the most important being the Finance Committee, and can call certain ministers for questioning about their ministry's requests for appropriations.

233. The Parliament must vote before the financial year in question begins and must not introduce amendments which create or increase expenditure without at the same time making proposals for creating or increasing a source of income.

234. The ways and means budget and, where there is one, the programme budget may, depending on the country, be covered by a single Act or by several separate Acts, each corresponding to the budget or a ministry. Once the Finance Act has been voted, the government issues executive orders apportioning and distributing the budget lines in time and space together with the relevant budgetary identification codes. The budget is then ready for implementation.

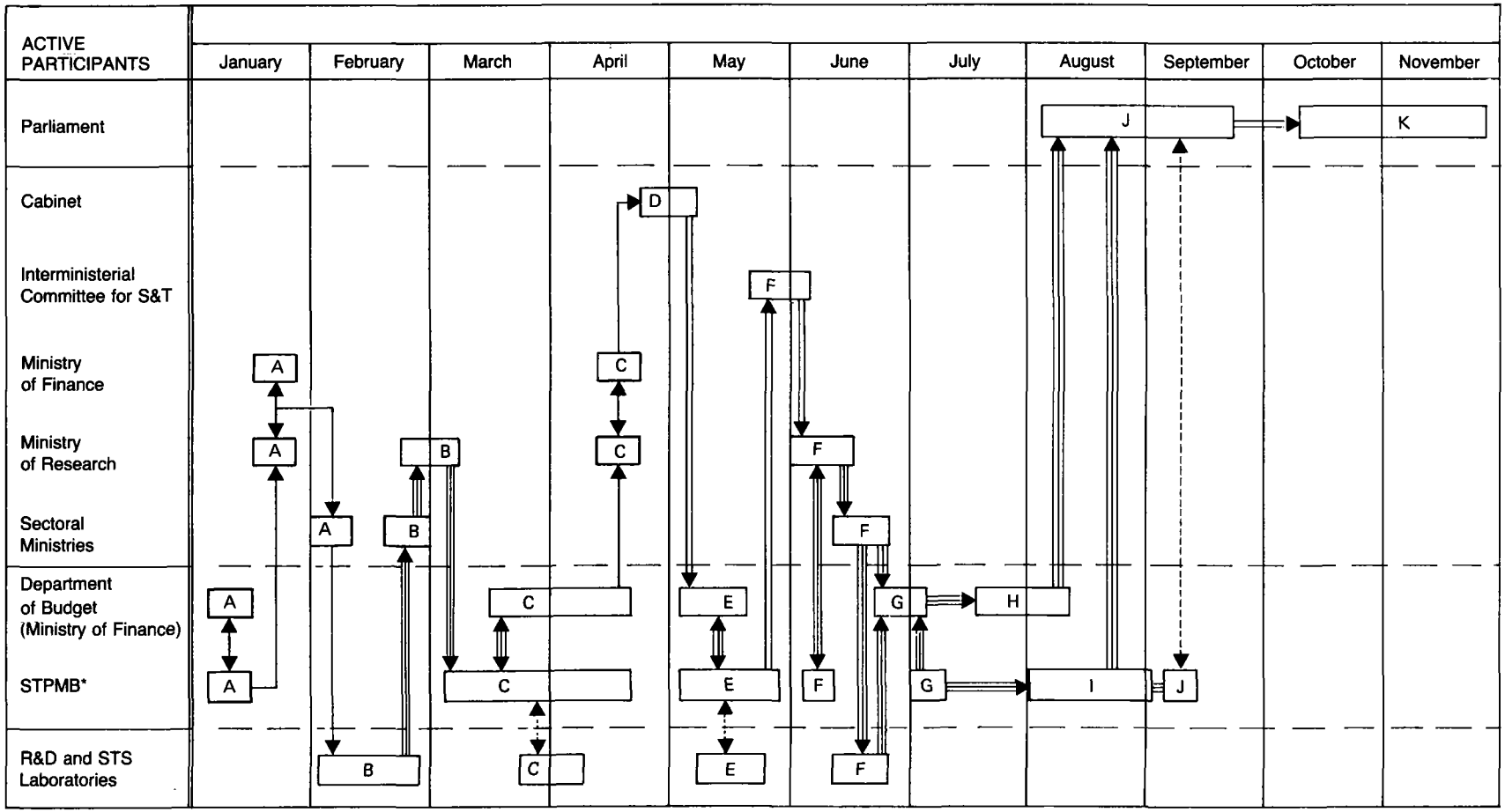
8.5.3 Budget implementation and control

235. Budget implementation and control obey the rules of public accounting. The procedure for employing budgetary appropriations passes through four phases - obligation, liquidation, approval of payment and payment - which are subject to a series of controls:

- an *ex ante* control before funds are obligated;
- an *ex post* control at the time the payment is made;
- an overall *ex post* control after the Finance Act has been implemented.

236. A legal commitment is the act whereby a public body creates or recognizes a commitment on its part giving rise to an expense. This may arise, for example, from a contract, a written agreement, an order for goods or services, or from a decree or executive order concerning the appointment of a civil servant. The obligation of funds is the book-keeping equivalent of the legal commitment (i.e. the corresponding sum is frozen in the accounts). In many countries, an operation cannot begin without the preliminary sanction of the comptroller. He is an official acting under the authority of whatever body is responsible for the control of public accounts (Ministry of Finance, *Inspection des Finances*, Audit Office, etc.), who does not examine the usefulness or advisability of the expenditure but solely its propriety from a budgetary and administrative point of view. In addition to this *ex ante* control by the comptroller, the obligation of funds is often preceded by a series of so-called consultative operations carried out by specialized ministerial committees concerning State contracts.

Figure X - EXAMPLE OF A BUDGET PREPARATION PROCEDURE FOR S&T



Approximate length of time involved
Interaction or delivery of a document
Consultation
Overall appropriation
Overall appropriation and principal courses of action
Detailed breakdown
*STPMB Science and Technology Policy-Making Body

A Budget circulars and forms
B Requests for funding
C Processing of renewable appropriations
D Amount of renewable appropriations and deciding on priorities for new appropriations
E Processing of new appropriations
F Amount and distribution of total budget
G Details of operations envisaged
H Complete draft budget
I Descriptive report
J Consideration by parliamentary committees
K Discussion and vote.

237. The purpose of liquidation is to check the validity of the debt and to determine the exact sum owed. This is done by the accounts officers in each ministry.

238. The approval of payment is the administrative and book-keeping act whereby the accounts officer, in following the conclusions of the liquidation, instructs the paymaster to pay the debt of the public body concerned.

239. Payment is the act whereby the State discharges its debt by paying the sum owed. This is done by a public accountant who keeps the accounts of State transactions in accordance with the system of national accounts.

240. When the financial year has ended, the Audit Office carries out an overall *ex post* control of the implementation of the Finance Act, the findings of which are set out in a government report to the Head of State and laid before Parliament. This report is usually presented two years after the end of the financial year.

TO SUM UP:

- the way in which the object of the authorized expenditure is identified in the budget line determines the type of budget, how advanced it is, and its legal, book-keeping, economic or policy-oriented character;
- the programmes in a functional programme budget are arranged in accordance with a programme structure based on a functional classification;
- this type of budget facilitates budgetary negotiations and arbitrations by supplying the information needed to gauge how far it is consistent with the development plan and strategy;
- it makes it possible to prepare and implement horizontal or multi-institutional programmes;
- lastly, in addition to traditional book-keeping controls, it makes it possible to check the effectiveness of programme management and of a programme's achievements.

Part III

The functional budgeting of science and technology

Having examined both the case for an explicit S&T budget and the decision-making process in which the S&T budget should be integrated, the third and final part of this manual deals with the introduction of functional S&T budgeting. The lessons learned from an examination of the different national situations regarding S&T budgeting are applied in recommending methods, procedures and instruments for the establishment of a programmatic budget of S&T containing a budgetary indicator for S&T which shows directly the total amount of public appropriations assigned to S&T by reference to those assigned to other fields, and which makes it possible to obtain a direct reading of the institutional distribution as well as of the object of these appropriations. This third part of the present manual now sets out in a succinct manner the various operations which have to be carried out in order to programme S&T in a multi-annual perspective which links up the Plan and the Budget. Finally, the reader is offered a number of remarks concerning the drawing up and the use of functional classifications.

CHAPTER IX — NATIONAL SITUATIONS REGARDING THE BUDGETING OF SCIENCE AND TECHNOLOGY

INTRODUCTION

241. Taking into consideration our description of the distinctive features of the State budget, this chapter examines the various current national situations in regard to S&T budgeting. It looks at the content of and ways of identifying the budget lines devoted to S&T in the general State budget and at the main types of S&T budget in actual use. This is in part based on a Unesco survey, carried out in 1977 and 1978 in Member States in Europe, North America, Latin America and the Caribbean (5 & 6). It should be made clear that, in view of the novelty of this study, the wide variety of budgetary structures, procedures and terms employed, and the shortage of documentation, the detailed findings of this survey cannot be regarded as entirely reliable. In this chapter, the figures giving the number of countries corresponding to a given situation should be regarded as no more than a rough indication. The overall findings, however, offer a representative picture of the general situation as it stands today.

9.1 Identification of budget lines devoted to S&T in the general State budget

242. The budget line (see Section 8.3.1) is the basic unit of information which makes it possible to perform all the necessary budget analyses. It is thus clearly essential for the State budget to contain budget lines almost exclusively concerned with S&T activities so that the total amount, object and apportionment between institutions of S&T budgetary appropriations can be identified.

243. At least 28 of the 33 countries* replying to the Unesco survey produce budgets with budget lines, 90% or more of whose operations concern S&T. Where the other 5 countries are concerned, only a lack of precise information and the

* 10 in Latin America, 2 in North America, 4 in Eastern Europe and 17 in Western Europe.

fact that the questionnaire proved unsuited to certain methods of financing R&D has prevented us from offering a valid opinion on this point (6). Taking available international statistics on S&T into consideration, it may be confidently asserted that the budgets of almost all countries, developing and developed, contain lines of this kind.

244. However, the fact of knowing that such lines exist without the ability to identify them explicitly is of little use for the preparation of a real S&T budget. Only 15 of the 28 national budgets containing budget lines for S&T identify these lines as such by means of a specific code or acronym. In the 13 other cases, preparation of an S&T budget would require a new or modified budgetary classification to make it possible to identify, by one or more codes, the budget lines concerning S&T or, alternatively, would require the setting up of special channels of information for S&T in addition to the normal budgetary information system (see Sections 9.2.2 and 9.2.3).

245. For the specific S&T code or symbol in the above 15 national budgets, 6 countries use a functional (F) budgetary classification and the other 9 an institutional nomenclature (I), an economic classification (E) or an *ad hoc* budgetary code. When an institutional nomenclature is used, the S&T activities financed by the State budget are usually grouped together (vertically) under the responsibility of a single central government agency - a Ministry for instance - which is contrary to the horizontal character of many of these activities, and gives rise to friction with the so-called "sectoral" Ministries. In the case of an economic classification, S&T is usually regarded as a sub-division of intangible capital investment - a debatable practice as we have seen (see Section 8.4.3), especially since operating expenses in R&D remain unidentified. The last case represents a form of processing peculiar to S&T, the budget lines of which may, for instance, be grouped together within each ministerial budget under an *ad hoc* "S&T" category outside the budgetary classifications used, which makes impossible any comparison between S&T appropriations and those assigned to other fields.

246. It may surprise the reader that only 6 countries use a functional classification to identify their S&T budget lines, even though such classifications appear to exist in 26 of the 33 countries surveyed. In certain cases (at least 5 countries) for a variety of reasons the existing functional classification is not used to carry out an overall budget analysis in the form of an F/I recapitulatory table (the reasons include restricting use to major inter-institutional programmes, a marked institutional slant that renders such a table pointless, budgetary procedures that are ossified or being updated, etc.). In others, it would be impossible to establish a complete S&T budget by means of this classification because the S&T category (or categories) is either missing (9 out of 29 countries) or covers only a small proportion of S&T activities, e.g. fundamental research alone, or only certain specific fields of R&D (15 out of 26 countries). In some countries, several of these reasons may apply simultaneously.

9.2 The main types of S&T budget in use

247. The type of S&T budget used by a given country depends on the presence or absence of a code permitting the identification of budget lines devoted to S&T and on the classification to which this code belongs. The general analysis of budgetary resources allocated to S&T activities can be integrated with the general State budget or presented as a special composite budget and can be carried out before *(ex ante)* or after *(ex post)* adoption of the Finance Bill by Parliament, either in respect of the appropriations authorized (i.e. before

implementation of the budget) or in respect of the expenditure obligated (after implementation of the budget). All these situations, which are described below, can be summarized as follows:

(a) explicit S&T budget integrated in the general State budget (GSB);

(b) explicit S&T budget, drawn up specially and appended to the GSB;

(c) *ex post* compilation of S&T appropriations;

(d) *ex post* compilation of actual expenditures on S&T.

9.2.1 The integrated S&T budget

248. The use of a functional classification containing S&T as a fully-fledged (i.e. first-level) category with the same status as other functional categories like education, health or communications, makes it possible to produce an explicit S&T budget integrated into the general State budget incorporated in the Finance Bill laid before Parliament. In this case, the general budget contains a ways and means budget supplemented by a programme budget broken down by function (i.e. a functional programme budget, see Section 8.4.2). This type of budget includes recapitulatory tables which cross-tabulate these functions, sub-divided into programmes, with institutions (F-P/I), economic categories (F-P/E) or nature of expenditure (F-P/N). These functional tables allow direct reading of the total amount, object and apportionment of budgetary appropriations allocated to S&T activities. Besides these comprehensive tables, more detailed partial tables for each function and its related programmes - and thus for the S&T function too - are often included with the Finance Bill documents. Figures VIII and XI illustrate an explicit S&T budget integrated in the general State budget in the form of F/E and F/I recapitulatory tables.

249. Of the 6 countries which, as we have seen, identify their S&T budget lines by means of a special code based on a functional classification, only 4* possess a real S&T budget integrated into the functional programme presentation of their general budgets. By contrast, the other 2 countries** employ a functional classification in which S&T is not a fully-fledged (i.e. first-level) category but a second-level sub-category, and sub-categories do not generally appear in such recapitulatory analysis tables, but permit the construction of a special S&T budget (see Section 9.2.2).

250. In countries with an integrated S&T budget, the usual method of allocating S&T budgetary appropriations should be neither to group all S&T activities together under a single ministry which would then finance and administer them, nor to split the activities between ministries responsible for fields other than S&T, but should be something between the two. The administration of S&T appropriations is left in the hands of ministers or agencies whose functions, from a systemic point of view (see Section 10.2), lie upstream or downstream of S&T so as not to cut the S&T function off from other State functions, especially the education function and the economic functions related to the production of goods and services. For budgeting

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* Argentina, Colombia, Netherlands and Norway, but some promising experiments are underway in other Latin American countries.

** Brazil and Spain.

Figure XI - THE INTEGRATED S&T BUDGET

Recapitulatory table by function and by institution of the general State budget contained in the Finance Act.

	— FUNCTION (F) programmes	INSTITUTION (I)	Total
	1 ... 2 ... 3....		
S&T budget	4 S&T programmes	institutional distribution	
	5 ...		
	Total		Budget TOTAL

Figure XII - THE SPECIAL S&T BUDGET

Principal recapitulatory table of the general State budget contained in the Finance Act.

— NATURE of expenditure (N)		INSTITUTIONS (I)	Total
Current			
Capital			
Total			Budget TOTAL[1]

Special composite table for S&T presented in a document appended to the Finance Act.

Special functional grouping	INSTITUTIONS (I)	
S&T	institutional distribution	Total for S & T[2]

N.B. Total[2] is included in the TOTAL[1].

purposes, on the other hand, they are grouped together functionally by means of the general budgetary information system and the standard machine-processing techniques of the Department of the Budget. They are then processed and apportioned between ministries by the central government agencies responsible for S&T policy, in particular the National S&T Policy-Making Body (STPMB) and, when there is one, by the inter-ministerial S&T committee (see Section 4.1 above and Figure X), both acting in conjunction with the Ministry of Finance. The individual ministries concerned do not negotiate directly with the Ministry of Finance, though they are consulted at each stage of the budgetary procedure, but intervene chiefly at the beginning of the process to determine the amount and object of their requests, and at the end to administer the funds allocated to them. A similar procedure should be followed for the other social functions assumed by the State.

251. Generally speaking, this integrated budget covers all S&T activities in the broad sense, namely, the general administration of S&T, the training of future research workers, all fields of R&D, and STS* (see below, Section 10.2). As we shall see, this is not usually the case with the other types of S&T budget.

9.2.2 The special S&T budget

252. The use of a functional classification which includes S&T as a second-level category in all State functions, or of a specially-designed classification or even a special analysis, makes it possible to draw up an explicit S&T budget, drawn up specially and separated from the general State budget; this S&T budget, which is presented in a document appended to the Finance Bill laid before Parliament, is discussed in Parliament and then, if necessary, voted. It is a real S&T budget that allows a direct reading of the total amount, object and institutional distribution of the budgetary appropriations allocated to national S&T activities. Figure XII shows how this type of budget is presented.

253. 9 of the 33 countries replying to the survey have a special S&T budget, 1** of the 6 countries using a functional classification for the identification of budget lines allocated to S&T (here a second-level category, 3*** of the 9 countries using another form of classification (see page 118, paragraph 2), and 5**** of the 13 countries not coding these budget lines.

254. The techniques involved in a special composite S&T budget call for different budgetary procedures, information channels and machine-processing from those employed for other areas of the general State budget. They usually lead to additional costs too. When the annual budget is being drawn up, each ministry negotiates with the government the total amount of appropriations, with the exception of those for S&T, to be allocated to it. Its S&T appropriations, grouped together with those for other ministries, are negotiated separately at inter-ministerial level by the STPMB, the Finance Minister and the government. After the special S&T budget has been approved by Parliament, these appropriations are distributed among the various ministries for administration (see above, Figure X).

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* STS stands for Scientific and Technological Services.

** Brazil (40) (Spain also has a functional classification permitting this type of budget).

*** Austria, France (41) and Portugal.

**** Belgium, Finland, Ireland, Poland and the United Kingdom.

255. This method of budgeting which, like that employed for the previously-mentioned integrated S&T budget, represents a measure of inter-ministerial action, has a number of specific drawbacks:

- the STPMB must have special budgetary information channels for S&T and the corresponding facilities for machine-processing;
- preparing budgets of this type takes longer and costs more;
- this budget, also known as the "research envelope" (41), often includes only R&D proper and even then not all of it, since part of the research effort generally falls outside it. University, space or military research, for example, are sometimes given separate treatment;
- this type of budget often includes only the capital and current expenditure which is not to do with personnel. They continue to be covered by the sectoral budget which the minister concerned negotiates directly - without joint inter-ministerial action - with the Ministry of Finance;
- inter-ministerial co-operation is not difficult and not concerned with the harmonious integration of the S&T function with other State functions on the input or output sides, as it is not possible to make direct comparisons between these functions.

9.2.3 The *ex post* compilation of S&T budgetary appropriations

256. It is possible, at the beginning of the financial year but after the Finance Act has been voted, to see what budgetary appropriations have been allocated to S&T in each ministry with a view to grouping them together in a summary report. Although it is sometimes called an *ex post* S&T budget, this report is not a real S&T budget serving overall S&T policy as it has not been discussed and voted as such by the government and the Parliament. Even though such compilations are not a form of inter-ministerial co-operation they may improve the co-ordination of the implementation of the S&T activities authorized.

257. Two* of the 33 countries replying to the survey produce a compilation of appropriations allocated to S&T in the Finance Act.

9.2.4 The *ex post* compilation of actual budgetary expenditure on S&T

258. Lastly, after implementation of the Finance Act, it is possible to carry out a statistical analysis of actual expenditure on S&T during the financial year. Statistical compilations of this kind may be undertaken by the national statistical bureau by means of an analysis of the national accounts or a special survey of public institutions, or by the STPMB aggregating the data gathered from S&T units as part of the survey of national scientific and technological potential (18). In accordance with the Recommendation concerning the International Standardization of Statistics on Science and Technology (30), most countries produce this type of *ex post* compilation, those with a real S&T budget ("integrated" or "special") in order to monitor its implementation and prepare the next budget, and those

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* Canada and the United States (42).

without one in order to facilitate international comparisons and keep an eye on how government efforts to promote S&T develop from year to year.

9.3 The situation of government public establishments undertaking scientific and technological activities

259. Two problems may hinder the accurate evaluation of budgetary appropriations allocated to S&T:

(i) the first problem arises from the general transfers to autonomous public institutions which carry out S&T activities (see Section 8.2). In the particular case of universities, since a budget line can only contain a single functional code, these transfers will be classified under the "Education" function. The evaluation of the funds allocated to S&T will thus err considerably by omission and the margin of error can only be reduced if university expenditure is broken down into "Education" and "S&T" (see Section 10.3.3(a)). General transfers are typical of countries whose autonomous public institutions are not integrated into the institutional nomenclature of the State budget. All the 13 countries with a real S&T budget ("integrated" or "special") include those institutions mentioned by name in this budget, but very few* break down university expenditure into expenditure on education and expenditure on S&T (45);

(ii) the second problem concerns the independent resources of these same institutions (see Section 8.2). If they are not individually identified in the institutional nomenclature or if the budget does not take this type or resource into consideration, here again evaluation of the funds allocated to the S&T function will be subject to a fairly large margin of error (see Section 10.3) which can only be corrected outside the general budgetary procedure by means of alternative information channels that permit identification of this type of resource (the survey of national scientific and technological potential, for instance). Only 4 of the above 13 countries include the independent resources of autonomous public institutions in their budgets.**

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* Argentina, and perhaps some other countries.
** Argentina, Belgium, Colombia and Portugal.

TO SUM UP:

- an examination of the situation in various countries shows that:

  (a) though virtually all the countries incorporate, in their budgets, budget lines devoted to S&T, only a few of them identify these lines by means of a code specific to S&T;

  (b) only a few countries have a really explicit S&T budget, whether it be integrated into the general State budget, or drawn up specially and annexed to the latter for discussion by Parliament;

  (c) an *ex post* compilation of either budgetary appropriations foreseen for S&T (i.e. after the parliamentary vote and before the fiscal period) or budgetary expenditure earmarked for S&T (i.e. after the fiscal period) cannot be said to constitute a real S&T budget;

- the preparation of an integrated or special S&T budget enables a general discussion to take place concerning the total S&T effort to be made by the nation and how it can be directed to serve the objectives and priorities chosen for the society and its economy;

- the integrated S&T budget and, to a lesser extent, the special S&T budget, provide a safeguard to protect S&T activities, which have more to lose from cuts in expenditure than other activities because returns are indirect and long term, all budgetary modifications concerning S&T needing in principle to be negotiated with the STPMB;

- only the integrated S&T budget uses the same budgetary procedure, information system and machine processing as the other functions covered by the general State budget;

- only the integrated S&T budget facilitates co-ordination of the S&T function with the education function and the economic functions related to the production of goods and services;

- the special S&T budget appears to be more common in developed countries with a traditionally strong S&T potential, whereas the integrated S&T budget seems more appropriate for developing countries whose budgetary procedures have not yet become ossified by the burden of tradition.

CHAPTER X — CHOICE OF BUDGETARY INDICATOR FOR SCIENCE AND TECHNOLOGY

INTRODUCTION

260. Starting from the process of preparation of the State budget as set out above, and from the experience gained in various countries in respect of budgeting for S&T, the present chapter will examine the type of budget which will make it possible to furnish before the event not only a budgetary indicator for S&T showing directly the total amount of public appropriations allotted to S&T by reference to those allotted to other fields, but also a direct reading of the institutional distribution and the object of these appropriations. Having discussed the characteristics of the budget recommended for S&T, and the activities which such a budget should cover, we shall now examine the precision of the indicator contained in this budget and the way it complements the other instruments of *ex post* analysis.

10.1 Characteristics of the budget recommended for S&T and instruments to be used for its preparation

261. The foregoing makes it possible to affirm that, in order to be truly "Governmental S&T policy in action", the S&T budget should:

(a) indicate explicitly and in detail not only all the activities which the Government commits itself to carrying out or supporting in order to put S&T to the service of endogenous and global development, but also the means available for use and the objectives to be obtained for this purpose;

(b) be discussed and approved by Parliament;

(c) enable all citizens of the nation to gauge with facility the State's effort in favour of national scientific and technological development.

Let us first examine the main characteristics of the S&T budget recommended, before turning thereafter to the instruments to be used for its preparation.

10.1.1 Principal characteristics of the budget recommended for S&T

262. To fulfil this function, the S&T budget should possess a number of characteristics of a legal, accounting and political nature. Bearing in mind earlier observations on S&T policy and the State budget, it should:

(i) make possible the explicit identification of all budget lines relating to S&T in the State budget, whether this is the general budget or its appended budgets;

(ii) cover all activities connected with the national S&T policy, whatever their type, field or objective;

(iii) be contained in the Finance Bill laid before Parliament;

(iv) contain a budgetary indicator for S&T giving directly the total amount of budgetary appropriations foreseen for S&T, wherever the budget lines concerning S&T are to be found in the general State budget. This indicator should be precise and reliable and should react immediately to any variation in the total as well as in the structure of the budgetary appropriations allotted to S&T, which is not the case as regards an indicator based on any *ex post* evaluation (statistical compilation);

(v) permit direct comparison of this total amount with the amount of appropriations for other areas of the State budget;

(vi) provide a direct reading of the institutional distribution of this total amount;

(vii) provide a direct reading of the distribution by nature and the economic effects of the expenditure covered by this total amount;

(viii) permit an easy estimation of the distribution by objectives and by programmes of this total amount;

(ix) provide for due consideration of the S&T programmes and sub-programmes set forth in the national development plan, especially multi-institutional, intersectoral and horizontal programmes;

(x) provide for the complementarity of *ex ante* evaluations (budgetary forecasts), evaluations in progress (administration of budget) and *ex post* evaluations (statistical analysis) of S&T appropriations, and hence for links between S&T budgeting, the system of national accounts (43), the survey of national scientific and technological potential at the S&T executing unit level (18), and national statistics relating to aggregate expenditure on S&T (30);

(xi) not require special budgetary information channels for S&T, i.e. it should use the Department of the Budget's general budgetary information system;

(xii) be drawn up by means of computer processing of budgetary data, using the Department of the Budget's current software and hardware;

(xiii) not lead to additional costs for its operation;

(xiv) not require changes in the budgetary procedures laid down by law.

Characteristics (i) to (x) concern the relevance of the indicator whereas (xi) to (xiv) concern its feasibility.

10.1.2 Choice of the instrument to be used for preparing the S&T budget: the S&T function

263. Taking into account the characteristics of the general State budget (see Sections 8.2, 8.3 and 8.4) and those of the S&T budget recommended, the tasks of identifying the budget lines concerning S&T, and of bringing them together in budgetary tables for inclusion in the general State budget, can only be performed by means of a budgetary classification which meets the criteria of: homogeneity, exhaustiveness, internal equilibrium and stability over time, mentioned in Section 8.3.2; being used or utilisable, in the analytical recapitulatory tables figuring in the State budget; and being such that it can incorporate a specific first-level category for S&T. The horizontal character of scientific and technological activities makes it impracticable to have recourse to either an institutional nomenclature (I) or a classification by branches or sectors of economic activity (B).

Secondly, neither the nature of the goods and services covered by the expenditure nor their economic effects can serve as a criterion for identifying expenditure on S&T and distinguishing it from expenditure on education, health or defence. In consequence, the economic classifications, whether aggregate (E) or non-aggregate (N) are no use for this purpose.

264. Bearing in mind our observations on the "innovation" or "S&T" function (Section 1.3) and on the functional programme budget (Section 8.4.2), it would seem that only the introduction of a first-level category for S&T into the functional classification makes it possible to establish an S&T budget which satisfies all the foregoing conditions.

265. In this case, the general State budget will include recapitulatory tables showing the breakdown of all the appropriations ascribed to the programme. These will be set out (in lines) by function, and (in columns) by institution, so far as concerns Table F-P/I; by economic impact, so far as concerns Table F-P/E; and by the nature of the expenditure involved, so far as concerns Table F-P/N (see page 107, (b)). An explicit S&T budget is integrated into these Tables, since:

(a) this budget is made up of the line corresponding to the functional category of S&T;

(b) the budgetary indicator for S&T is shown directly by the total of this line which may be compared with the total of each of the other lines, that is to say of each of the other functions;

(c) the institutional distribution, the economic impact and the nature of the expenditure authorized for S&T may be read directly within this line.

Such explicit and integrated budgets exist for the other functions like education and health.

266. We have called this approach to the budgeting of S&T activities "the integrated S&T budget" (see Section 9.2.1) and it is illustrated by Figures VIII and XI. Apart from being straightforward and cheap to introduce, the integrated S&T budget has two important advantages over the special S&T budget, i.e. a composite budget specially designed for S&T (see Section 9.2.2):

(a) in the framework of a strategy based on a systemic approach of development, it enables the S&T function to be co-ordinated with other political functions on both the input (i.e. education) and output sides (i.e. production of goods and services) (see Section 10.2);

(b) where democracy and the relationship between science, technology and society are concerned, it encourages when necessary the widespread dissemination of the government's S&T policy since the F-P/I recapitulatory table - one of the most important tables in the Finance Act - is usually commented upon and thoroughly analysed by newspapers and other publications when it comes before Parliament for discussion.

267. What is involved here is not just a technical decision but a strategic and political choice concerning the adoption of a functional approach to government decision-making (see Section 7.2.4). It also concerns the acknowledgement of the fact that the S&T function is bound up with the role of the innovation-heritage (or innovation-conservation) dialectic in ensuring the survival and overall endogenous development of the nation (see Section 1.3). To make S&T a fully-fledged political function on the same level as education, health or communications is a promising and advanced approach which has already been adopted or tried out in certain countries, particularly in Latin America (see Section 9.2.1) (5, 45 & 47).

268. This approach, however, still has to overcome the hesitation of certain decision-makers who raise a whole series of objections, some of which are merely excuses for their refusal to take a new look at existing situations while others, like the two below, deserve a reasoned answer:

(i) S&T is only an input to other functions and therefore has no existence in its own right;

(ii) unlike education or health, there is nothing which explicitly justifies the government assuming an S&T political function on behalf of society as a whole.

269. As far as the first objection is concerned, it can be easily answered that a large proportion of S&T activities have a certain autonomy compared with other functions assumed by the State. Fundamental research is not an input to other functions, except in the long run. Even applied research cannot be considered, within the annual time framework of a budget, as an input to other functions. In addition, within the complex socio-economic system that a nation is, there is an interdependence among functions, and functions such as education, communications or the development of energy are equally inputs to other functions.

270. As the second objection has already been dealt with in Section 1.3, we need only remind the reader that, just as there exists a right to education or to health, so too there is a right to "variety", of which S&T is the most important source. "Variety" - a term which embraces the notions of "diversity", "difference" and "change" - is an essential condition of

mankind's survival and freedom, in particular the freedom to choose the best ways to cope with the multiple problems and challenges of today and tomorrow. Indeed, "the function of science has always been to offer new opportunities for choice".* In this respect, research and experimental development (R&D) may be regarded as a normally risk-free trial-and-error process which enables us to extend and diversify our knowledge and technical resources and thus multiply the possibilities of change which are necessary for human emancipation and the development of society. The State has therefore a duty to promote this right, and to make of R&D a controlled generator of variety and of innovation.

271. For all that, it is obviously always possible to advance theoretical arguments against this approach, but experiments currently being conducted in certain countries are demonstrating its practical advantages and justifying its adoption, particularly by developing countries, which consider S&T to be one of the vital factors of their development.

10.2 Coverage of the S&T function

272. In order to define, in comparison with other functions, the activities covered by the S&T function, i.e. the activities towards which science and technology policy as pursued in the large majority of countries is directed, a systems approach once again proves useful. On the input side of the S&T function is the education function while on the output side one finds the various economic functions related to the production of goods and services in the broadest sense:

- the education function produces the skilled manpower (storage and dissemination of existing knowledge) needed for both the S&T and other functions);
- the S&T function produces new knowledge and finds new applications for existing knowledge, and
- the functions related to production make use of new and existing knowledge and applications to optimize the production of goods and services.

273. Seen from this point of view, the S&T function covers four groups of activities, that is, one group to give direction and three executive groups. Their respective roles, based on the actual practices of some countries and on the "Recommendation concerning the International Standardization of Statistics on Science and Technology"** are:

- planning and general administration of S&T, which covers the strategic and organizational activities of the S&T function;

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* Quoted from the opening address to the Bernard Gregory Symposium on "Science and Decision-Making", (Unesco, Paris, 1979) by Pierre Aigrain, Secretary of State for Research, France.

** Adopted by the General Conference of Unesco at its twentieth session, Paris, 27 November 1978 (30).

- R&D training of scientists and technologists, which covers activities concerned with the transition from the education function to the S&T function;

- Research and experimental development (R&D), which is the hard core of the S&T function;

- Scientific and Technological Services (STS), which comprise R&D support services as well as dissemination activities aimed at linking the S&T function with the economic functions related to the production of goods and services.

274. No doubt this model over-simplifies the actual situation but it both facilitates identification of the corresponding budget lines while cutting coding errors to a minimum, and it highlights the budgetary levers which should be operated to achieve full internal and external integration of the S&T function. Indeed, the harmonious functioning of the four groups of activities among themselves, as well as the satisfactory integration of the S&T function with other functions - particularly with the education function and the functions related to the production of goods and services - is one of the essential objectives of S&T policy.

275. Of course, the existence of the explicit indicator *(ex ante)* of budgetary appropriations for the S&T function is of tremendous help in achieving this integration. It is known, for example, that if too much encouragement is given to training people abroad without at the same time developing national R&D programmes and providing research workers with satisfactory working conditions, a brain drain is likely to result. On the other hand, if the demand and supply of locally-produced R&D gets out of balance or becomes distorted, the R&D system is likely to find itself cut off from the country's productive system and encouragement given to the importation of technology which could perhaps have been developed on the spot. If the royalties paid for imported technology become too excessive in comparison with local expenditure on R&D, the country's technological dependency will probably increase. If, therefore, the budget is to be an essential instrument of science and technology policy, the S&T function must cover all four groups of activities mentioned above and not just R&D.

The following sections examine each of these groups in detail.

10.2.1 Planning and general administration of S&T

276. The planning and general administration of S&T covers all management activities associated with the development and effective use of the national S&T potential:

- the formulation of national policies, plans, programmes and budgets concerning the overall or sectoral development of S&T;

- the design, application and evaluation of the operational mechanisms for putting these policies into effect and for the implementation of these plans, programmes and budgets;

- the co-ordination, promotion and financing of S&T operations;

- the management and evaluation of the efficiency and effectiveness of S&T operations;

- the survey and evaluation of the national scientific and technological potential;

- the preparation and application of norms and standards for S&T (e.g. the legal status of research workers);

- promotion of the application of R&D results;

- the management of technological transfers;

- studies on science and technology policy (i.e. the science of science);

- the specialized training of the manpower required for the foregoing activities, etc.

10.2.2 R&D training of scientists and technologists

277. The training of future research workers during the postgraduate stage of higher education represents the transition between systematic and formal education on the one hand and practical R&D - and sometimes STS - activities on the other. The original R&D work done by students during this phase may be described as follows:

- it adds to existing knowledge in a particular discipline and therefore concerns either fundamental research or discipline-oriented applied research (seldom mission-oriented applied research or experimental development);

- it is supervised or "sponsored" by one or more academic scientist of merit and experience recognized by the local scientific community;

- it usually constitutes the basis for theses leading to a doctorate or other recognized academic degree;

- it usually lasts at least one year, and may be much longer for the most advanced degrees.

278. This group of activities excludes training which does not lead to the higher levels of the S&T executing agencies, i.e. to the status of research worker, or the equivalent for those intending to exercise an STS activity. It does not cover, therefore, training courses for S&T administrators (classified in the previous group, see Section 10.2.1) or refresher or specialized courses, whether or not of university level, for professional staff and technicians working in industry.

279. Here, certain developing countries with a scientific and technological potential that is still very weak could, at least for a limited period of time, include under the S&T function the training of certain higher technicians responsible for the experimental development of appropriate technologies.

10.2.3 Research and development (R&D)

280. R&D is the hard core of the S&T function and the focus of the systematic and creative activities to increase knowledge and find new applications in the natural sciences, the human and social sciences, or the applied sciences. This group of activities is commonly divided into fundamental research, applied research and experimental development, but in the identification of budget lines it is unusual and generally pointless to try and draw any precise distinction between the three kinds.

281. This group does not include the systematic collection of general scientific data, normally included under scientific and technological support services (STS) (see Section 10.2.4). It does, however, include the *ad hoc* collection of scientific data with the specific purpose of throwing light on an unknown phenomenon, controlling a new situation or checking the validity of a new theory or idea.

10.2.4 Scientific and technological services (STS)

282. Scientific and technological services (44) consist of a group of routine activities related to R&D and forming an active link between R&D and the production of goods and services. From a budgeting point of view, they divide into two sub-groups:

- support services for R&D, and
- dissemination services for S&T.

(a) STS support of R&D

283. These services can call on highly qualified personnel and have considerable material resources, so are capable of undertaking R&D activities should the occasion arise. They include:

(i) testing, standardization, metrology and quality control (regular routine research work concerned with the analysis, control and testing of materials, products, appliances and processes by known methods, together with the establishment and maintenance of legal standards and units of measurement);

(ii) the routine or regular collection of general scientific data (topographical, geological, hydrological and oceanographic data; routine astronomical, meteorological and seismological observations; the charting of soils, minerals, plant life, animal life and fish; the routine testing of soils, air and water; the regular monitoring and supervision of levels of pollution and radioactivity);

(iii) scientific and technological collections, the items of which could be the object of R&D activity (science and/or technology museums; botanical and zoological gardens; anthropological, archaeological, geological collections, etc).

284. Unlike the recommendations concerning the international standardization of S&T statistics (30), the S&T function budget does not normally include the collection of data on human, social, economic or cultural phenomena since its cost is very high compared with the cost of R&D using these data. Nor does the S&T budget include prospecting for oil and minerals for subsequent exploitation since these activities are more closely associated with the production of goods and services than with the S&T function.

(b) STS for dissemination of S&T

285. The task of these services is to disseminate scientific and technological knowledge (including technological transfer) within the field covered by the S&T function (i.e. to the active participants in the S&T function, such as research workers and those responsible

for S&T policy) and outside it in the direction of the education function and the functions related to the production of goods and services. They are particularly important in developing countries whose private sector is too weak or too dominated by transnational corporations to make practical use of R&D achievements. The most common of these services disseminate S&T as know-how and as written, oral and visual information. They include:

(iv) the dissemination of S&T documentation and factual data (S&T services provided by libraries, archives, information and documentation centres; reference services, scientific congresses and symposia; S&T data banks);

(v) popularization, scientific advisory services and technical assistance (extension services for farmers and industry; bilateral and multilateral technical co-operation; day-to-day activities of engineering departments and project-study offices, which give advice on the application of scientific and managerial knowledge;

(vi) the submission and registration of patents and licences (systematic investigations of a scientific, legal or administrative nature on patents and licences, carried out in public agencies).

The study and management of technology transfer contracts are usually included in the "planning and general administration of the S&T" group of activities.

10.3 Accuracy of the functional budgetary indicator

286. National S&T policy needs an accurate and reliable budgetary indicator. In practice, however, the indicator based on the S&T function may produce inaccurate values. Being a totalizer, internal errors or mistakes in addition are unlikely, especially if the budgetary data are processed and checked by computer. External errors due to faulty coding may be detected by detailed analysis, during the financial year, of the operations covered by each budget line. This will give a reference value which can then be compared with the figure shown by the budgetary indicator and can be used to make corrections, especially during the two or three financial years after the budgetary indicator has been introduced. When a new identification or classification procedure is applied without preparing the ground beforehand, errors of coding may ensue, with some codes being left out or, more rarely, with too many being included, the chief cause being the inaccurate labelling of certain budget lines. The most common sources of error are studies, advisory services and technical assistance, general subsidies and deliberate errors.

10.3.1 "Studies"

287. The budget lines entitled "studies" often concern operations which generally use well-tried methods (e.g. certain economic computation or multiple criteria methods described in Section 7.1.3) to analyse technical, economic and social situations in order to prepare the way for decisions. The lines

in question cover, for example, feasibility studies and simulations incorporated in the preliminary plans for a physical infrastructure project. Only studies which include a high proportion of innovation should be classified in the R&D group of activities under the S&T function, e.g. models that require the development of new methods.

10.3.2 "Technical advisory services and assistance"

288. Budget lines headed "technical advisory services and assistance" cover operations whose purpose is to provide advisory services to assist or inform government departments or public or private production firms. These operations may be undertaken by certain public institutions and by regional and international co-operation organizations. Here again, the criterion is the proportion of technological innovation included, regardless of the beneficiary, which might be a single firm or the nation as a whole. Generally speaking, assistance with management or administration should not be classified under the S&T function. On the other hand, budget lines relating to international programmes of scientific and technological co-operation, including contributions to regional and international organizations, bilateral agreements or the local counterparts of these programmes, should be entered under the S&T function, in the R&D or STS (dissemination of S&T) group of activities, as appropriate.

10.3.3 "General subsidies"

289. Budget lines entitled "general subsidies" usually cover a number of State functions and include:

- subsidies to universities for the S&T and education functions;
- subsidies to industrial or commercial government public establishments or to private firms on behalf of the S&T function and the economic production functions;
- subsidies to learned societies and associations of engineers.

(a) General subsidies to universities

290. The fact that university subsidies are not broken down - either at the national level or in the universities themselves - into a "teaching" budget and a "research" budget is probably the most important source of errors of omission since these appropriations usually represent a non-negligible part of public funds devoted to S&T. As the teaching budget is almost always larger than the one for research, the public funds for universities are classified under the education function in order to reduce the relative error due to classification. This lack of breakdown, a consequence of the rule that universities should be autonomous and of inherent weaknesses in the ways and means budget, thwarts all attempts - however hesitant - to pursue an active S&T policy.

291. In the case of special S&T budgets (i.e. *ex ante* composite budgets, see Section 9.2.2), a temporary solution is to use distribution

keys based on the average proportion of their time which teachers spend on research. The result could, for example, be as follows:*

- expenditure on staff (by group of disciplines):
  - 65% of the time of teacher-researchers in the natural sciences is devoted to R&D;
  - 30% in medecine, pharmacy and dentistry;
  - 10% in humanities and law;
- operating expenditure other than on staff:
  - 20% (average of all disciplines);
- capital expenditure:
  - 30% (average of all disciplines).

292. But this solution is impossible, even as a temporary measure, for an S&T budget integrated in the general State budget (see Section 9.2.1) because the budget lines in the general budget cannot be divided up on a proportional basis. The only way out is for the budget of each university to be a real programme budget, distinguishing the education function from the S&T function, prepared by the science council of each university, based on detailed proposals of teacher-researchers, and drawn up in conjunction with the STPMB. This approach would solve the problem of obtaining automatic statistical data on university research programmes.

(b) General subsidies to public or private enterprises

293. The budget lines containing the general subsidies accorded to public or private enterprises for technological innovation or technological transfer cannot be broken down with any accuracy into the S&T function and the production functions.

294. It will be observed that technological innovation is not mentioned explicitly in the definition of S&T function activities (see Section 10.2). Certain international authorities, however, have adopted definitions which include "innovation" as an activity distinct from R&D and STS. When regarded in the narrow sense as technological innovation, it is sometimes defined as the creation of a new product or process and the effort to ensure that new ideas and inventions are used effectively in the national economy. This would cover, *inter alia*, activities relating to technological transfer. The fact that technological innovation is considered as a self-contained component within the S&T function when it partly overlaps with R&D and STS is a typical consequence of an institutional rather than functional standpoint since it enables certain subsidized institutions and enterprises to avoid dividing their programmes

* The figures correspond to those used in the distribution keys of the 1980 "research envelope" in France (41).

into scientific operations and industrial or commercial operations. There is either a scientific activity aimed at developing, improving or adapting products or processes, therefore counting as part of the S&T function, or an economic activity consisting of the marketing and industrial organization of a product or process which is new to that particular country and therefore coming under the functions related to the production of goods and services. Subsidies to institutions and enterprises for technological innovation or technological transfer must accordingly be broken down to reflect the scientific or economic nature of the subsidized activities and divided accordingly between the S&T function and the various functions related to the production of goods and services.

(c) General subsidies to learned societies and associations of engineers

295. The general subsidies accorded to learned societies, associations of engineers, academies of science (in market or mixed economy countries) may, even though these institutions do not as a rule carry out R&D work, be classified in the S&T function (STS for dissemination of S&T) in order to reduce the relative error in coding to a minimum. In countries with a planned economy, however, academies of science pose no problem since they devote most of their activities to R&D.

10.3.4 Deliberate errors

296. In countries with an integrated S&T budget, a possible source of error is the deliberate decision to attach budget lines involving S&T to other functions. Some public institutions - to evade the interministerial co-ordination procedure for the S&T function - might be tempted to make their requests for S&T appropriations invisible by integrating them with general appropriations for functions needing less justification (see Section 12.4). In extreme cases, the integrated S&T budget would be left with only that expenditure corresponding to fundamental research. This situation can be avoided by asking all the institutions concerned to co-operate in gradually introducing the budgetary indicator based on the S&T function and by using incentives and, if necessary, control procedures when evaluating programme effectiveness.

10.4 Complementarity of functional budgetary indicator with *ex post* statistical returns and surveys

297. It has already been pointed out that the budgetary indicator selected to identify S&T appropriations should be compatible with the national S&T statistics (30), the survey of national scientific and technological potential (18) and the system of national accounts (43).

298. Budgeting, national statistics and the survey in fact back each other up in a way which rules out any overlapping:

- the budgetary indicator is established each year on the basis of proposals from the ministries and other public institutions mentioned by name in the institutional nomenclature (the level at which institutional structures are most highly aggregated), is concerned with the forecast expenditure (appropriations) to allow for, and covers not only R&D and STS but also the general administration of S&T and the training of future research workers;

- statistical returns are made annually by all executing agencies, both public (see Section 8.2) and private bodies, are concerned with the financial side of public, private and foreign resources and actual expenditure during the preceding financial year, and cover only R&D and, when relevant, STS;

- the survey of national scientific and technological potential usually takes place at intervals of more than one year (every two or three years, for example) and covers executive S&T units* (i.e. the level at which institutional structures are the most fragmented) in the public sector and, when they exist, in the private sector, makes a detailed study of financial, human, institutional and material resources, information media and ongoing R&D projects and STS activities, but deals only with R&D and STS.

299. Each method makes it possible to gather, at different points in time, data which vary in the degree of their cohesion and vary widely in scope. Taken together, these data provide a comprehensive, detailed and active measurement of the government's efforts to promote S&T. As we saw in Chapter VI, the *ex ante* and *ex post* quantification of S&T activities make it possible to evaluate the efficiency of these activities by comparing the data supplied by the budgetary indicator with those derived from the survey and from national statistics. But if the budgetary indicator is compatible with the system of national accounts, the effectiveness of these activities can also be evaluated by measuring the impact of government S&T expenditure on the productivity of the economic sectors covered by the national accounts (46).

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* See footnote page 49

TO SUM UP:

- only introduction of a first-level category for S&T in the functional classification will make it possible to draw up, in a simple and economical way, an S&T budget lending itself to a straightforward reading of the total amount, the object and the institutional distribution of budgetary appropriations for S&T, while at the same time facilitating the co-ordination of the S&T function with the other political functions on its input and output sides, within an overall and endogenous development strategy;

- to arrive at a satisfactory internal and external integration of S&T, this function should cover the following four groups of activities: general administration of S&T, training of future research workers, R&D and STS;

- the accuracy of the budgetary indicator will depend on the willing co-operation of the institutions concerned and on the instructions given to them on how to code the budget lines headed "studies", "advisory services and technical assistance", "university subsidies", "innovation and technological transfer subsidies for public and private undertakings";

- the budgetary indicator must complement the statistical or other surveys in order to permit evaluation of the efficiency and effectiveness of the activities concerning the S&T function.

CHAPTER XI — CONDITIONS FOR, AND STAGES OF, THE BUDGETARY INTEGRATION AND PROGRAMMING OF THE S&T FUNCTION

INTRODUCTION

300. Having examined the advantages, coverage, accuracy and complementarity of a budgetary indicator based on the S&T function and obtained through the preparation of an explicit S&T budget integrated in the general State budget, we shall first describe the conditions required to facilitate the integration of the S&T function into the State budget and then describe in detail the stages and operations needed firstly to achieve this integration and secondly to programme S&T within a multi-year perspective that links the plan and the budget together.

11.1 Conditions for the integration of the S&T function in the general State budget

301. Our summary of the characteristics of the general State budget and of the budgetary indicator selected for S&T makes it possible to outline the conditions required to facilitate the integration of the S&T function in this budget. There are budgetary prerequisites, institutional prerequisites and co-operation prerequisites.

(a) Budgetary prerequisites

The main budgetary prerequisites are:

(i) there should be budget lines mostly (i.e. more than 90%) devoted to S&T activities in the general State budget;

(ii) a functional classification should be used to identify the budget lines in the general State budget;

(iii) recapitulatory analysis tables for the Finance Bill should be constructed by means of this functional classification;

(iv) the functional classification should contain a first-level S&T category and, if necessary, second-level categories for each group of activities belonging to the S&T function;*

(v) the total amount of S&T appropriations should exceed a certain threshold (e.g. 1% of the total budget) and be distributed among a sufficiently large number of institutions carrying out S&T activities (e.g. 60% to 70% of that amount to be distributed among 25% of the institutions listed in the institutional budgetary nomenclature);

(vi) the budget should be organized by programmes, the structure of which is based on the functional classification;

(vii) a computer should be used to process the budgetary data, and computer programmes to produce the functional recapitulatory tables should be available;

(viii) the budget should include both the resources of the Exchequer and the independent resources of government public establishments exercising the S&T function.

(b) Institutional prerequisites

(ix) the existence of a Science and Technology Policy-Making Body (STPMB) and of adequate machinery for formulating, implementing and monitoring such policy; and

(x) the existence of institutional machinery responsible for formulating and co-ordinating national development plans, programmes and budgets.

(c) Co-operation prerequisites

(xi) the existence of close collaboration between the national STPMB and the institutions responsible for planning and budgeting; and

(xii) the broad support and wholehearted co-operation of those institutions in receipt of budgetary appropriations for activities coming within the scope of the S&T function.

302. Only (i) and (iv) are absolutely necessary for the preparation of an integrated S&T budget but the other prerequisites will do much to ease this task. Countries wishing to introduce step by step a functional budgetary indicator for S&T should, as we shall see in the next section, consider how far these conditions have been satisfied.

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* To construct a special S&T budget, on the other hand, one must have second-level S&T categories systematically included under each first-level category of the functional classification.

11.2 Stages in the integration of the S&T function in the general State budget

303. By reason of the difficult economic conjuncture prevailing in many developing countries, the stages of progressive introduction of a system of planning, programming and budgeting (PPB) of State activities generally occur in an order which is the reverse of the cycle according to which PPB will function once that system has been introduced and has become operational. Thus:

Stages in the progressive introduction of the PPB system

	Annual		Planning,
Budgeting	- multi-annual	-	both middle
	programming		and rolling term

Cycle of PPB system once operational

The few national experiments so far undertaken with the co-operation of Unesco show that the S&T function can usually be integrated in the general State budget in four stages, each of which generally lasts one budgetary period (i.e. one year in the majority of cases).

These stages are:		Year of implementation
(i)	a feasibility study	N-2
(ii)	trial integration of the S&T function in the general State budget of year N	N-1
(iii)	achievement of greater accuracy and a start made to programming the integrated S&T budget for the year N+1	N
(iv)	annual and multi-annual programming of S&T	from N+1 onwards

304. The following sections describe the content and sequence of the operations in each stage. These are largely based on experience gained in Colombia since 1975 with the Unesco/UNDP project (COL/72/040) (47 & 48). As countries differ from each other, these operations should be adapted and even, in many cases, extensively modified to fit the national situation.

11.2.1 Stage one: feasibility study

305. The aim of the feasibility study, undertaken during the year N-2, is to see whether it is possible:

- to identify explicitly, in the general State budget for the year N, the budget lines in which over 90% of the appropriations are for S&T;

- to show, in the functional recapitulatory tables of this budget, the total amount, object and institutional distribution of these appropriations;

- to introduce by stages the multi-annual budgetary programming of all activities comprised in the S&T function.

306. If possible the Science and Technology Policy-Making Body (STPMB) should entrust this study to a small working group of STPMB officials and, if need be, outside experts. The study should cover the following main topics: the government decision-making and budgeting processes; the national scientific and technological system; the concern of the government and the scientific community in integrating the S&T function in the budget; the level of satisfaction of the conditions needed to facilitate the task in question.

(a) The government decision-making and budgeting processes

307. In Chapters VII and VIII we saw how any reform aimed at rationalizing government decisions in general or in a given field such as S&T in particular, must adapt smoothly to the government decision-making machinery, allowing for its qualities, defects and the way it might develop in the future. Since familiarity with this machinery will be particularly useful for the STPMB in its discussions with the Department of the Budget and the Ministry of Planning. it is essential for the feasibility study to make a thorough and detailed examination of:

(i) the methods, procedures and instruments of government decision-making used in the country, with special emphasis on the links between planning and budgeting.
Chapter VII deals with this point;

(ii) the situation of public institutions and their resources vis-à-vis the State budget, in particular the resources of universities.
Sections 8.2, 9.3 and 10.3 deal with this point;

(iii) the structure of the general State budget, and in particular:

- the budget lines,

- the budgetary nomenclatures and classifications used to code these lines,

- the recapitulatory analysis tables contained in the Finance Bill, and

- the types of budget used, that is, a ways and means budget whether or not supplemented by a programme budget (institutional or functional) and whether or not divided into an operating budget and capital investment budget.

This point is dealt with in Sections 8.3 and 8.4;

(iv) the preparation, approval and implementation of the general State budget, with identification of:

- active participants, particularly the roles of the Department of the Budget and the Ministry of Planning,
- procedures (consultation, negotiation, arbitration, production and transmission of documents, etc.),
- data-processing methods (the computer and computer software used),
- the budgetary timetable, and
- the documents and other products (laws, circulars, forms, outline budgets, preliminary drafts, finance bill, Finance Act, executive orders, evaluation reports, etc.).

It might prove useful to work out simplified diagrams illustrating the budgeting process along the lines of Figures IX and X.

This point is dealt with in Sections 8.5, 9.2.1 and 9.2.2.

(b) The national scientific and technological system

308. This will include a closer examination of:

(i) the form of financial support for S&T in the country concerned (sources, channels, procedures and recipients). This point is dealt with in Section 3.3;

(ii) the national S&T budgeting situation (identification and coding of the budget lines relating to S&T, type of S&T budget). The questionnaire proposed in Annex III could be used for this purpose.
This point is deal with in Section 9.2;

(iii) the institutional structures of S&T, with a view to identifying, within the national S&T system, the governing central and sectoral institutions and the executing agencies which will help prepare the S&T budget. In the case of the executing agencies, the data obtained from the survey of national S&T potential could be used.
This point is dealt with in Chapter IV.

(c) The concern of the government and the scientific community in integrating the S&T function in the budget

309. To gain the close and wholehearted co-operation of active participants in this scheme, the feasibility study should make recommendations acceptable to all concerned. Meetings should therefore be arranged with those responsible for government public establishments (universities, national State-owned R&D and STS centres), the Ministry of Finance

(Department of the Budget), the Ministry of Planning (especially if responsible for the State capital investment budget) and with the sectoral ministries and their science departments. These meetings could initially take the form of unofficial discussions to persuade key officials of the advantages of a real S&T budget, followed by a survey of official opinion based on a questionnaire and explanatory document (49). This survey would seek to obtain the opinion of the various parties on:

- the inclusion, in the functional classification of the budget, of a first-level S&T category and a sub-category for each group of activities (see Section 10.2);

- definition of the S&T category and sub-categories;

- the co-operation procedures and co-ordination machinery required for carrying out the various operations of the scheme's next three stages.

(d) The level of satisfaction of the conditions needed to facilitate the task in question

310. This involves assessing, on the basis of answers to (a), (b) and (c) above, how far the conditions enumerated in Section 11.1 actually exist and the likelihood of their being satisfied in full, in order to decide on the priority operations to be carried out at the start of the second stage.

311. After completing the feasibility study, the STPMB working group would produce a general report summing up its conclusions, examining the replies to the questionnaire and making recommendations concerning the operations involved in the ensuing stages (50). This report would do well to emphasize that integration of the S&T function in the general State budget does not require changes in prevailing legal procedures, additional expenditure, alterations to the general budgetary information system or the centralization or transfer of S&T appropriations to the STPMB. It should be widely circulated among all active participants in the scheme.

11.2.2 Stage two: trial integration of the S&T function in the budget

312. To facilitate communication and co-ordination between the various institutions involved in the ensuing operations, a group of co-ordinators should be set up, consisting of an official from each institution concerned. There should also be an extended working group in which the members of the small working group responsible for the feasibility study would join forces with co-ordinators from the Department of the Budget (DB) and the Ministry of Planning (MP). This working group would begin by devising a plan of action (51) for implementing the recommendations of the feasibility study. This plan of action would include a timetable of operations and would indicate the main person in charge of each operation in the group (STPMB and/or DB and/or MP). The main operations for the second stage are:

(a) modification of the functional classification (DB and STPMB)

313. This involves the incorporation of a first-level S&T category together with its corresponding sub-categories (see Sections 10.1.2 and 10.2). If no such functional classification exists,

one will have to be drawn up by following the suggestions in Chapter XII and drawing on the classifications proposed in Annex VIII D, E and F.

(b) modification of budgetary guidelines and forms (DB and MP)

314. The documents issued by the Department of the Budget and, as appropriate, by the Ministry of Planning for the submission of appropriation requests should state that these requests must be identified by a code based on the above functional classification (52, 53 & 54).

In cases where an S&T category has been added to the functional classification already used for year N-2, it will suffice to add, to these documents, a note stressing the importance which government attaches to budgetary integration of the S&T function.

(c) modification or development of the computer software needed for functional processing (DB)

315. This involves developing the computer programmes needed for establishing the budgetary data files for each function and for preparing the recapitulatory analysis tables of the general budget and the detailed analysis tables for each particular function.

(d) circulation and explanation of the new guidelines and forms (DB and STPMB)

316. The institutions participating in the budget process should be helped to understand the new guidelines and to make proper use of the new forms by a series of actions to stimulate interest and provide information and training, such as visits to the institutions concerned and the organization of short courses or seminars in co-operation with the national higher education establishment concerned with public administration.

(e) trial identification of the budget lines relating to S&T in the current budget (STPMB)

317. This exercise, focused on the budget for the year N-1 now being implemented, serves to check the relevance of the proposed guidelines and to prepare members of the working group involved in the next operation. It should take the form of pilot studies in a few ministries.

(f) functional coding of the budget lines contained in the preliminary drafts of institutional budgets (DB and STPMB)

318. The purpose of this operation is to identify explicitly, by means of the functional classification codes, the budget lines contained in the preliminary drafts of institutional budgets submitted to the Department of the Budget by the ministries responsible for the institutions.

(g) preparation (DB) and approval of the draft general State budget integrating a specific S&T budget

319. The budgetary data are processed and a draft general State budget for the year N, containing *(inter alia)* a recapitulatory Table F/I (see Figure XI) is prepared for submission to Parliament (see Section 8.5.2); an explicit S&T budget is integrated into the functional tables of this general budget.

(h) preparation and circulation of an information document on the appropriations allocated to the S&T function

320. On the basis of the general State budget, once approved by Parliament, consolidated tables of the budgetary appropriations for the function S&T, as presented in Figures XIII and IV, may be drawn up and circulated by the STPMB as a separate document for information. At this stage, the S&T budget is still a ways and means budget.

321. The operations listed above are all relatively easy to carry out. Nevertheless, they will often involve lengthy negotiations, especially when the prerequisites in regard to co-operation and co-ordination are not properly satisfied. To facilitate matters, the scheme could be initially confined to the identification of budget lines relating to the R&D sub-category alone.

11.2.3. Stage three: towards greater accuracy of the indicator and a start to the programming of an integrated S&T budget

322. The third stage (year N) serves to prepare the S&T budget for the year N+1 while attempting to reduce functional coding errors to a minimum and to begin aligning S&T activities with national objectives. National experiments in this field are still too recent for us to draw up a detailed and exhaustive list of the operations needed for this stage, but the two most important are:

(a) attempts to minimize errors in the functional budgetary indicator

323. As shown in Section 10.3, the functional budgetary indicator will, especially in the initial phase, be subject to serious errors as a result of faulty coding. During the year N, therefore, the errors made in the functional budget prepared during the preceding stage and now being implemented will have to be assessed and then taken into account for preparation of the functional budget for the year N+1. The success of this operation will depend on co-operation between the institutional co-ordinators and the analysts from the Department of the Budget. The errors in question could be identified by gathering further detailed information on the operations carried out in connection with each line of the current budget, at the most fragmented level of executing agencies, i.e. the S&T units. This information would be obtained by visiting the institutions concerned and/or by special forms which could use the same information channels as employed by the STPMB for the survey of national scientific and technological potential. These forms should preferably be designed for subsequent use as a framework

Figure XIII - DETAILS OF APPROPRIATIONS FOR THE S&T FUNCTION, BY INSTITUTION AND BY NATURE OF EXPENDITURE

NATURE OF EXPENDITURE / INSTITUTIONS	Current expenditure	Capital expenditure	TOTAL
CENTRAL GOVERNMENT			
SPECIAL FUNDS			
DECENTRALIZED OR AUTONOMOUS PUBLIC BODIES			
TOTAL			TT

Figure XIV - DETAILS OF APPROPRIATIONS FOR THE S&T FUNCTION, BY BRANCH OF ECONOMIC ACTIVITY AND INSTITUTION AND BY S&T SUB-CATEGORY

— BRANCH of economic activity / institutions	Sub-category of S&T function					Total S&T function	%
	General administration	Post-graduate training	R&D	STS support	STS dissemination		
TOTAL %						TT	100

for a programme structure and description (see Section 8.4.2, and the fourth stage in Section 11.2.4). The data obtained would not only reduce errors in the next S&T budget (year N+1) to a minimum but also serve for preliminary analysis of financial flows, complementarity with the survey, managerial efficiency, impact on development and so forth.

(b) preparation of the integrated S&T budget for the year N+1

324. Preparation of the next S&T budget will provide a second opportunity to test the integration of the S&T function in the budget. Most of the stage two operations will have to be repeated (see Section 11.2.2), with the institutions asked to fill in the forms by linking their proposals to the socio-economic objectives and research priorities contained in the national development plan. The F/I recapitulatory table, incorporating an explicit S&T budget, will be once again included in the Finance Bill laid before Parliament. The S&T budget, at this stage, will not yet have reached the stage of being a programmatic budget.

11.2.4. Stage four: the annual and multi-annual programming of S&T (from N+1 onwards)

325. The S&T function must be properly integrated in the general State budget before there can be any real programming of S&T (56, 57, 58 & 59) that will smooth the passage from the S&T strategy and forecasts contained in the national development plan to the actual operations authorized in the S&T budget. For the introduction of S&T programming, due account should be taken of the seldom conclusive experiments with programme budgets (see Section 7.2.3) and their few recorded applications to research; but the specific characteristics and requirements of S&T should also be taken into consideration (see Section 5.3). If the country in question has no previous experience in programming, this stage could serve as a pilot-experiment for the other national functions for which the State is responsible.

326. As defined in Section 8.4, an S&T programme, an S&T sub-programme or the S&T programme element (i.e. an STS activity or an R&D project) is a consistent series of creative or routine actions which serve the S&T function (i.e. whose purpose is to generate variety), contribute to the achievement of one or more socio-economic objective and/or the general progress of knowledge, and usually last longer than the budgetary period.

327. The programming of S&T is a complex and time-consuming process which generally entails the following operations grouped under two broad headings: organization of the phases of S&T programming, and execution of these phases.

(a) Organization of the phases of S&T programming

328. The first task is to establish the conceptual and operational framework for the programming of S&T. A start is made by determining the most important phases in S&T programming, how long each should last and their scheduling in relation to the conventional budget process. In most programme budget systems these phases may be identified as preliminary information, studies, decision-making, execution, subsequent control and

information, and feedback. Figure XV summarizes them in diagrammatic form. The next step is to organize the implementation of each phase, along the following lines:

(i) organization of the preliminary information

- identify the data required for the studies and decision-making phases and assess their accessibility, considering the existence of the survey of scientific and technological potential (18), national statistics (30) and the system of national accounts (43) (see Figure XVI below);
- improve the general budgetary information system and, if necessary, add a further special channel for the programming of S&T;
- develop the computer software required for data storage, for the mathematical processing needed by the studies and for the presentation of data and programmes in tabular form, etc;
- define a programme description (see page 106, paragraph 3), a programme structure (see page 105, paragraph 3) and programme indicators (see page 106, paragraph 4);
- establish the corresponding guidelines and forms to be sent to those who will supply this information;
- inform and train those involved in this phase (those supplying and those collecting the requisite data);
- etc.;

(ii) organization of the studies phase

- select the methods to assist decision-making that are best suited to the particular characteristics and requirements of S&T (see Section 7.1.3);
- train those taking part in this phase;
- etc.;

(iii) organization of the decision-making phase

- identify and inform the parties concerned: Parliament, Government, STPMB, Department of the Budget, Science Department of the Ministry of Planning, R&D and STS institutions (see Chapter IV);
- lay down the procedures for interaction, decide their sequence, the amount of time needed in each case and their intended outcome (see Figure X);
- set up the structures for inter-ministerial co-ordination;
- etc.;

(iv) organization of the execution phase

- adapt conventional *ex ante* budgetary controls to the requirements of the programming (see Sections 7.2.1(e), 8.4.2 and 8.5.3);

- establish the means of co-ordination for each field, sector, etc., to facilitate the execution of multi-institutional S&T programmes;

- inform and train research managers in the techniques of management by objectives;

- etc.;

(v) organization of the subsequent control and information phase

- adapt conventional *ex post* budgetary controls to the requirements of programming (see Sections 7.2.1(e), 8.4.2 and 8.5.3);

- develop methods of monitoring management and results, and methods of evaluating the efficiency and effectiveness of S&T programmes (21 & 22), by making use of data from the survey of national scientific and technological potential, national statistics and the system of national accounts (see Chapter VI and Section 10.4);

- etc.

(b) Execution of each phase in the programming of S&T

329. The execution of the phases below must be preceded by their organization:

(i) execution of the prior information phase

- collect together the requisite data on objectives, means (e.g. requests for appropriations), activities (programme description), impact, etc.;

- use a computer for the storage, mathematical processing and classification of data;

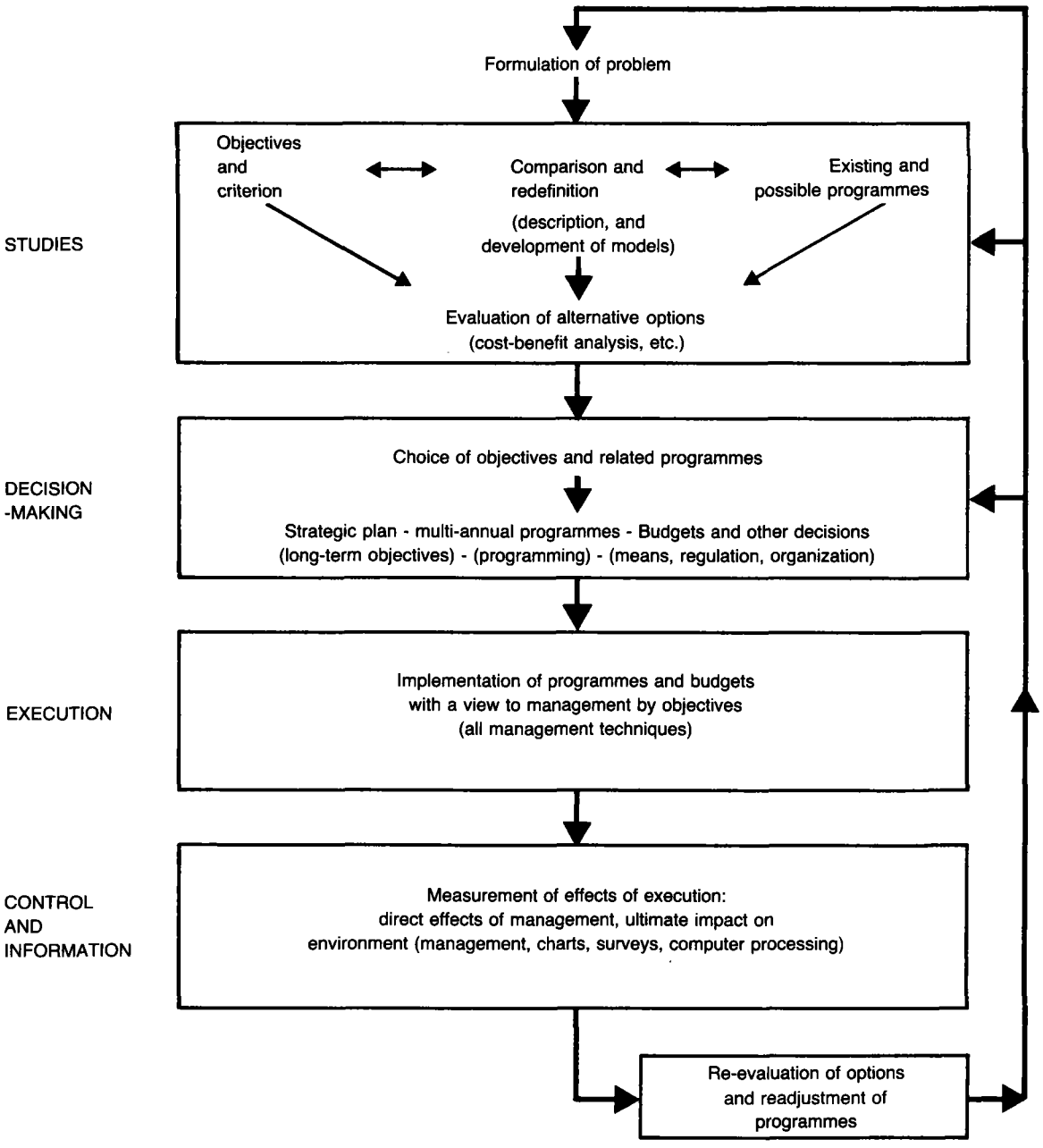
- etc.;

(ii) execution of the studies phase

- analyse the objectives (i.e. the socio-economic objectives of the national development plan and the progress of knowledge in general);

- analyse the means to be employed, in particular the national scientific and technological potential, the budgetary appropriations earmarked for S&T in the current budget, etc.;

Figure XV - PHASES OF THE S&T PROGRAMMING PROCESS



Source: bibliographical reference (34)

Figure XVI - NATURE AND ACCESSIBILITY OF THE INFORMATION NEEDED FOR DECISION-MAKING

Studies and decisions on \ Information on	means	activity	consistency between means and activity	effect	consistency between activity and effect
- means	XX	X	X		
- objective	X	XX	X	XX	XX
- functioning of programme	XX	XX	XX		
- programme in relation to environment		XX	X	XX	XX
Acessibility of information	000	00	00	0	0

Legend: XX vital, X very useful, useful; 000 easy, 00 possible, 0 difficult

Source: French textbooks

- compare available resources with the objectives and work out alternative S&T programmes;

- evaluate these alternative S&T programmes and compare them with programmes being implemented (i.e. existing programmes) or proposed (i.e. new programmes) by R&D and STS institutions;

- etc.;

(iii) execution of the decision-making phase

- select new programmes for mission-oriented R&D and for STS;

- renew, modify or halt the existing programmes of mission-oriented R&D and STS;

- decide on the main directions to be taken by fundamental research and evaluate the corresponding budgetary appropriations;

- etc.;

(iv) execution of the execution and control phases

- distribute S&T programmes, S&T sub-programmes and the S&T programme elements (R&D projects and STS activities) among the executing agencies;

- execute and administer the R&D projects and the STS activities contained in each programme;

- evaluate the actual expenditure obligated and the scientific results achieved;

- evaluate the efficiency and effectiveness of the R&D projects and STS activities;

- etc.;

(v) execution of the feedback phase

- re-examine the means employed and the objectives in the light of any significant discrepancies detected between forecast and actual costs and between forecast and actual results;

- etc.

330. This somewhat theoretical summary will clearly need to be adapted to allow for the particular goals being pursued, the national situation, the difficulties encountered and so forth.

TO SUM UP:

- before embarking on a scheme to integrate the S&T function in the general State budget, a feasibility study has to be made in order to evaluate the national situation in regard to planning and budgeting, the responsible S&T structures, the executing agencies and the ways in which S&T is financed, and to make recommendations on the operations to be carried out, taking into account the opinions of the various parties involved;

- the integration of the S&T function in the general State budget should be effected in stages, initially keeping to the ways and means budget structure and gradually reducing the functional coding errors to a minimum;

- the multi-annual programming of S&T, made possible by integration of the S&T function in the budget, should be introduced cautiously by following the example of existing programme budget systems, with due regard for the particular characteristics and requirements of S&T;

- such a complex conceptual and operational framework should be introduced gradually so that the various phases in the multi-annual S&T programming process - prior information, studies, decision, execution, subsequent control and information, and feedback - may be carried into effect.

CHAPTER XII — DEVELOPMENT AND USE OF A FUNCTIONAL CLASSIFICATION INCORPORATING A SCIENCE AND TECHNOLOGY FUNCTION

INTRODUCTION

331. An S&T budget integrated in the general State budget cannot be obtained without a functional classification which includes the S&T function. Countries without a classification of this kind will therefore have to develop one. This chapter begins by examining the functional classification proposed by the United Nations in order to ascertain whether it can serve to prepare an S&T budget, and then provides some fundamental suggestions accompanied by examples on how to devise a true functional classification. The chapter concludes with a few remarks on the proper use of this type of classification.

12.1 The functional classification proposed by the United Nations

332. Since 1958 the United Nations has made available to Member States "a classification of the functions or purposes of government" as an instrument for the national accounting and statistical analysis of public expenditure. According to the "Manual for Economic and Functional Classification of Government Transactions", published by the United Nations in 1958 (35), the purpose of this classification is to identify public expenditures according to "the immediate or short-run purposes served". Although revised several times (43, 59 & 60), it is still based on the way governments are organized (architectural order) rather than on the functions that governments assume (functional order). Despite its title it still closely resembles an institutional nomenclature, with whose advantages and drawbacks we are now familiar. Furthermore, it only takes in, whether explicitly or implicitly, the "R&D" group of activities, and then solely as a second-level category under a few of the first-level categories. A classification of this kind cannot serve to establish either an integrated S&T budget or a special S&T budget. Annexes VIII.A and VIII.B present two of the four existing versions of this classification, dating from 1958 and 1968 respectively.

12.2 Development of a functional classification

333. In designing a functional classification one has to conform to certain criteria or principles, some of which derive from the functional aspect itself and others from the strategy for overall endogenous development (see Chapter I) and the purpose for which the classification is intended.

12.2.1 Criteria drawn from use of the functional approach alone

334. The discussion in Section 7.2.4 on the function, the functional aspect and processes, enables us to outline a series of general criteria on the basis of which a given social organization can either work out a functional classification or reappraise and modify one that already exists. These criteria are:

(a) each first-level category should suggest a function which is vital for the survival and development of the social organization concerned, unaffected by considerations of time and space (i.e. by aspects of the organization's architecture or structure for instance) and associated with the social organization's chosen strategy for ensuring its survival and development (i.e. with its vision of its future shape);

(b) each first-level category should suggest a function in connection with which a group of mutually complementary and co-ordinated activities are conducted, focusing on medium- or long-term objectives with a view to achieving a result of the desired quantity and quality within a set period of time, a result that is essential though not enough in itself to bring society to its future shape;

(c) each category, whatever its level, should cover a group of activities which involve, in their various capacities, a number of active participants (i.e. components of the structure: advisory bodies, decision-making authorities, institutions with responsibility, executing agencies, etc.) belonging to the social organization concerned;

(d) each category, whatever its level, should cover a group of activities within which the active participants engage in a large number of intense relationships and interactions with each other (co-operation, conflicts, duplicated efforts, influence, negotiations, consultations, co-ordination, integration, etc.).

12.2.2 Criteria drawn from the development strategy and the requirements of the State budget

335. Bearing in mind what was said on the subject of overall endogenous development in Chapter I and the State budget in Chapter VIII, the foregoing criteria may be supplemented by some other more precise and more operational criteria which should be applied in the construction of a real functional classification:

(a) this classification should be functional in the strict sense (i.e. should embrace those groups of activities which the State must exercise or support as its contribution to the survival and development of the nation). Its categories should therefore not be based on the country's institutional structure, on its system of accounts or administration, on scientific and technological disciplines or on the present amount of budgetary appropriations;

(b) it should be exhaustive (i.e. it should permit the classification of all the activities of public institutions and the re-apportionment of all budgetary appropriations in the State budget without exception);

(c) it should be capable of serving for *ex ante* evaluations (budgetary forecasts) and *ex post* evaluations (statistical analyses);

(d) it should be stable in time so that comparative analyses can be made from one year to another (the functional aspect remains stable over long periods of time whereas the architectural aspect may undergo frequent changes);

(e) it should permit the computer processing of financial data so that recapitulatory analysis tables such as the "Institutions/ Functions Table " (I/F) can be established;

(f) it should be simple (i.e. contain only brief headings and two levels of category, namely, the political functions of the State and the major objectives being pursued or the groups of programmes being executed in connection with each function), homogeneous and consistent (i.e. founded on a single criterion, that of the function), and balanced (i.e. maintain a comparable level of fragmentation within each function).

12.2.3 Examples of functional classification

336. In addition to the functional classification of France (Annex VIII.C), which authorizes the compilation of a special S&T budget, Annex VIII.D, E and F presents three practical examples of a functional classification which can be used to obtain an integrated S&T budget and which may prove helpful to countries wanting to construct their own classifications.

(a) The functional classification used by Colombia

337. In the functional classification of Colombia (Annex VIII.D), the functions are divided into three types of service: general services, economic services and cultural and social services. For political and psychological reasons, the S&T function (code 290) comes under economic services. Although this decision has no direct impact on S&T budgeting, it points to a conception of development influenced by the economic model (see Section 1.2.1) which might well cause the programming of S&T to pay too much attention to economic objectives alone (62).

(b) A proposed functional classification of the conventional type

338. This functional classification (Annex VIII.E) places the S&T function closer to its vital role in overall endogenous development. It is compatible with the branches of the ISIC classification (Annex IX) but, with its traditional structure and the institutional slant of its function headings, it remains conventional.

(c) A proposed functional classification of the systemic type

339. The functional classification proposed in Annex VIII.F seeks to keep more closely to the criteria stated in Section 12.2.2. It bears less resemblance to the traditional structure of the budgetary classifications in general use and adopts function headings which correspond more closely to a systems approach. It would, however, be risky to try introducing such a novel classification into government decision-making machinery. Certain participants might reject the functional integration of S&T in the State budget because of the systems viewpoint underlying this classification.

12.3 National functional classifications and the internal functional classification of the United Nations system

340. The United Nations system serves each of its Member States and mankind in general. Its duty is to help each State to fulfil the functions it assumes on behalf of its citizens. But, since the various peoples forming the international community are interdependent, it also has the duty of taking action to see that national strategies and plans of action are compatible with each other and mutually complementary in order to ensure the survival and development of mankind as a whole. This is why the political functions assumed by a State correspond very closely to those assumed by the United Nations system. The differences are more apparent than real, in many cases stemming from the fact that the United Nations system only has the power to incite States to take action whereas a State has, in addition, the power to coerce its citizens. For example, where a State has the function "public order and security" the United Nations puts "prevention of conflicts and establishment of a peaceful international order".

341. In order to plan and budget its programmes, the United Nations system should therefore use a functional classification whose content and structure correspond as closely as possible to the political functions assumed by Member States on behalf of their citizens. More specifically, its own functional classification should be compatible with those - when they exist - used by countries in their programme budgets for the preliminary apportionment (budgetary forecasting) and subsequent distribution (statistical analysis) of government expenditure. This approach would allow the United Nations system to respond more fully to the needs, concerns and capabilities of Member States (63). In this case, the following schema should be adopted:

Functions assumed by States to ensure the survival and development of the Nation	Functions assumed by the United Nations system to ensure the survival and development of mankind
National functional classifications	Functional classification of the United Nations system

342. Indeed, as is pointed out by the United Nations Advisory Committee on the Application of Science and Technology to Development (64), "... the efforts to harmonize science and technology policy at the level of the United Nations system require, to be fully effective, a substantial degree of harmonization at the national level which should range from the formulation of a national science and technology policy to implementation of national programmes through co-ordinated requests for co-operation from the international system".

12.4 Observations on the use of a functional classification

343. Some of the guidelines to be found in manuals on planning and budgeting give rise to an incorrect (i.e. institutional) use of functional classifications by recommending, for example, that functional activities such as education and training in a particular sector should be classified in that sector. If, accepting this recommendation, the Ministry of Agriculture were to classify activities related to agricultural training under the function Agriculture, the Ministry of Industry those related to industrial training under Industry, and the Ministry of Health those related to medical training under Health, how would the resulting functional classification differ from an institutional nomenclature? And how could the country's education and training activities be identified and co-ordinated?

344. Scientific and technological activities pose the same problem. As long as all the scientific and technological aspects of the activities undertaken by the various government institutions - e.g. agricultural R&D, industrial R&D, medical R&D - are not classified under the S&T function, identification of the appropriations allocated to S&T activities in the country concerned will be impossible; the S&T function would include only fundamental research which is not the responsibility of the sectoral ministry. The budgetary indicator based on the S&T function would be so misleading that it would be useless as an instrument for promoting an overall policy for the S&T function. To avoid this problem, budgetary circulars and forms should offer precise guidelines (see Section 11.2.2).

TO SUM UP:

- a classification which can truly claim to be functional must obey certain criteria, in particular the criterion whereby each function covers an area which is vital for the survival and development of the nation and constitutes the focal point of numerous and intense interactions between citizens;
- a functional classification must be accompanied by a set of instructions designed to avoid coding errors arising from an institutional approach to government decision-making.

Concluding remarks

345. This manual has suggested a procedure for gradually integrating the S&T function into the general State budget which does not require new legislation, the creation of special administrative structures, changes in the general budgetary information system, additional expenditure, or the centralization or transfer of S&T appropriations to the national Science and Technology Policy-Making Body. Indeed, all that the establishment of this procedure does in fact require is a political decision on the role that S&T should play in national development. Once the State, in the context of its strategy for overall and endogenous development, recognizes that the capacity of a given society to innovate really is a vital function which must be accepted and supported in order to ensure the survival and development of the nation, and decides to take appropriate action to translate this recognition into practical effect, it will become a relatively simple matter to adapt the suggested procedure to the particular situation and needs of the country, and thus:

- to use a functional classification containing a first-level S&T category together with its corresponding sub-categories as a means to identify the budget lines in the Finance Bill;

- to prepare a real S&T budget integrated in the draft general State budget and permitting a direct reading of the total amount (S&T budgetary indicator), apportionment and object of public funds allocated to S&T, and a direct comparison of these appropriations with those allocated to other functions of the State;

- to co-ordinate the S&T function with the education function on its input side and the economic functions of production on its output side, and so develop the national scientific and technological potential and contribute to avoiding the brain drain and the importing of technologies which either threaten the authenticity of the country's collective heritage or could have been developed locally;

- to set up, step by step, a genuine programming of the S&T function which will ensure the passage from the S&T strategy and forecasts in the national development plan to the integrated S&T budget without overlooking the particular characteristics and requirements of S&T.

346. Unlike the problem of integrating the S&T function in the budget, S&T programming might well prove a complex process which needs time to organize. Although a good many experiments are being conducted in a number of countries, we have only touched upon the subject at the end of this manual because the experiments are too recent to provide conclusive evidence. Unesco intends to improve the manual by drawing upon the experience gained from its use in interested Member States and to supplement it by undertaking studies on the annual and multi-annual programming of S&T.

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Annex II Subject index

This index refers to numbers of paragraphs, figures and annexes in which the main concepts of the Manual are used, presented or defined; the numbers underlined indicate paragraphs containing definitions.

Annex III Survey of national situations in regard to S&T budgeting

I. Type of general State budget used in the country

Please answer the following questions by YES or NO:

(1) Is the general State budget used, a traditional ways and means budget only (sometimes also called administrative or institutional budget)? ...

If your answer is YES, go on to question (3).

(2) Is the ways and means budget mentioned in question (1) above supplemented by:

(a) an institutional programme budget

(that is, a programme budget in which each programme is attached to one of the public institutions mentioned by name in the institutional nomenclature)? ...

(b) a functional programme budget

(that is, a programme budget in which each programme is attached to a State function by means of a functional classification)? ...

II. Explicit identification of budget lines concerning S&T activities in the draft State budget

Please answer the following questions by YES or NO

(3) Are there any budget lines in the general State budget in which more than 90% of the appropriation is earmarked for S&T activities? ...

(4) What S&T activities are taken into consideration in the budget lines referred to in question (3) above

(a) Planning and general administration of S&T? ...

(b) R&D training of scientists and technologists? ...

(c) Research and experimental development (R&D)? ...

(d) Scientific and technological services (STS) for support and dissemination? ...

(5) Are the budget lines referred to in questions (3) and (4) above explicitly identified as such by means of a code or symbol specific to S&T? ...

(6) Does the code or symbol specific to S&T mentioned in question (5) above belong to one of the following budget classifications:

(a) an institutional nomenclature (I)

(a positive answer indicates that explicitly identified S&T is generally grouped under the responsibility of a central government agency such as a ministry for S&T)? ...

(b) an economic classification of receipts and expenditure (E) or a classification by nature of expenditure (N)

(in which case, S&T is generally regarded as a fixed-capital or non-tangible investment outlay)? ...

(c) a functional classification or classification by purpose, in which S&T is regarded:

(i) globally as a fully-fledged function (first-level category)? ...

(ii) explicitly and systematically as a sub-category within each major function? ...

(iii) or in part explicitly, as a sub-category within certain functions and, in part implicitly, within other functions? ...

(d) a programme structure

(in which case, S&T is made up of an aggregation of two or more programmes and sub-programmes in which the highest level of the structure may be either the institutional nomenclature (it is then an institutional programme structure) or the functional classification (it is then a functional programme structure which could be multi-institutional)? ...

(e) no homogeneous budget classification

(in which case, what is involved is a treatment peculiar to S&T)? ...

III. S&T budgeting procedure

Please answer the following questions by YES or NO (modalities A and B below constitute an alternative; modality C may be combined with A or B; modality D excludes, by definition, modalities A, B and C):

MODALITY A "integrated S&T budget"

(7) Do all the budget lines relating to S&T appear explicitly in the functional programme budget of the State that supplements its traditional ways and means budget (this implies affirmative answers to questions (2)(b), (3), (5) and (6)(c)(i) or (ii) above)? ...

(8) Does the "Function/Institution" recapitulatory analysis table of the functional programme budget of the State permit direct reading of the total amount and institutional distribution of appropriations earmarked for S&T, in which case it is an explicit S&T budget integrated into the general State budget (this implies affirmative answers to questions (2)(b), (3), (5) and (6)(c)(i) and (7) above)? ...

MODALITY B "special S&T budget"

(9) Is there an explicit S&T budget, drawn up specially and appended to the draft general State budget, and available before voting the Finance Act? ...

(10) Is the S&T budget referred to in question (9) above obtained:

(a) directly from data already appearing in the requests for appropriations transmitted by all executing institutions to the Office of the Budget via the general budget information system (this implies affirmative answers to questions (3) and (5) above)? ...

(b) or by means of additional data gathered by the national S&T Policy-Making Body (STPMB) via a special budget information circuit, from institutions engaging in S&T activities? ...

MODALITY C "an *ex post* compilation of S&T appropriations or expenditures"

(11) Is there an *ex post* compilation of public funds devoted to S&T, obtained by grouping together *ex post* (after voting of the Finance Act) the S&T appropriations accorded to each ministry, or by means of a statistical analysis (after implementation of the Finance Act) of S&T expenditure obligated by each ministry? ...

MODALITY D "no overall analysis of public funds devoted to S&T"

(12) Is the situation characterized by the absence of any overall analysis of public funds devoted to S&T, this analysis being *ex ante* or *ex post?* In this case, these funds are considered only implicitly in global appropriations for public institutions. ...

IV. Method of processing budgetary data

(13) Is the processing of budgetary data for the general State budget:

(a) largely computerized? ...

(b) largely manual? ...

(14) If your answer to questions (7) to (10) is YES, is the processing of the budgetary data for the explicit S&T budget:

(a) largely computerized? ...

(b) largely manual? ...

V. Location of autonomous or decentralized public institutions engaging in S&T activities in the State budget

(15) Do the autonomous or decentralized public institutions receiving subsidies for their S&T activities (e.g. universities) appear:

EITHER

(a) mentioned by name in the institutional nomenclature used in the general State budget? ...

OR

(b) mentioned by name in the institutional nomenclature used in an appended budget specific to these institutions and submitted to the competent authorities (generally Parliament) for recommendations or approval? ...

OR

(c) in no institutional nomenclature since they are regarded as fully independent institutions receiving a global subsidy from the State via their tutelary ministry or an *ad hoc* budgetary post? ...

(16) Are these autonomous or decentralized public institutions' own resources taken into account in either of the budgets mentioned in questions (15)(a) and (15)(b) above? ...

VI. Share of the budgetary appropriations devoted to S&T in the State budget

(17) Indicate the share of budgetary appropriations devoted to S&T in the State budget in comparison with the total amount of that budget. ...%

VII. Material requested in addition to the above replies

To facilitate the precise and detailed analysis of replies, the following material would be helpful:

(a) copies of pages taken directly from the document(s) containing the draft State budget for the current year, giving:

- the title of the document
- its table of contents
- any recapitulatory analysis tables that may be - or are actually - used to show the global amount or distribution of budgetary appropriations for S&T
- the budget of the national STPMB
- the budget of an autonomous or decentralized public institution carrying out S&T activities only
- the budget of a university carrying out S&T activities;

(b) a copy of the document containing the norms, instructions, forms and classifications used by public institutions in drawing up their budget proposals to be included in the finance bill for the current year;

(c) a copy of the norms, instructions, forms and classifications used by public institutions engaging in S&T activities to provide budgetary information to the STPMB;

(d) a copy of the integrated S&T budget, special S&T budget or *ex post* compilation corresponding to modalities A, B or C.

Annex IV

Institutional nomenclatures

Annex IV.A Institutional nomenclature of Argentina

Source: *Ley No 21.550, Presupuesto General de la Administración Nacional para el ejercicio del ano 1977*

CENTRAL GOVERNMENT

Decentralized bodies

NATIONAL LEGISLATURE

NATIONAL JUDICIARY

NATIONAL AUDIT OFFICE

THE PRESIDENCY OF THE NATION

Comité Federal de Radiodifusión
Ente de Calificación Cinematográfica
Comisión Nacional de Energía Atómica
Instituto Nacional de Cinematografía
Ente Autárquico Nacional 1978
Instituto Nacional de la Administración Pública

MINISTRY OF PLANNING

MINISTRY OF THE INTERIOR

Caja de Retiros, Jubilaciones y Pensiones de la Policía Federal

MINISTRY OF FOREIGN RELATIONS AND RELIGION

MINISTRY OF JUSTICE

MINISTRY OF DEFENCE

Dirección General de Fabricaciones Militares
Instituto de Ayuda Financiera para pago de retiros y pensiones militares
Registro Nacional de las Personas

HIGH COMMAND (Army)

Instituto Geográfico Militar

HIGH COMMAND (Navy)

HIGH COMMAND (Air Force)

Fondo para la defensa antiaérea territorial

MINISTRY OF THE ECONOMY

Corporación para el desarrollo de la pequena y mediana empresa

DEPARTMENT OF PROGRAMMING AND ECONOMIC CO-ORDINATION

DEPARTMENT OF FINANCE

Comisión Nacional de Valores
Superintendencia de Seguros de la Nación

DEPARTMENT OF INDUSTRIAL DEVELOPMENT

Instituto Nacional de Tecnología Industrial

DEPARTMENT OF AGRICULTURE

Servicio Nacional de Parques Nacionales
Junta Nacional de Carnes
Junta Nacional de Granos
Consejo de Administración del Fondo Algodonero Nacional
Instituto Nacional de Tecnología Agropecuaria
Mercado Nacional de Hacienda
Consejo Agrario Nacional
Instituto Nacional de la Actividad Hípica
Comisión Reguladora de la producción y comercio de la yerba mate
Instituto Forestal Nacional

DEPARTMENT OF TRADE

Dirección Nacional de Azúcar
Instituto Nacional de Vitivinicultura

DEPARTMENT OF TRANSPORT AND PUBLIC WORKS

Dirección Nacional de Vialidad
Instituto Nacional de Prevención Sísmica
Instituto Nacional de Ciencia y Técnica Hídricas

DEPARTMENT OF COMMUNICATIONS

DEPARTMENT OF ENERGY

DEPARTMENT OF MINES

DEPARTMENT OF MARITIME INTERESTS

DEPARTMENT OF FOREIGN COMMERCE AND INTERNATIONAL ECONOMIC RELATIONS

MINISTRY OF CULTURE AND EDUCATION

Instituto Nacional de Crédito Educativo para la igualdad de oportunidades
Fundación Miguel Lillo
Universidad Nacional del Sur
Universidad Nacional de Buenos Aires
Universidad Nacional de Córdoba
Universidad Nacional de Cuyo
Universidad Nacional de La Plata
Universidad Nacional de Tucumán
Universidad Nacional del Litoral
Universidad Nacional de Rosario
Universidad Nacional del Comahue
Comisión Nacional de Estudios Geoheliofísicos.

Universidad Nacional del Nordeste
Consejo Nacional de Investigaciones Científicas y Técnicas
Fondo Nacional de las Artes
Universidad Nacional de Río Cuarto
Universidad Nacional del Centro de la Provincia de Buenos Aires
Universidad Nacional de Mar del Plata
Universidad Tecnológica Nacional
Consejo Nacional de Educación Técnica
Universidad Nacional de Salta
Universidad Nacional de Lomas de Zamora
Universidad Nacional de Catamarca
Universidad Nacional de Luján
Universidad Nacional de Santiago del Estero
Universidad Nacional de Misiones
Universidad Nacional de Entre Ríos
Universidad Nacional de Jujuy
Universidad Nacional de la Pampa
Universidad Nacional de la Patagonia
Universidad Nacional de San Luis
Universidad Nacional de San Juan

MINISTRY OF LABOUR

MINISTRY OF SOCIAL WELFARE

GENERAL SECRETARIAT OF THE MINISTRY OF SOCIAL WELFARE

DEPARTMENT OF PUBLIC HEALTH

DEPARTMENT OF SOCIAL SECURITY

Caja Nacional de Previsión de la Industria, Comercio y Actividades Civiles
Caja Nacional de Previsión para el personal del Estado y Servicios Públicos
Caja Nacional de Previsión para trabajadores autónomos
Dirección Nacional de Recaudación Previsional
Instituto Nacional de Obras Sociales

DEPARTMENT OF SPORT AND TOURISM

DEPARTMENT OF HOUSING AND TOURISM

Caja Federal de ahorro y préstamo para la vivienda

DEPARTMENT OF YOUTH AND THE FAMILY

FEDERAL ADMINISTRATION OF THE NATIONAL HEALTH SYSTEM

DEPARTMENT OF SOCIAL ADVANCEMENT AND ASSISTANCE

Instituto Nacional de Acción Cooperativa
Instituto Nacional de Acción Mutual
Centro Nacional de Reeducación Social

NATIONAL DEBT SERVICING

TREASURY OBLIGATIONS

EMERGENCY FUND

Annex IV.B Institutional nomenclature of Brazil

Source: *Lei No 6395 de 9/12/77. Orçamento Geral de Uniao para o Exercicio Financeiro de 1977*

CENTRAL GOVERNMENT

Chamber of Deputies

Federal Senate

Audit Office

Supreme Federal Court

Federal Appeals Court

Military Tribunal

Electoral Tribunal

Labour Tribunal

Federal Court

Federal District and Territories Courts

Presidency of the Republic

Ministry of Aviation

Ministry of Agriculture

Ministry of Communications

Ministry of Education and Culture

Ministry of the Army

Ministry of Finance

Ministry of Industry and Commerce

Ministry of the Interior

Ministry of Justice

Ministry of the Navy

Ministry of Mines and Energy

Ministry of Welfare and Social Assistance

Ministry of External Relations

Ministry of Health

Ministry of Labour

Ministry of Transport

General Charges of the Union

National Development Fund

Allocations to the States, Federal District and Municipalities

National Urban Development Fund

Financial Charges of the Union

Union Contingency Fund

Annex V

Economic classification

Annex V.A Economic classification of revenue: Peru

Source: *Decreto Supremo No 153-76 EF* 25 October 1976, Lima, Peru

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1.0.0 ORDINARY REVENUE

- 1.1.0 Taxes
  - 1.1.1 On income
  - 1.1.2 On property
  - 1.1.3 On imports
  - 1.1.4 On exports
  - 1.1.5 On production and consumption
  - 1.1.6 Others
- 1.2.0 Duties
  - 1.2.1 General administration
  - 1.2.2 Justice and police
  - 1.2.3 Education
  - 1.2.4 Health
  - 1.2.5 Housing and construction
  - 1.2.6 Agriculture and non-mineral resources
  - 1.2.7 Industry, mining and commerce
  - 1.2.8 Transport and communications
- 1.3.0 Contributions
  - 1.3.1 Pensions
  - 1.3.2 Welfare
  - 1.3.3 Training and research
  - 1.3.4 Others
- 1.4.0 Sale of non-capital goods and services
  - 1.4.1 Agriculture and mines
  - 1.4.2 Industry
  - 1.4.3 Transport, communications and storage

1.4.4 Education, leisure and culture

1.4.5 Health

1.4.6 Others

1.5.0 Income from property

1.5.1 From real estate

1.5.2 From financial assets

1.6.0 Fines and other penalties

1.6.1 Fines and similar penalties

1.6.2 Other penalties

1.7.0 Current transfers

1.7.1 Internal: from non-public sector

1.7.2 Internal: from public sector

1.7.3 External

1.8.0 Balance

2.0.0 CAPITAL REVENUE

2.1.0 Sale of capital goods

2.1.1 New buildings (excluding land)

2.1.2 Other buildings (excluding land)

2.1.3 Urban and rural land

2.1.4 Vehicles, equipment and machinery (used)

2.1.5 Others

2.2.0 Repayments

2.2.1 Of educational loans

2.2.2 Of mortgage loans

2.2.3 For agrarian reform

2.2.4 Other repayments

2.3.0 Borrowing

2.3.1 Internal: loans

2.3.2 Internal: bonds

2.3.3 External

2.4.0 Capital transfers

2.4.1 Internal: from non-public sector

2.4.2 Internal: from public sector

2.4.3 External

Annex V.B Economic classification of expenditure: Peru

Source: *Ley del Presupuesto Bienal del Sector Público Nacional para el ejercicio 1975-1976 (Decreto Ley No 21057)*

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100. CURRENT EXPENDITURE

- 110. Consumption expenditure
  - 111. Salaries
  - 112. Goods and services
- 120. Current transfers
- 130. Interest and other payments
  - 131. Internal debt
  - 132. External debt

200. CAPITAL EXPENDITURE

- 210. Gross capital formation
  - 211. Buildings
  - 212. Equipment and machinery (new)
  - 213. Studies and projects
- 220. Financial investment
  - 221. Real estate (ownership)
  - 222. Upkeep of old property
  - 223. Loans for the acquisition of securities
- 230. Capital transfers
- 240. Amortization of debts
  - 241. Of internal debts
  - 242. Of external debts

Annex VI Classification of sources of revenue: Bolivia

Source: *"Manual de programación presupuestaria para uso de los organismos del sector público de la República de Bolivia"*, published by the *Dirección General del Presupuesto*, Ministry of Finance, La Paz, Bolivia, 1973.

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100. INTERNAL

- 110. Contributions from the National Exchequer
- 120. Own resources
- 130. Internal loans
- 140. Transfers from other public or private institutions
- 150. Others
  - 151. Special levies
  - 152. Balances from previous accounts
  - 153. Donations
  - 154. Contributions from the community
  - 155. Others

200. EXTERNAL

- 210. External loans
- 220. Donations or aid
- 290. Others

Annex VII Classification by nature of expenditure: Peru

Source: *Decreto Supremo No 153-76-FE* of 25 October 1976, Lima, Peru

TYPE OF EXPENDITURE Detailed breakdown	
01.00	REMUNERATION
01.01	Basic wages of permanent non-manual workers
01.02	Permanent manual workers' wages
01.03	Bonuses
01.04	Special payments subject to deductions for pension
01.05	Special payments not subject to deductions for pension
01.06	*Ex-gratia* payments
01.07	Overtime
01.08	Family allowances
01.09	Dependents allowance
01.10	Danger money
01.11	Special expenses for executive staff
01.12	Education allowances
01.13	Gratuities
01.14	Indemnities for delayed promotion
01.15	Renewal of contract bonuses
01.16	Length of service allowance
01.17	Wages of non-manual workers under contract
01.18	Wages of manual workers under contract
01.19	Other remuneration for non-manual workers
01.20	Other remuneration for manual workers
01.21	Appropriations

02.00 GOODS

02.01 Foodstuffs
02.02 Rations
02.03 Clothing
02.04 Fodder for livestock
02.05 Raw materials
02.06 Office equipment and supplies
02.07 Teaching materials
02.08 Medical supplies and medecines
02.09 Laboratory equipment
02.10 Building equipment
02.11 Electrical equipment
02.12 Sanitary equipment
02.13 Data processing equipment
02.14 Printing equipment
02.15 Photographic and sound recording equipment
02.16 Sports equipment
02.17 Explosives and munitions
02.18 Domestic utensils and products
02.19 Printed matter and subscriptions
02.20 Fuel and lubricants
02.21 Fittings
02.22 Tools
02.23 Spare parts
02.24 Insignia, medals and decorations
02.25 Equipment for official missions abroad
02.26 Miscellaneous
02.27 Appropriations

03.00 SERVICES

03.01 Travel, travel expenses and allowances (official business)
03.02 Travel, travel expenses and freight cost (removals)
03.03 Local travel
03.04 Official duties and celebrations
03.05 Personal insurance
03.06 Non-personal insurance
03.07 Research and studies
03.08 External consultants, experts and auditors
03.09 Packaging, freight and storage

03.10 Installation and conditioning
03.11 Maintenance and repair
03.12 Public service fees
03.13 Public service charges
03.14 Educational fees
03.15 Customs duties
03.16 Publications
03.17 Printing
03.18 Printing of value-quoted certificates
03.19 Book-binding
03.20 Rent for buildings
03.21 Rental charges for furniture, equipment and other items
03.22 Rental charges for data processing services
03.23 Legal and notarial services
03.24 Commissions
03.25 Services abroad
03.26 Miscellaneous
03.27 Appropriations

04.00 CURRENT TRANSFERS

04.01 To the Social Security (national sickness and maternity fund)
04.02 To the Social Security (national pension fund)
04.03 To retirement funds
04.04 To public institutions
04.05 To public enterprises
04.06 To local government
04.07 To social welfare societies
04.08 Abroad
04.09 Death grants
04.10 Subsidies
04.11 Subventions to legal entities
04.12 Subventions to individuals
04.13 Sickness and maternity benefits
04.14 Miscellaneous
04.15 Appropriations

05.00 PENSIONS

05.01 Pensions
05.02 Appropriations

06.00 INTEREST AND COMMISSION

06.01 Interest on the internal national debt
06.02 Interest on the external national debt
06.03 Commission, etc. on the internal national debt
06.04 Commission, etc. on the external national debt
06.05 Appropriations

07.00 STUDIES

07.01 Pre-investment studies by tender
07.02 Pre-investment studies by the government
07.03 Final studies by tender
07.04 Final studies by the government
07.05 Appropriations

08.00 PUBLIC WORKS

08.01 By tender
08.02 By the government
08.03 Appropriations

09.00 CAPITAL GOODS

09.01 Office furniture and equipment
09.02 Furniture and equipment for educational establishments
09.03 Furniture and equipment for medical, hospital and social services
09.04 Machinery and equipment for laboratories
09.05 Machinery and equipment for agriculture and stock-breeding
09.06 Machinery and equipment for engineering
09.07 Building machinery and equipment
09.08 Generating plant and equipment
09.09 Industrial machinery and equipment
09.10 Data processing machinery and equipment
09.11 Machinery and equipment for communications
09.12 Photographic and sound-recording machinery and equipment
09.13 Household electrical appliances and equipment
09.14 Land
09.15 Buildings
09.16 Ships and aircraft
09.17 Passenger transport vehicles
09.18 Goods vehicles and other utility vehicles

09.19 Livestock

09.20 Arms

09.21 Expropriations

09.22 Used capital goods

09.23 Miscellaneous

09.24 Appropriations

10.00 LOANS, ACQUISITION OF SECURITIES AND OTHERS

10.01 Loans

10.02 Shares

10.03 Bonds

10.04 Miscellaneous

10.05 Appropriations

11.00 CAPITAL TRANSFER

11.01 To public institutions

11.02 To public enterprises

11.03 To local government

11.04 To social welfare agencies

11.05 Abroad

11.06 Miscellaneous

11.07 Appropriations

12.00 AMORTIZATION OF DEBTS

12.01 Internal national debt

12.02 External national debt

12.03 Appropriations

Annex VIII

Functional classifications

Annex VIII.A Functional classification proposed by the United Nations in 1958

Source: "A Manual for Economic and Functional Classification of Government Transactions", (ST/ECA/49), Sales No. 58.XVI.2, United Nations, New York, 1958

SERVICE

Functions

Sub-functions

---

100. GENERAL SERVICES

110. General Administration

111. Organs of state
112. Fiscal administration
113. General economic regulation
114. Conduct of foreign affairs
115. Other

120. Defence

121. Administration
122. Armed Forces
123. Civil defence
124. Other

130. Justice and police

131. Administration
132. Law courts
133. Police
134. Prisons
135. Other places of detention and correction

200. COMMUNITY SERVICES

210. Roads and waterways

211. Administration
212. National highways
213. Roads and streets
214. Waterways

220. Fire protection, water supply and sanitation

221. Administration
222. Fire protection
223. Water supply
224. Sewerage and refuse disposal
225. Other sanitary services

230. Other community services

231. General research and scientific services
232. Other

300. SOCIAL SERVICES

310. Education

311. Administration
312. Primary schools
313. Secondary schools
314. Colleges and universities
315. Technical training institutions
316. Adult education, libraries and museums
317. Other

320. Health

321. Administration
322. Research
323. Hospitals
324. Medical and dental centres and clinics
325. Individual health services
326. National health scheme
327. Special health programmes

330. Social security and special welfare services

331. Administration
332. Social security benefits
333. War veteran benefits
334. Child and mother care
335. Care of aged and disabled
336. Care of mentally defective people
337. Other welfare institutions

340. Other social services

341. Administration
342. Housing
343. Recreation
344. Religion
345. Social services not included elsewhere

400. ECONOMIC SERVICES

401. Agriculture and non-mineral resources

411. Administration and regulation
412. Research
413. Agriculture
414. Forestry
415. Hunting and fishing

420. Fuel and power

421. Administration and regulation
422. Research
423. Coal-mining, petroleum and natural gas
424. Electricity, gas, steam heat and power

430. Other mineral resources, manufacturing and construction

431. Administration and regulation
432. Research
433. Mineral resources not classified elsewhere
434. Manufacturing
435. Building and construction

440. Transport, storage and communications

441. Administration and regulation
442. Research
443. Railway
444. Water transport
445. Air transport
446. Other transport, storage and warehousing
447. Communications

450. Other economic services

451. Administration and regulation
452. Research
453. Commerce
454. Economic services not included elsewhere

500. UNALLOCABLE EXPENDITURE

510. Interest on general debt

520. Subsidies not included elsewhere

530. General transfers to local government

540. Foreign economic aid and other unallocable transfers to abroad

550. Other

Annex VIII.B Functional classification proposed by the United Nations in 1968

Source: Table 5.3 of "A System of National Accounts", (ST/STAT/SER.F/2/ Rev. 3, Sales No. E.69.XVII.3), United Nations, New York, 1968.

FUNCTION

Sub-function

---

10. GENERAL PUBLIC SERVICES

- 11. General administration
- 12. External affairs
- 13. Public order and safety
- 14. General research (1)

20. DEFENCE

30. EDUCATION

- 31. General administration, regulation and research (2)
- 32. Schools, universities and other educational facilities
- 33. Subsidiary services

40. HEALTH

- 41. General administration, regulation and research
- 42. Hospitals and clinics
- 43. Individual health services

50. SOCIAL SECURITY AND WELFARE SERVICES

- 51. Social security and assistance
- 52. Welfare services

60. HOUSING AND COMMUNITY AMENITIES

- 61. Housing
- 62. Community development
- 63. Sanitary services

70. OTHER COMMUNITY AND SOCIAL SERVICES

71. Recreational and related cultural services
72. Religion and services, n.e.c.

80. ECONOMIC SERVICES

81. General administration, regulation and research
82. Agriculture, forestry, fishing and hunting
83. Mining, manufacturing and construction
84. Electricity, gas, steam and water
85. Roads
86. Inland and coastal waterways
87. Other transportation and communication
88. Other economic services

90. OTHER PURPOSES

91. Public debt transactions
92. Transfers of a general character to other governmental organs
93. Outlays in connection with disasters and other calamities
94. Outlays, n.e.c.

Notes appearing at the end of Table 5.3 of "A System of National Accounts"

(1) In addition, it is desirable to furnish data of total outlays on all the research and scientific endeavours, i.e., on the activities, services and promotional schemes of this type included under other categories of the classification as well as in category 14.

(2) Some outlays on educational or health research of a more detailed character will be classified under categories 32 or 42 respectively.

Annex VIII.C Functional classification of France

Source: *Notes et Etudes Documentaires, n° 3965-3966.*
Paris, *La Documentation française*, 1973.

FUNCTION

Group of activities

---

1. PUBLIC AUTHORITIES AND GENERAL DEPARTMENTS OF GOVERNMENT

   11. Public authorities
   12. Central government departments
   13. Justice
   14. Territorial administration
   15. Internal security
   16. Economic and financial departments
   17.
   18.
   19. Research
   10. Non-allocated appropriations

2. EDUCATION AND CULTURE

   21. First-level education
   22. Second-level education
   23. Higher education
   24. Agricultural and veterinary education
   25. Sport and socio-educational activities
   26. Vocational training
   27. Teacher education
   28. Cultural activities
   29. Research
   20. Non-allocated appropriations

3. SOCIAL SECTOR, HEALTH AND EMPLOYMENT

   31. Health
   32. Social measures
   33. Child care
   34. Social security
   35. Work and employment
   36. Ex-servicemen
   37. Personnel training
   38.

39. Research
30. Non-allocated appropriations

4. AGRICULTURE AND THE COUNTRYSIDE

41. Land development
42. Water supply
43. Improvement of rural dwellings
44. Environment and forests
45. Agricultural production and farm resources
46. Packaging, storage, processing and marketing
47. Market intervention
48. Activities of a social nature
49. Research
40. Non-allocated appropriations

5. HOUSING AND TOWN PLANNING

51. Land development (except new towns)
52. New towns
53. Urban networks and services
54. Urban transport
55. Housing
56.
57.
58.
59. Research
50. Non-allocated appropriations

6. TRANSPORT AND COMMUNICATIONS

61. Ports and waterways
62. Air transport
63. Roads
64. Rail transport
65. Postal services and telecommunications
66.
67.
68.
69. Research
60. Non-allocated appropriations

7. INDUSTRIES AND SERVICES

71. Energy
72. Mining and metallurgy
73. Mechanical and electrical engineering, electronics
74. Chemical and rubber industries
75. Textile and other industries
76. Building materials, building and public works
77. Tourism
78. Trades and crafts
79. Research
70. Non-allocated appropriations

8. EXTERNAL

81. Representation abroad
82. Activities abroad
83. Development aid
84. Co-operation with French-speaking African States south of the Sahara and with Madagascar
85. International bodies
86. Foreign military aid
87.
88.
89. Research
80. Non-allocated appropriations

9. DEFENCE

0. NON-FUNCTIONAL EXPENDITURES AND NON-ALLOCATED APPROPRIATIONS

Annex VIII.D Functional classification of Colombia

Source: *Presupuesto Nacional de Colombia para el ejercicio 1977*

SERVICE

FUNCTION

Group of activities

---

100. GENERAL SERVICES

110. CENTRAL GOVERNMENT

111. Executive and legislative branches
112. Financial and fiscal resources
113. Foreign and international relations
114. Overall planning
115. Overall statistics
116. Civil Service
117. Labour questions
118. Regional development and territorial integration
119. General government services other than the above

120. PUBLIC ORDER AND SECURITY

121. General administration
122. Justice
123. Police
124. Prison service
125. Fire service

130. NATIONAL DEFENCE

131. General administration
132. Army
133. Navy
134. Air Force

---

* The description of the content of each heading of this classification appears in document UNESCO/NS/ROU/ , December 1983.

200. ECONOMIC SERVICES

220. RENEWABLE NATIONAL RESOURCES

221. General administration and regulation
222. Protection and preservation of the environment
223. Settlement and distribution of land
224. Conservation and improvement of land
232. Agricultural output and hygiene
233. Animal output and hygiene
234. Forestry output and hygiene
235. Fisheries output and hygiene

240. NON RENEWABLE NATURAL RESOURCES

241. General administration and control
242. Coal-mining
243. Oil and natural gas extraction
244. Metallic ores extraction
245. Non-metallic ores extraction

250. ELECTRICITY, GAS AND WATER

251. General administration and regulation
252. Electricity services
253. Gas services
254. Water services

260. INDUSTRY, COMMERCE AND TOURISM

261. General administration and regulation
262. Output of manufacturing industry
263. Marketing
264. Promotion of tourism

270. TRANSPORT

271. General administration and regulation
272. Rail transport
273. Road transport
274. Sea and river transport
275. Air transport

280. COMMUNICATIONS

281. General administration and regulation
282. Postal services
283. Telegraph and telephone
284. Radio and television

290. SCIENCE AND TECHNOLOGY

291. General administration and regulation
292. Training of scientists and technicians
293. Research and development
294. Circulation of scientific and technological information
295. Scientific and technological support services

300. CULTURAL AND SOCIAL SERVICES

310. EDUCATION

311. General administration and regulation
312. Pre-primary and primary education
313. Secondary education
314. Intermediate tertiary education
315. Vocational tertiary education
316. Non-formal education
317. In-service training
318. Educational facilities

330. HEALTH

331. General administration and regulation
332. Medical and dental services
333. Public health, vaccination and environmental health
334. Food and nutrition

350. CULTURE, SPORT AND LEISURE

351. General administration and regulation
352. Culture
353. Sport and leisure
354. Support for organizations

360. TOWN AND COUNTRY PLANNING

361. General administration and regulation
362. Urbanization, including housing
363. Urban and rural sanitation services

370. SOCIAL SECURITY AND WELFARE

371. General administration and regulation
372. Social security
373. Social welfare

400. NON-CLASSIFIABLE EXPENDITURE

410. NATIONAL DEBT

420. TRANSFERS BETWEEN PUBLIC AGENCIES

430. DISASTERS, NATIONAL CALAMITIES AND OTHER CONTINGENCIES

440. MISCELLANEOUS EXPENDITURE

Annex VIII.E Example of conventional type of functional classification

SERVICE

FUNCTION

Group of activities

100. GENERAL GOVERNMENTAL SERVICES

110. GENERAL ADMINISTRATION

111. Executive
112. Legislature
113. Financial and fiscal administration
114. General planning and programming
115. Regional planning and development
116. Regulation of employment
117. General statistics

120. JUSTICE AND INTERNAL SECURITY

121. General administration
122. Justice
123. Police
124. Prison service
125. Prevention of and protection against disasters

130. FOREIGN AFFAIRS

131. General administration
132. Diplomatic relations
133. Bilateral and multilateral aid

140. DEFENCE

141. General administration
142. Armed forces
143. Civil defence

200. INNOVATION SERVICES

210. SCIENCE AND TECHNOLOGY

211. Administration and regulation
212. Training of future research workers (i.e. post-graduate studies)
213. Research and development
214. Scientific and technological services

300. ECONOMIC SERVICES

310. RENEWABLE NATURAL RESOURCES

311. Administration and regulation
312. Protection and preservation of the environment
313. Agrarian reform and land distribution
314. Conservation and improvement of farmland
315. Agricultural output and promotion
316. Animal output and promotion
317. Forestry output and promotion
318. Fisheries output and promotion

320. NON RENEWABLE NATURAL RESOURCES

321. Administration and regulation
322. Coal-mining, oil and natural gas extraction
323. Metallic ores extraction
324. Non-metallic ores extraction

330. ELECTRICITY, GAS AND WATER SUPPLIES

331. Administration and regulation
332. Production, transmission and distribution of electricity
333. Transport and distribution of gas
334. Water supply

340. MANUFACTURING

341. Administration and regulation
342. Output and promotion of manufacturing industry

350. COMMERCE

351. Administration and regulation
352. Internal trade and consumer protection
353. Foreign trade and price support
354. Tourism and hotels
355. Banking and insurance

360. TRANSPORT

361. Administration and regulation
362. Rail transport
363. Road transport
364. Sea and river transport
365. Air transport
366. Other forms of transport

370. COMMUNICATIONS

371. Administration and regulation
372. Postal services
373. Telegraph and telephone
374. Radio broadcasting and television

400. CULTURAL AND SOCIAL SERVICES

410. EDUCATION

411. Administration and regulation
412. Pre-primary and primary education
413. Vocational and technical secondary education
414. General secondary education
415. Higher education (with the exception of post-graduate studies)
416. Non-formal education, impossible to define, by level
417. In-service training for skilled workers and professional staff

420. CULTURE, SPORT AND LEISURE

421. Administration and regulation
422. Cultural affairs
423. Sport
424. Leisure

430. HEALTH

431. Administration and regulation
432. Medical and hospital services
433. Preventive medecine (including vaccination campaigns)
434. Public and environmental health and hygiene
435. Food and nutrition

440. SOCIAL SECURITY AND WELFARE

441. Administration and regulation
442. System of social security benefits and allowances
443. Social services provided by charitable organizations

450. DEVELOPMENT OF HUMAN COMMUNITIES AND SETTLEMENTS

451. Administration and control
452. Urban communities and settlements
453. Rural communities and settlements

900. NON-FUNCTIONAL OR NON-ALLOCATED EXPENDITURE

910. NATIONAL DEBT

920. GENERAL TRANSFERS BETWEEN PUBLIC AGENCIES

930. DISASTERS AND CALAMITIES

940. MISCELLANEOUS EXPENDITURE

Annex VIII.F Example of the systemic type of functional classification

FUNCTION

Objective

100. OVERALL HOMOEOSTASIS

- 110. General legislation and public administration
- 120. Planning of overall development
- 130. Financing of overall development
- 140. Regional development and town and country planning
- 150. Organization of international relations
- 160. Protection of national sovereignty

200. EXCHANGE WITH THE NATURAL ENVIRONMENT

- 210. Exploitation and preservation of animal and plant life
- 220. Prospecting for and extraction of mineral resources and fuels
- 230. Exploitation and preservation of land and water resources
- 240. Exploitation and preservation of marine, oceanic and coastal systems
- 250. Utilization and preservation of the atmosphere
- 260. Exploration and utilization of space

300. PROCESSING AND CIRCULATION

- 310. Processing by small and large-scale industry
- 320. Building and public works
- 330. Production, storage and distribution of energy
- 340. Development of transportation and warehousing
- 350. Marketing and distribution of basic and manufactured products
- 360. Development of banking and insurance
- 370. Development of the hotel trade and tourism

400. INFORMATION

- 410. Transmission of messages and signals
- 420. Processing and storage of documents
- 430. Mass communication

500. SOCIAL REGULATION AND PROTECTION

- 510. Regulation of social relations
- 520. Protection of physical and mental health
- 530. Improvement of standard of living
- 540. Improvement of the quality of life and the human environment

600. INTELLECTUAL HERITAGE

- 610. Transmission of the intellectual heritage
- 620. Protection of the intellectual heritage

700. INNOVATION

- 710. Scientific and technological innovation+
- 720. Social innovation
- 730. Cultural innovation

900. NON-ALLOCATED EXPENDITURES

+ PROGRAMMES COMING UNDER THE OBJECTIVE "SCIENTIFIC AND TECHNOLOGICAL INNOVATION"

FUNCTION

Objective

Group of programmes

---

700. INNOVATION

- 710. Scientific and technological innovation
  - 711. Planning and general administration
  - 712. Training of future research workers
  - 713. Research and experimental development (R&D)
  - 714. Scientific and technological services (STS)

Annex IX Classification by branches of economic activity (ISIC)

Source: International standard industrial classification of all economic activities. (ST/STAT/SER.M/4 Rev.2), United Nations, New York, 1969.

DIVISION Major group	
1000.	AGRICULTURE, HUNTING, FORESTRY AND FISHING
1100.	Agriculture and hunting
1200.	Forestry and logging
1300.	Fishing
2000.	MINING AND QUARRYING
2100.	Coal mining
2200.	Crude petroleum and natural gas production
2300.	Metal ore mining
2900.	Other mining
3000.	MANUFACTURING
3100.	Manufacture of food, beverages and tobacco
3200.	Textile, wearing apparel and leather industries
3300.	Manufacture of wood and wood products, including furniture
3400.	Manufacture of paper and paper products, printing and publishing
3500.	Manufacture of chemicals and chemical, petroleum, coal, rubber and plastic products
3600.	Manufacture of non-metallic mineral products, except products of petroleum and coal
3700.	Basic metal industries
3800.	Manufacture of fabricated metal products, machinery and equipment
3900.	Other manufacturing industries
4000.	ELECTRICITY, GAS AND WATER
4100.	Electricity, gas and steam
4200.	Water works and supply
5000.	CONSTRUCTION
5000.	Construction

6000. WHOLESALE AND RETAIL TRADE AND RESTAURANTS AND HOTELS

- 6100. Wholesale trade
- 6200. Retail trade
- 6300. Restaurants and hotels

7000. TRANSPORT, STORAGE AND COMMUNICATION

- 7100. Transport and storage
- 7200. Communication

8000. FINANCING, INSURANCE, REAL ESTATE AND BUSINESS SERVICES

- 8100. Financial institutions
- 8200. Insurance
- 8300. Real estate and business services

9000. COMMUNITY, SOCIAL AND PERSONAL SERVICES

- 9100. Public administration and defence (1)
- 9200. Sanitary and similar services
- 9300. Social and related community services
- 9400. Recreational and cultural services
- 9500. Personal and household services
- 9600. International and extra-territorial bodies

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(1) The sub-divisions Public Administration and Defence do not occur in the ISIC. These categories are defined in Table 5.3 of "A System of National Accounts", (ST/STAT/SER.F/2/Rev.3), Sales No. E.69.XVII.3, United Nations, New York, 1968.

Annex X Recommendation on the national budgeting of scientific and technological activities

Adopted by the Fifth Meeting of the Standing Conference of Directors of National Science Policy and Research Councils of the Latin American and Caribbean Member States.

(Quito, 13-18 March 1978)

The Fifth Meeting of the Standing Conference of National Science Policy and Research Councils of the Latin American and Caribbean Member States,

CONSIDERING

That the variable "Science and Technology" exerts a very profound impact on the evolution of political, economic, cultural and social structures of countries,

That scientific and technological activities are carried out mainly by public institutions in most of the countries of the Region,

That, consequently, the major portion of the expenditure devoted to such activities is derived from budgetary allocations appearing in national budgets which in certain cases do not appropriately or explicitly identify these activities, a situation that hinders their proper orientation and co-ordination,

That the experience of several Member States, together with the methodological studies and practical advisory missions carried out by Unesco, have demonstrated the desirability of utilizing the functional classification, provided that such classification include the specific function and sub-functions which identify "Science and Technology",

That the experience mentioned above also showed the need for training courses and seminars for officials responsible for the programming and budgeting of scientific and technological activities, with a view to improving the integration of "Science and Technology" in the budgetary procedures of the government,

That the First Meeting of the *ad hoc* Working Group on National Budgeting for Science and Technology, convened by Unesco in Montevideo, Uruguay, from 20 to 24 June 1977, demonstrated the desirability of holding periodic meetings in order to exchange information on national experiences in this regard,

That it is furthermore desirable to draw the attention of the Statistical Commission of the United Nations Economic and Social Council to the place that should be assigned to "Science and Technology" within the "Classification of Functions or Purposes of the Public Administrations" which is at present being revised,

That it is also necessary to draw the attention of the Conference of Ministers responsible for Science and Technology Policies in the European and North American Region (MINESPOL II), to be held in Belgrade in September 1978, as well as of the United Nations Conference on Science and Technology for Development, to be held in

Vienna in 1979, as to the desirability of promoting the explicit inclusion of "Science and Technology" within national budgets through functional identification of scientific and technological activities, and of benefitting from the progress achieved in this field in Latin America and the Caribbean,

RECOMMENDS TO MEMBER STATES:

That, with the participation of their national organization responsible for science and technology policy, they:

1. Take the necessary measures to improve their budgetary techniques and procedures allowing for the formulation of functional budgets by programmes;

2. Take the necessary measures with a view to including a function and specific sub-functions for "Science and Technology" within the functional classification of their respective budgets;

3. Insert specific instructions in the national budgeting manuals which permit a clear identification of the scientific and technological activities provided for in their respective budgets, and list these activities under the function "Science and Technology";

4. Offer co-operation and advisory services to those countries that require it, so that their respective national budgets will provide for the explicit budgeting of scientific and technological activities;

5. Request that the United Nations Development Programme (UNDP) support national programmes and a regional programme in the field of budgeting for science and technology with a view to fostering co-operation, aid and exchange of national experiences, as well as the organization of courses and seminars to train and bring up to date those officials who take part in the programming and budgeting processes concerning scientific and technological activities.

RECOMMENDS TO UNESCO:

1. That it co-ordinate its activities in the field of budgeting and programming of scientific and technological activities with those of other international organizations;

2. That it publish and distribute as soon as possible an operational and conceptual document related to national budgeting and programming for scientific and technological activities;

3. That within its Science and Technology Policy Programme it continue to collect and analyse the results of different national experiences, so as to take them into account in the periodic up-dating of the methodological documents related to the explicit integration of "Science and Technology" in the national budgetary processes;

4. That it continue to give practical advice in that field to the countries which request it, and that it give special support to the request, addressed by the Member States to the UNDP, for national programmes as well as for a regional programme aimed at offering

practical advice, travel grants, courses and seminars for the training of officials entrusted with the programming and budgeting of scientific and technological activities;

5. That it transmit to the Statistical Commission of the Economic and Social Council of the United Nations the suggestion that it would be desirable to include "Science and Technology" as a function in the "Classification of Functions or Purposes of the Public Administrations" which is at present being revised;

6. That it transmit to the Conference of Ministers responsible for Science and Technology Policies in the European and North American Region (MINESPOL II), meeting in Belgrade in September of 1978, as well as to the United Nations Conference on Science and Technology for Development (UNCSTD), meeting in Vienna in 1979, the recommendations on national budgeting of scientific and technological activities, adopted at this Meeting.

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