

ECONOMIC RESEARCH CENTRE

TENTH ROUND TABLE

(31st March - 2nd April, 1971)

*REPORT OF THE TENTH ROUND TABLE
ON TRANSPORT ECONOMICS*

Held in Paris, on the following topic:

**application of modern methods
(with special reference
to planning, programming,
budgeting techniques)
to the choice
of investment projects**

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT

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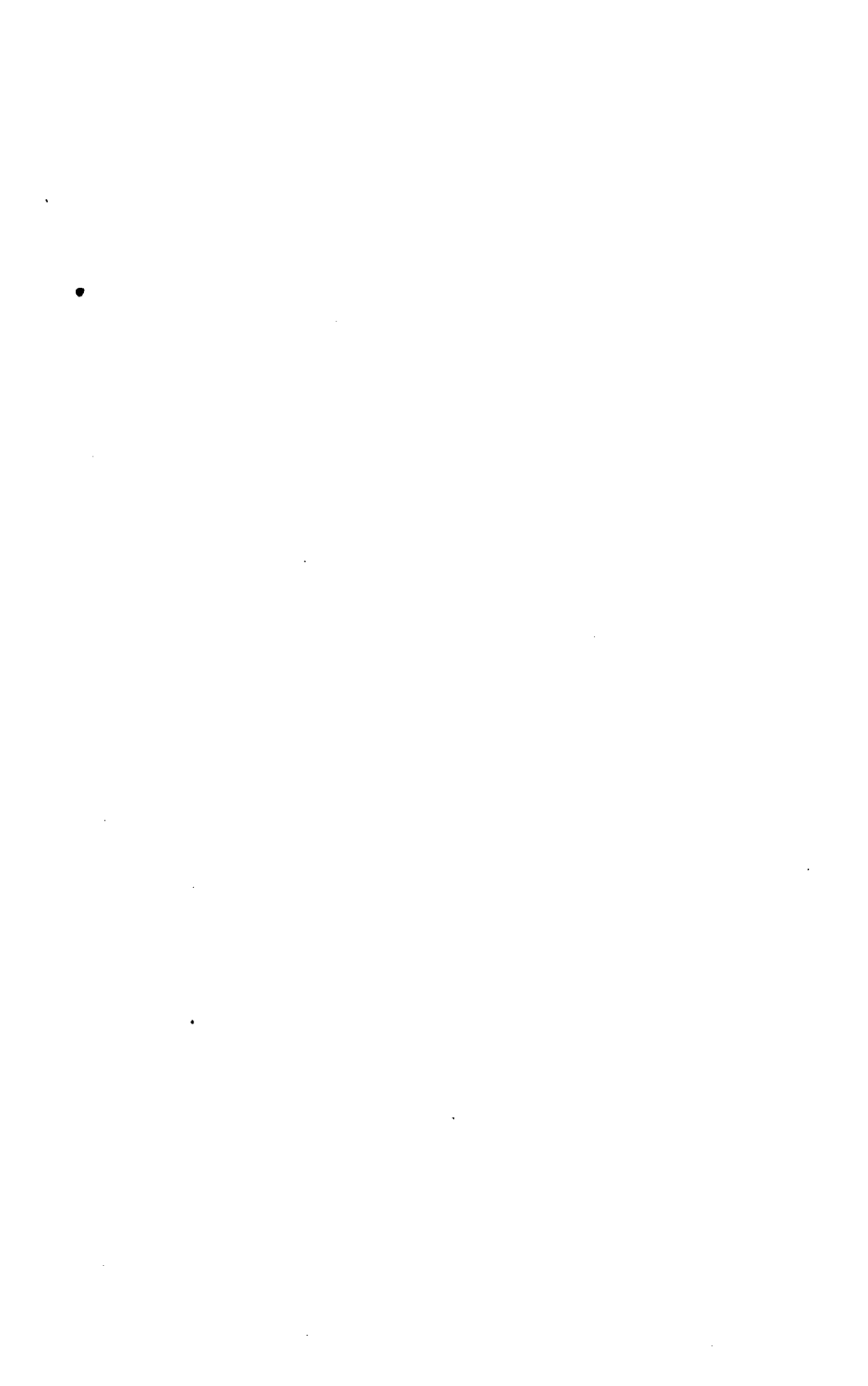
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INTRODUCTION

Planning, Programming and Budgeting (P.P.B.) techniques are attracting great attention as a means to clarify problems in the administration of the public sector.

The results of P.P.B. studies in the United States have attracted considerable attention in Europe and interest in the application of P.P.B. techniques to problem areas, including transport, found in many countries. Although the results of P.P.B. in the United States have not satisfied all expectations, a number of practical studies have been undertaken in Europe which have developed on the experience made in the United States. The Introductory Report to this, the tenth, Round Table of the E.C.M.T. outlined the progress in France with the application of P.P.B. (termed Rationalisation de Choix Budgétaire) to problems in the Transport Sector.

The Introductory Report has been fully discussed at a meeting of experts from the E.C.M.T. countries and a brief Summary of the main points arising in the discussion will be found after the Report.

The E.C.M.T. would like to thank all those who took part in the meeting, particularly the Rapporteurs - M. Perrod and his associates, and the Chairman, Mr. A.J. Harrison.

The present publication is sent to those persons and institutions who are included on the distribution list of the E.C.M.T. It will willingly be sent to other people or institutions who signify their interest.

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APPLICATION OF MODERN METHODS
(WITH SPECIAL REFERENCE TO PLANNING,
PROGRAMMING, BUDGETING TECHNIQUES)
TO THE CHOICE OF INVESTMENT PROJECTS

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REPORT ON THE TENTATIVE APPLICATION OF P.P.B.S.
TO THE CHOICE OF TRANSPORT INVESTMENTS

PLAN OF THE REPORT

INTRODUCTION:

JUSTIFICATION OF THE P.P.B.S. APPROACH (THE PROBLEM OF OBJECTIVES AND OF ECONOMIC AND SOCIAL APPRAISAL OF TRANSPORT PROGRAMMES).

- I. METHOD AND TECHNIQUES EMPLOYED FOR THE CHOICE OF PROGRAMMES.
- II. CONTEXT IN WHICH SUCH METHODS SHOULD BE EMPLOYED.
- III. APPLICATIONS.

CONCLUSION

INTRODUCTION

Transport is one of the fields where "scientific" methods of decision planning have always been most readily accepted by political decision-makers.

Economic analysis, in particular, has been widely applied in this sector since the 19th century and there can be no denying the important contribution of transport economists in a good many areas of theory (e.g. choice of investments, pricing, collective goods, and optimisation - to mention only the most important) and practice.

But it is no exaggeration to say that the application of increasingly refined methods of this kind has not yielded as good results as it could legitimately be expected to achieve. As our knowledge of the internal equilibria of the transport function improved, and as our methods for taking account of consumers' surplus became more precise, more and more difficulties cropped up in actual practice and decisions that were fully justified from the economist's standpoint were challenged - sometimes fiercely - by public opinion. The "motorways rebellion", is a case in point: though the protest was a peaceful one, its impact in the United States was lasting. The experts were amazed: how could there be any objection to the construction of urban motorways yielding so big a social surplus?

Such outbursts of public opinion have become sufficiently frequent (the San Francisco motorways "rebellion" having been followed by many other protests) to bring about a feeling of frustration within the professional circles concerned. It seems that three main factors have contributed to the gradual erosion of the transport economist's confidence in his own competence:

- recognition of the fundamental importance of "external effects" that cannot easily be analysed and quantified but to which the communities concerned are highly sensitive;

- awareness of the complete interdependence of transport, spatial systems planning and land-use policies. More generally speaking, the fact that transport strategies serve "goals" far beyond the "internal" objectives of the transport undertaking, and even beyond the collective objectives bound up with the satisfactory performance in the short-term, of a transport function;
- the growing diversification of social groups and cultural patterns within communities which gives added weight to the re-distributive aspects of policies, considerably hamper the analyst steeped in business management techniques and in global calculations that to him are clear and convincing.

Dismay at the sight of these difficulties, may paradoxically, lead to the adoption of one of the following radical attitudes, neither of which is justified:

- (a) to disregard anything which cannot conveniently be fitted into the "classical" framework of economic analysis
- (b) to throw overboard all the wealth of knowledge that this technique represents.

The first attitude is unrealistic. In our view, it stems from a misconception of the technician's role, a misconception based on the out-dated idea that he is able to prepare every decision in his back room, irrespective of the scope of the system dealt with, and can dispense with any true interchange with the representatives of the communities concerned at one or more levels.

The second attitude is bad because it fails to give political decision-makers the data on financial profitability, or even on internal economic rate of return, which - together with other indicators - they need to enlighten them as to the impact of the considered strategies.

Between these two extremes, the middle approach suggested by recent decision-planning methods is based on the idea that

economic analysis, as R. Passet(1) puts it, is a "truncated" technique, that is, a technique not only bereft of what it cannot integrate because of the many difficulties of evaluation to be overcome but, in some cases, also excluding what it does not wish to integrate.

Where Government is concerned however, the planning of decisions must involve completely open-minded thinking on the often conflicting objectives of the various groups concerned. Starting from this principle, the P.P.B.S. approach basically consists of four stages as follows:

1. General consideration of the transport system and its links with the overall system of activities from which it stems. Determination of the relevant variables so as to define the general socio-economic environment of the system considered, transport supply in its various forms, and the mechanisms relating to the fixation and foreseeable allocation of demand for each conceivable strategy.
2. The definition of "operational" objectives capable of providing indicators for appraising the relative value of the considered strategies with regard to each objective for all the groups concerned.
3. The choice of technical and institutional alternatives constituting a representative sample of the range of "possibilities". Simulation of the future operating conditions of these alternatives in order to calculate the impact of each of them on the various groups concerned.
4. Comparison of these alternatives and selection by Society of the practical strategy which best reconciles the views of all the groups concerned.

Stages 1 and 3 above are of a fairly technical character, and in their case P.P.B.S. involves no different treatment from that adopted with previous procedures. At most, they are inclined to imply a more open-ended approach to alternatives, but

(1) See Article entitled "Une Science tronquée" by R. PASSET in "Le Monde de l'Economie" of 11th January, 1971.

this is essentially because a P.P.B.S. study is well equipped with tools of analysis and can therefore cover a greater number of variants by taking into account all kinds of innovations.

The originality of the P.P.B.S. approach lies in stages 2 and 4, the underlying aim being two-fold:

- comprehensive coverage of economic and social viewpoints and their translation into objectives;
- improvement of project appraisal procedures in the light of these objectives.

WHY OBJECTIVES?

In the light of the proceedings of the Transport Commission for the VIth French Plan, objectives in the transport sector fall into three major categories:

- (1) "Internal economy" objectives directly linked with the competitiveness objective of the sector, this embracing all the objectives the pursuit of which normally lies with the "manager" of the transport "business".
- (2) "Economic development" objectives bound up with regional development objectives, which cannot be integrated into the economics of the transport "business".

This covers the collective objectives which make up the forward-planning responsibilities of the authorities as regards "structuring" the country, providing for continuity where required, and promoting the take-off of desired industrial growth by specific measures.

- (3) "Social development" objectives bound up with objectives catering for human needs and safeguards, which also cannot be integrated in the economics of the transport "business". This involves providing for urban and regional accessibility (i.e. public services) and safeguarding the living conditions and environment of the entire community.

These objectives match the three broad options of the VIth Plan as regards the Transport sector as a whole, with the following respective aims:

- to seek competitiveness at every level, notably by making "protected" sectors open to competition and applying the market system under "rules of the game" that are both plain and equitable;
- to promote an effective industrial policy implying government action in the field of land-use planning and the promotion of major industrial programmes together with a research and development policy oriented towards potential industrial applications;
- to protect human living conditions, especially those of the least privileged, giving careful attention to the negative and re-distributive effects of economic growth in industrial societies.

For the first category of objectives, which covers all the internal operations at the transport "business" (efforts to improve productivity of plant and machinery, adjustments to suit users' requirements, optimal utilisation of available resources), it is pointless to seek indicators other than those which have long been part of the armoury of classical economic analysis. Financial and economic appraisals and the calculation of surpluses give "overall" evaluations of the internal effectiveness of various strategies and, subject to certain well-known safeguards, very rightly lie at the root of all business decisions. With economic and social development objectives, however, things become more complicated.

In the case of economic development objectives, it is difficult to quantify the benefits of land-use planning policies with as much accuracy because such policies are nearly always linked with a long-range view of requirements which means that some of the benefits will go to future generations to the detriment of immediate effectiveness.

When faced with this transfer of benefits, which can be quantified(1), an attempt must be made to put in indicators of

(1) The problem here is between projects which may have a high return in the long term and those which offer a secure short-term return.

future effectiveness as only in this way is it possible to judge whether a particular land-use planning policy is warranted. This is a little-known field but it is of fundamental importance for transport economics.

In the case of "social development" objectives, the problem of indicators arises in different forms; here, it usually consists in securing, for the community as a whole, standards of service as regards urban accessibility (this being bound up with the concept of public service) and safeguards against pollution (environment standards). In the eyes of many economists, such standards of service may involve non-optimal allocation of resources as they are no longer subject to the interplay of supply and demand. The existence of such "social norms", which apparently conflict with the overall efficiency of the production system, is not a new problem, nor is it peculiar to the transport sector.

There is in fact no contradiction in this, but rather a restriction of the range of possibilities which is accepted by the community because it safeguards values so fundamental that considerations of efficiency cannot be allowed to damage them. Just as no industrial policy could nowadays be based on the intensive and unpaid labour of an underprivileged minority (e.g. child labour in the 19th century), no transport policy could in future be put into practice if certain minorities suffered negative effects in excess of what are regarded as "norms" by general political consensus.

The indicators under review are of somewhat different kinds, i.e. close to business profit indicators in the case of internal objectives, nearer to a reflection of the long-term preoccupations of the community where economic development objectives are concerned and more akin to the "scale of values" of the political consensus in the case of social development objectives.

Generally speaking, the primary aim of P.P.B.S. systems is to integrate objectively the various aspects of a complex development and transport problem in such a way that all those involved can see their views and interests reflected in the indicators employed.

This open-ended approach to the range of objectives clearly raises the problem of evaluation. Given that indicators to measure the impact on all the groups concerned are essential for planning a collective choice, there still remains to find a way of aggregating these selection criteria and, where necessary, of revising the initial objectives in the light of first appraisals.

TOWARDS AN ECONOMIC AND SOCIAL EVALUATION OF TRANSPORT PROGRAMMES

Evaluation in this case means an overall assessment since the object is to aggregate individual viewpoints in order to work out the best solution for the community.

Such aggregation implies three separate weightings:

- to determine the relative importance assigned to each objective by a given group within a given time scale;
- to determine, for a given objective, the relative importance assigned by a given group to each time scale;
- to determine the relative importance of each group as such.

In a sector governed by a market system (individualised transactions of "private" goods) this three-fold weighting is achieved by prices. In the absence of normative criteria for income distribution as between groups, a "balance sheet" for the community can be worked out on this price basis in order to determine the optimal solution.

Prices cannot play this role without modification in the transport sector. As the involvement of individuals in a transport system does not systematically consist of "individualised" transactions, transport is a "mixed" good for which market mechanisms are either non-existent or distorted by important external effects.

In order to be able to apply economic analysis to the transport sector, economists have, of course, had to replace prices by monetary equivalents inferred from the observation of individual behaviour: for instance, the valuation of time, human life, comfort, etc. in money units.

This urge to translate everything into monetary equivalents is often open to criticism in the transport sector on various grounds:

- it tends to cloud the importance of "minority" views because of its high degree of aggregation;
- it can be biased by the fact that individuals more readily display their preferences for private goods than public goods (because they can consume public goods without their having to ask and pay for them);
- it tends in practice to give too much weight to effects that are easily expressible in monetary units to the detriment of those that are not (i.e. intangibles);
- it makes it no easier to take account of long-term effects, especially as regards environment amenities, because lack of information on the negative effects of certain options prevents individuals from indicating meaningful preferences in this respect;
- it leads to the relative effectiveness of solutions being treated as the only issue to the detriment of considerations of equity. The re-distributive effects of the choices adopted are usually underestimated if not disregarded altogether;
- above all, the methods of calculating shadow prices are very often of questionable validity.

The second essential characteristic of the P.P.B.S. approach therefore consists in basing collective decisions on more flexible procedures than the elaboration of a purely monetary "balance sheet" for the aggregation of individual choices.

We will first tackle the technical aspects of the P.P.B.S. approach as at present discussed for the preparation of the VIth Plan with reference to Transport.

Next, consideration will be given to the context in which these methods are used and this will be illustrated with three practical applications.

I. METHODS AND TECHNIQUES FOR THE CHOICE OF PROGRAMMES

Before discussing transport programme selection and evaluation techniques, it may be useful to recall and describe briefly the broader context that they fit into, that is, the overall methodology bound up with systems analysis.

1.1 Methodology of systems analysis

This normally comprises four phases as follows:

- 1.1.1. Description of the system.
- 1.1.2. Determination and definition of objectives.
- 1.1.3. Determination of programmes.
- 1.1.4. Evaluation and selection of action programmes.

Each of these stages will be taken in turn (though they can in fact overlap to a considerable degree).

1.1.1. Description of the system

Here the aim is to analyse the transport system, that is, to consider its component parts and their inter-relationships. This descriptive process is useful in that it clearly defines the problem itself and its boundaries. These can be of an economic or social order but they can also be boundaries in space or time. In addition, a distinction has to be made between internal (or endogenous) variables which in fact correspond either to possible actions or the result of such actions and variables that are external (or exogenous) to the system and which define the frame of reference of the survey.

1.1.2. Determination and definition of objectives

The purpose of this second stage is to get a clear picture and plain statement of the objectives of the decision-makers concerned. The problem of objectives is discussed in the Introduction to this Report.

1.1.3. Determination of programmes

The next stage consists in seeking out every possible elementary action matching these objectives and formulating alternative programmes. The process which consists in taking stock of possible actions must not be confined to an inventory of existing projects. The comprehensiveness aimed at can be achieved by ascertaining the essential characteristics of the actions to be undertaken, e.g. mode of transport and inter-modal combination, characteristics of equipment, management, etc. For each characteristic, variants must be envisaged. Techniques such as analysis can be employed at this stage. Similarly, an objective-programme structure will help to visualise the considered strategies more clearly. A first selection (by cost-effectiveness analysis) is a good way of simplifying the problem.

1.1.4. Programme evaluation and selection

It then remains to compare the programmes among themselves with due regard to the relevant objectives. This is done by means of more or less sophisticated techniques such as cost-effectiveness analysis, cost-benefit analysis, multi-criterion analysis, and "overall" cost-benefit analysis. These are discussed later on in this report.

This methodology is fully meaningful only if the analyst and the political decision-maker each play their respective roles. The iterative process in which they are involved may be shown schematically (their "individualisation" being itself also schematic) as follows:

Decision-maker

(Sets the problem.
Defines his own objectives.
Intervenes for certain necessary simplifications.
Formulates his criteria.
Participates in the formulation of a method of evaluation.
Makes the final decision.

Analyst

{Clarifies the problem and defines its frame of reference.

{Takes stock of the decision-makers concerned and of the corresponding viewpoints.

{Determines a first "structure of objectives".

{Systematically seeks out possible programmes.

{Analyses their implications.

This scheme of things seems essential if the analysis of the range of choices is to be a really workable instrument. Evaluation is of course an awkward phase and, as stated in the Introduction, the way in which it is dealt with differs from classical methods. More particulars on this point are accordingly given below.

1.2. Cost-effectiveness analysis

The analyses of costs and benefits classified under this head provide data for decisions as to the choice of alternative programmes.

For practical purposes, this type of analysis is intended to give a meaningful reply to the following question:

"How should programmes for the fulfilment of given objectives be selected so as to make the best use of the resources assigned to these objectives?".

However, the choice between such programmes can be based on two approaches which in fact amount to breaking down the foregoing question into two parts:

- How effectively does a programme make it possible to achieve comparable given objectives? This approach with costs taken as constant (i.e. an overall budgetary constraint on costs) makes it possible to determine the most effective programme;

The maximisation of effectiveness is measured by reference to the objective indicator.

- Can the results of an existing programme be achieved at less cost?

This approach, based on a given effectiveness rating, shows which programme is least costly.

In this case, therefore, costs are minimised.

Attention must be drawn to major difficulties in the measurement of effectiveness. When this can be done by reference to a single quantitative criterion, straightforward evaluation is feasible, but if effectiveness is measured by several indicators the first approach mentioned above becomes far more complicated as it calls for a value judgement from the decision-maker on the relative importance of each effectiveness indicator.

Another basic issue arises in connection with the optimal allocation of available resources between programmes contributing to different objectives. Cost-effectiveness analysis does not give a complete answer. Though it does indeed cover the marginal output of each programme as regards effectiveness, it does not enable the "objectives decision-maker" to judge marginal output in terms of utility(1), the point being that allocation is optimised when the utility output of all objectives are equal.

It follows that cost-effectiveness analysis is not suitable for achieving the optimal allocation of resources as between different objectives. In practice it is useful mainly for comparing alternative projects or programmes with identical objectives or for planning decisions concerning predetermined mandatory objectives. Classical economic analysis is therefore well adapted to this purpose, but its contents lead to consideration of another procedure for the simultaneous determination of objectives to be attained and of resources to be allocated to them, namely, cost-benefit analysis.

(1) Utility variation, in the decision-maker's judgement, for a marginal variation of a given objective indicator, the others remaining unchanged.

1.3. Cost-benefit analysis

This is a technique for solving the following problem: "how to compare programmes involving different degrees of attainment of objectives and different costs, classify them in the light of a choice criterion in decreasing order of merit so as to maximise welfare or the satisfaction of needs subject to a given resource constraint".

This is a feasible procedure but it unfortunately involves a considerable difficulty, that is, the evaluation of benefits bound up with the programmes envisaged. This difficulty is discussed at greater length later on, but here it must be pointed out that non-marketable goods, inter alia, must be taken into account and that in order to measure the benefits obtained by producing them it is necessary to simulate their behaviour on a competitive market and estimate monetary equivalents by ascertaining the price that individuals would be prepared to pay if a market did exist.

The various stages of this cost-benefit analysis will be discussed in turn:

Once the programmes have been determined as comprehensively as possible and a so-called reference "solution" selected for the comparison of costs and benefits, special attention must be given to the various social or economic groups (target-groups) that the programmes will affect.

Next comes the most important and most tricky stage: the determination and valuation of benefits and costs.

1.3.1. Determination and evaluation of benefits

1.3.1.1. Determination of benefits

A public programme of resource allocation generates two kinds of benefits: direct and indirect.

Direct benefits:

These are the physical outputs of the system provided, the term "physical outputs" taken in a broad sense since they are both quantitative (increased amount of the service produced) and

qualitative (improvement in the quality of that service). Such direct benefits are either goods or services sold on the market or more or less divisible collective services which, although included in the preference functions of individuals, are not subject to pricing on a competitive market.

External benefits:

These are of two kinds:

- technological external effects;
- pecuniary external effects.

The first concern "the changes in the physical output possibilities of other producers or the satisfaction that consumers may derive from a given volume of resources".

The second concern input or output prices according to R. PREST and R. TURVEY, the right approach to cost-benefit analysis is to eliminate all the factors corresponding to a pure and simple transfer or to a change in allocation by considering costs and benefits on the basis of a given set of prices.

However, as pointed out by G. TERNY, this restriction on taking into account certain external effects is due to the fact that economic efficiency is treated as the only selection criterion for objective functions. But insofar as government operations, because of their scope, are likely to bring about big changes in the initial distribution of wealth and incomes through the medium of input and output prices, it would be appropriate to include another element besides economic efficiency to cover the redistributive effect of the programmes being compared. To take account of the respective importance of each of them, weights could be calculated for the various objective functions (marginal rates of substitution between their independent variables).

1.3.1.2. Evaluation of benefits

The main difficulty lies in having to take into account non-monetary or intangible effects (particularly as regards external effects) arising from non-marketable goods and services.

The analyst must then evaluate how much consumers would be prepared to pay for the service in question if it could be sold and if users were able to include in their appraisals the benefits which do not accrue to them direct. He does this by imputing monetary values both to the physical outputs (internal or direct effects) and to the external effects of the system. Thus, by putting a price on time and safety, for instance, benefits of widely different types such as the saving of work time, increased safety and leisure time can be coherently accounted for.

Furthermore, when monetary benefits are valued in the light of actual market prices, due regard must be paid to errors resulting from the fact that markets for goods and services are not "perfect" if judged by the standard of economic equilibrium and optimal efficiency, and to changes in the general price level that are brought about by certain public investments.

1.3.2. Determination and evaluation of costs

A cost inventory involves fewer methodological difficulties than an inventory of benefits, but real costs may well be appreciably underestimated through lack of information.

Costs bound up with government resource allocation exercise are of two kinds:

- initial cost (or investment cost);
- operating cost (i.e. operation and maintenance).

These costs must be very carefully evaluated with due regard, in particular, to the difficulties of imputation resulting from the fact that the programme envisaged may include the provision of several related services matching different functions.

Once a correct evaluation has been made of physical outputs (or benefits) in money terms, of initial costs and of maintenance and operating costs for each of the years during the life of the initial investments, the next step is to compare the respective merits of the programmes.

1.3.3. Selection criteria

This implies the use of a selection criterion. In cost-benefit analysis, the criterion is the maximum discounted rate of return. This choice infers that the "growth of economic efficiency" objective is given precedence over other objectives enabling the achievement of some kind of collective welfare. Hence, since the collective discount rate is deemed to reflect what the community attributes to consumption at various times over a period, the most suitable general criterion for comparing government resource allocation programmes is the maximisation, subject to given constraints, of the present value of all benefits less the present value of all costs.

Thus, if i is the rate of discount, I the initial cost of a project (installed in year $T = 0$) N the life of the project (n , being variable from one programme to another, $t = 1 \dots n$) a the yearly benefits corresponding to each programme, c the yearly costs (operating and maintenance costs), the discounted profit is written as follows:

$$B = I + \sum_{t=1}^{t=n} \frac{at - ct}{(1+i)^t}$$

The adoption of a programme is governed by the maximisation of B .

However, it may be considered that insofar as discounted benefit or profit covers, besides direct effects or benefits - the external effects on all "agents" affected by the project, it is not far remote from the concept of surplus.

Other criteria are also employed in cost-benefit analysis for the ranking of projects, viz.:

- internal rate of return (the rate of discount at which the present value of future income stream equals that of total outlay including capital cost). If the project shows a higher rate than the discount rate selected it should be adopted;
- marginal rate of return (for determining the scale of projects);

- "immediate" rate of return (for determining the timing of a project).

1.3.4. Limitations of the method

It may be useful at this point to recall the limitations of the cost-benefit method under review. Though undoubtedly a necessary instrument, it still falls short of what is needed for rational decision-making on public expenditures.

The risk of sub-optimisation

Bearing in mind that present budgetary practise imposes a financial constraint on each productive function of the public economy, the application of cost-benefit analysis, if restricted to a few programmes having the same function, disregards every possibility of promoting an "optimum situation" and cannot determine anything better than a "second best optimum". This cannot be avoided, unless resources ceased to be mandatorily apportioned according to traditional budgetary appropriation procedures, and were automatically allocated in the light of the quantitative data obtained by applying the "overall" cost-benefit method to all functions of the public economy until the marginal rates of return had the same value in all cases and were equal to the marginal rate of return for investment in the private sector. As long as these parities are not achieved, resources can be switched from purposes involving a lower marginal cost-benefit ratio to those where the marginal ratio is higher. However, it has to be admitted that the risk of sub-optimisation is inherent in this technique insofar as it is effective for evaluating the respective merits of programmes or projects with clearly defined identical objectives, but far less useful for allocating limited resources to programmes involving separate objectives. Useful though it is for the efficient implementation of a predetermined policy, it is of little guidance for the shaping and formulation of government resource allocation policy.

The inadequacy of economic efficiency as a single criterion

The main limitation of cost-benefit analysis lies in the underlying principles of the choice criterion adopted, for it means in fact that public programmes can be ranked solely by reference to economic efficiency since the only independent

variable of the objective function usually adopted is maximisation of the discounted value of benefits less the discounted value of costs. Simplification of this kind is tolerable for small-scale projects but cannot be regarded as suitable for government activities of such magnitude as to alter the environment to which they relate.

In practice, due regard must be paid to other objectives which sometimes conflict with economic efficiency, such as redistribution of incomes in favour of under-privileged social categories or areas, and the dissemination of values not amenable to economic analysis.

Trade-offs between objectives thus become essential. To give decision-makers clearer guidance, the analyst has to diversify the independent variables of the objective functions taken into account and apply to each of them weights or coefficients (which may be identical with the marginal rates of substitution in cases where objectives can be substituted for each other) in order that the programmes may be better compared in relation to these different objectives.

This refinement of formal cost-benefit analysis so as to include "non-single choice" criteria leads to the more elaborate so-called "combined criteria" methods of analysis with the help of which the procedure for choosing between alternative programmes, given one or more objectives, can be truly integrated.

1.4. Multi-criteria analyses

Before giving a diagrammatic description of two multiple-criteria selection techniques (the PATTERN and ELECTRE methods) we shall recall briefly the basic mathematical concepts:

Let there be a set of objects E which are to be ranked with reference to a set of points of view indicated by the index $I = 1, 2, \dots, n$. It is assumed that the objects E may be predetermined for each point of view.

In addition, for each point of view or criterion, there exists a scale (a finite set of completely determined steps), and the objects E may be attached to a level of the corresponding scale.

Thus with every object E there is associated a series of steps corresponding to each of the points of view (i.e. a point in a multi-dimensional space). The object of multi-criteria methods is to find a complete predetermination in this multi-dimensional space (the set of objects will be reduced to the one chosen).

1.4.1. The PATTERN method (Planning assistance through technical evaluation of relevance number: method developed by HONEYWELL)

The principal phase of the method which will be described allows the means to be ranked once the objectives are determined. Schematically, the process is as follows:

Constructing the relevance diagram (or graph)

This is the fundamental element in the method. Starting from the determined objective which represents the top of the tree, this is divided into separate objectives which are then similarly divided in their turn, and so on until the means are reached. This diagram will be complete when, after iterations, it is composed of elements, their definitions and the specific criteria used in studying each element, all this structure being coherent. The data gathered in this descriptive phase lead to the ranking guide. This guide assembles the necessary information for allotting relevance scores or numbers.

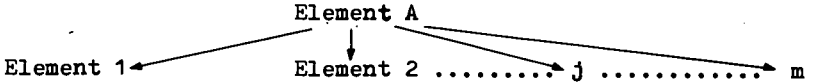
Relevance numbers

Once the diagram is constructed, it is then a question of assessing the contribution of an element at one level towards the element from which it is directly descended, taking into account the different criteria of selection. Here is introduced the relevance number or score which expresses, with respect to each criterion, the contribution of the element to the element from which it resulted.

In fact, the data already assembled in the relevance guide give, for any node of the diagram, the factors necessary for allotting scores to the various elements resulting from the node, for each criterion, incidentally together with their relative weights. Each element of the tree will thus be given

a relevance index (or number) which virtually represents a quantitative estimate of this element's contribution to the parent element.

Suppose the diagram is as follows:



Let us therefore consider m elements resulting from A , and n criteria C_i with weights P_i .

The relevance scores will be given by the following matrix:

CRITERIA	WEIGHTINGS	ELEMENTS				
		1	...	j	...	m
C_1	P_1	S_1^1	...	S_j^1	...	S_m^1
\vdots	\vdots	\vdots		\vdots		\vdots
C_i	P_i	S_1^i	...	S_j^i	...	S_m^i
\vdots	\vdots	\vdots		\vdots		\vdots
C_n	P_n	S_1^n	...	S_j^n	...	S_m^n
Relevance number		r_1	...	r_j	...	r_m

S_j^i is a measure of the contribution of element j to element A according to the criterion C_i of weight P_i . The relevance index or score is thus defined as:

$$r_j = \sum_{i=1}^{i=n} P_i S_j^i$$

The following normalizing expressions are introduced:

$$\sum_{i=1}^{i=n} P_i = 1$$

which requires $\sum_{j=1}^{j=m} r_j = 1$

$$\sum_{j=1}^{j=m} S_j^i = 1$$

The number r_j represents the capacity of element j (objective or means) with respect to its exit level from the mode, for realising the element A (objective or means) of this mode (which virtually means grouping the criteria).

Ranking of means

In order to rank the elements situated at the foot of the relevance diagram, the relevance numbers or indices of the elements encountered on the path leading to the element to be ranked at the top of the diagram are multiplied together. This direct relevance number associated with the means j will be $d_j = \prod rh$

When one means contributes to the realisation of several objectives, the total "points" of this means are summed. The ranking is obtained by arranging the means in decreasing order of their total "points".

However, for ranking programmes of action (grouping means of action) other selection criteria and a certain number of constraints have to be introduced at this stage of the method.

1.4.2. The ELECTRE method (reality represented by elimination and choice)

This method which was developed by S.E.M.A. is intended to provide guidance in the choice between numerous objectives, taking account of several criteria of which all are to be retained.

We shall restrict ourselves to a schematic description of the principle. This method, given the set of objects to be ranked and the system of criteria, makes the following assumptions:

- For each criterion a scale of scores may be established. This allows a score to be allotted to each object. It is the differences between scores and not the absolute scores which are significant.

- To each criterion is allotted a weighting factor indicating the relative importance of the criteria amongst themselves.

The principle of the method consists in defining a relationship for precedence between the objects. Thus it will be said that object O_1 has precedence over O_2 if on the one hand, the relative importance of the criteria for which O_1 is in fact preferred to O_2 is sufficiently great and if on the other hand, for the criteria for which O_1 is not in fact preferred to O_2 , the difference is not too large.

It is possible to define indicators to measure the agreement of preferences (rule of the majority) and the disagreement of preferences (rule of the minority). The object O_1 will have precedence over object O_2 if the agreement indicator exceeds a fixed threshold p and if the disagreement indicator is below a threshold q .

By reducing the constraints imposed by these thresholds, the number of objects comparable amongst themselves is increased, and in the limit a ranking of all the objects will result.

This method, which clarifies to some extent the decision process while maintaining every criterion, allows different programmes to be tested with respect to previously determined objectives, through the use of different patterns of relative weightings.

1.5. Overall cost-benefit analysis

1.5.1. Origin of the method

As defined above, cost-benefit and cost effectiveness techniques are found to be useful mainly for appraising the respective merits of programmes with identical objectives or for choosing between variants of a given programme or project. However, attention has already been drawn to their limitations for allocating limited resources between programmes involving

separate objectives and it hardly seems possible to formulate a government resource allocation policy if these methods alone are applied as they stand.

Hence, consideration must be given to a method which neatly integrates different objectives and the most suitable ways of attaining them so as to optimise the allocation of resources with due regard to the achievement of certain "satisfactions". The "overall cost-benefit" or "benefits-drawbacks" method seems to match this requirement. (It was judged most suitable for the programming stage of the French Plan.)

The origin of this method lies, as already pointed out, in the awareness of certain shortcomings of quantitative economic analysis in the narrow sense (cost benefit and cost effectiveness techniques) for throwing light upon the choices to be made within a far-ranging programme of resource allocation in the transport field. These shortcomings may be classified under the following heads:

- inability to evaluate in monetary terms certain external effects which are unwanted but which do exist (especially with regard to the environment) and certain social effects;
- the fact that the decision must take into account extraneous factors disregarded by quantitative economic analysis and, in particular:
 - . general policy considerations regarding transport such as the competitive position of the French transport system in an international context;
 - . policy considerations extraneous to transport which stem from the proposition that transport is not an end in itself and is shaped by policy decisions concerning economic growth (sectoral and regional economic development) land-use planning policy, defence policy or social policy (improvement of the standard of living).

To try to bridge these gaps, the "benefits-drawbacks" method aims not only to take into account and evaluate the costs and benefits (resulting from direct effects and external effects such as time saving and better safety) of the various programmes, but also to encompass other quantitative or qualitative criteria designed to cover the deficiencies of quantitative or qualitative economic analysis in its narrow sense. These external criteria reflect the concern to ensure that the final decision concerning action programmes must not treat transport policies as being independent of other government policies. This decision-making process stems from a true P.P.B.S. approach embracing a consistent pattern of national strategies in the various fields of government action.

1.5.2. Description of the method

The aim therefore consists in choosing programmes (1, 2, 3 n) to match a number of objectives specific to transport (Ot1, Ot2 Otp) and, indirectly, various objectives extraneous to transport, on which the programmes also have an impact. (Oc1, Oc2 Ocq).

In order to do this, criteria must be found to evaluate the advantages and drawbacks of each programme for achieving each objective. Depending on whether the objectives are specific to transport or simply have a bearing on transport, the criteria will be internal (Ci1, Ci2 Cia) or external (Ce1 Ces).

Moreover, for present purposes, benefits and drawbacks are always defined by a reference to attainment of the objectives. Thus, benefits represent progress towards achieving the desired options [benefits resulting from direct or indirect effects (external effects)] whereas "drawbacks" always represent a negative aspect (e.g. costs). Benefits and drawbacks are judged by qualitative or quantitative criteria depending on the objectives selected, and the methods of evaluation.

In practice, the benefits-drawbacks method works as follows:

For a given transport option or objective, the aim is to determine and then compare all the programmes which more or less

contribute to its achievement. To do this, the benefits and drawbacks are measured according to internal criteria, such as tariffs (revenues) by target groups, time savings etc. in the case of benefits, and costs to users, number of breaks-of-bulk by target groups, pollution index, etc., in the case of drawbacks.

The programmes then go through a first screening process according to one or more criteria such as overall D.C.F., internal rate of return or surplus, or other standards. If more than one criterion is taken into account, it is well to adopt the multi-criteria method, care being taken to weight the criteria as rationally as possible.

Next, the programmes are screened a second time in the light of the objectives which are extraneous to transport but on which the transport option concerned has a bearing. These different overall policies are discussed in paragraph 4.1 which deals with the origin of the method. At this second stage, it is necessary to determine the various external criteria for external objectives so as to judge how far these can be achieved by applying the programmes concerned. The latter are selected by weighting each of the criteria considered and by adopting multi-criteria selection techniques.

The final selection of programmes with a view to an optimal allocation of resources for achieving the objectives can be carried out in two ways: either by weighting the two scales in which the programmes are ranked (which, at first sight, seems extremely difficult and somewhat irrational) or to accept that the second screening gives decisive guidance as to the effectiveness of the programme for achieving the best collective satisfaction.

If certain difficulties in the application of this method are to be avoided the awkward problem of determining criteria and then weighting them for the effective use of multi-criteria techniques must not be under-estimated. It may be hoped that better information, the development of economics in the broad sense (and more especially the development of economic, sociological and psychological research) will pave the way for more explicit weightings and so avoid the implicit ones at present employed for the choice of major resource allocation programmes.

After this review of the various techniques for evaluating and comparing programmes, it may be useful to explain in what context these methods can be applied in the course of the decision-making process for the allocation of resources at governmental level.

II. IN WHAT CONTEXT SHOULD THESE METHODS BE EMPLOYED?

It is clear that the main purpose of these methods is to throw more light on the decision-making process and provide decision-makers with studies and analyses that they can use more effectively. Decision-makers are indeed associated, as regards all the aspects concerning them, with the various choices of a more or less political order to be made throughout the course of a study; they are made aware of the implications of alternative investment decisions and of their bearing on general policies in the sector concerned.

Together with all the other modern management and programming methods that the term "R.C.B." (i.e. P.P.B.S.) - as used in the French Civil Service - embraces, these methods must be integrated in the general decision-making process. Where public investments are concerned the French procedure is in two stages: the "Plan", then the Budget. Every large project is first provided for in the course of the preparation of the five-year plans and the actual decision on it is made when Parliament votes the Budget. The Economic and Social Development Plan thus lies at the very root of the problem at issue and it is also a suitable instrument for the application of the methods under review.

2.1. First, we must recall briefly the basic pattern for the preparation of the French Plan. At present, the Plan extends over a five-year period.

2.1.1. After the Vth Plan had been voted in 1966 methodological studies were conducted, but in 1967 the "Commissariat Général du Plan" launched long-term studies for the various sectors of the economy. These studies could thus be regarded as the "planning" stage of P.P.P.S.1 they involved investigations in depth to a greater or lesser degree but they may be criticised in an important respect for they were conducted by administrative working parties and so took only very

slight account of the policy aspect of the choices to be made. Those concerning transport will appear in a forthcoming publication. They will indicate a number of strategies for the different transport functions, these strategies being related to various external data and illustrated by their implications from various viewpoints. Unfortunately, these strategies are still of a very rudimentary kind because of the scarce resources available for the study, the lack of methodological thinking at the start, and the fact that political decision-makers took no part.

Inland transport of goods can however be taken as an example to outline the approach. The following diagram shows that this set has been divided into two sub-sets; "heavy" consignments (those exceeding 480 tons or so) and "light" consignments. For the latter, three strategies or systems have been studied and analysed from various angles and with six main exogenous variables relating to the overall economic development of the country (multiplication of output by 2-2, 5-3 between 1965 and 1985) and regional development (three assumptions as to the respective weight of the various regions have been adopted: "no action" - "non-selective" decentralisation, and "selective" decentralisation.

Further particulars on this topic can be found in the special number of "Objectifs" for June 1970(1).

2.1.2. The second part of the planning process is the so-called "major options" stage. This has a political content for in June 1970 it led to the adoption by the French Parliament of legislation approving "the report on the major options governing the preparation of the VIth Plan". The corresponding studies took twelve months and finally produced major guidelines for the transport sector which practically made it possible to work out the objectives that the Government laid down for the VIth Plan; whilst translating into concrete shape the ultimate aims of economic and social development regarding the transport sector, they could not, however, be quantified as it had not been possible to make an overall analysis of the means of action to be applied. On the other hand, they did make it possible to classify the actions required in some kind of priority order.

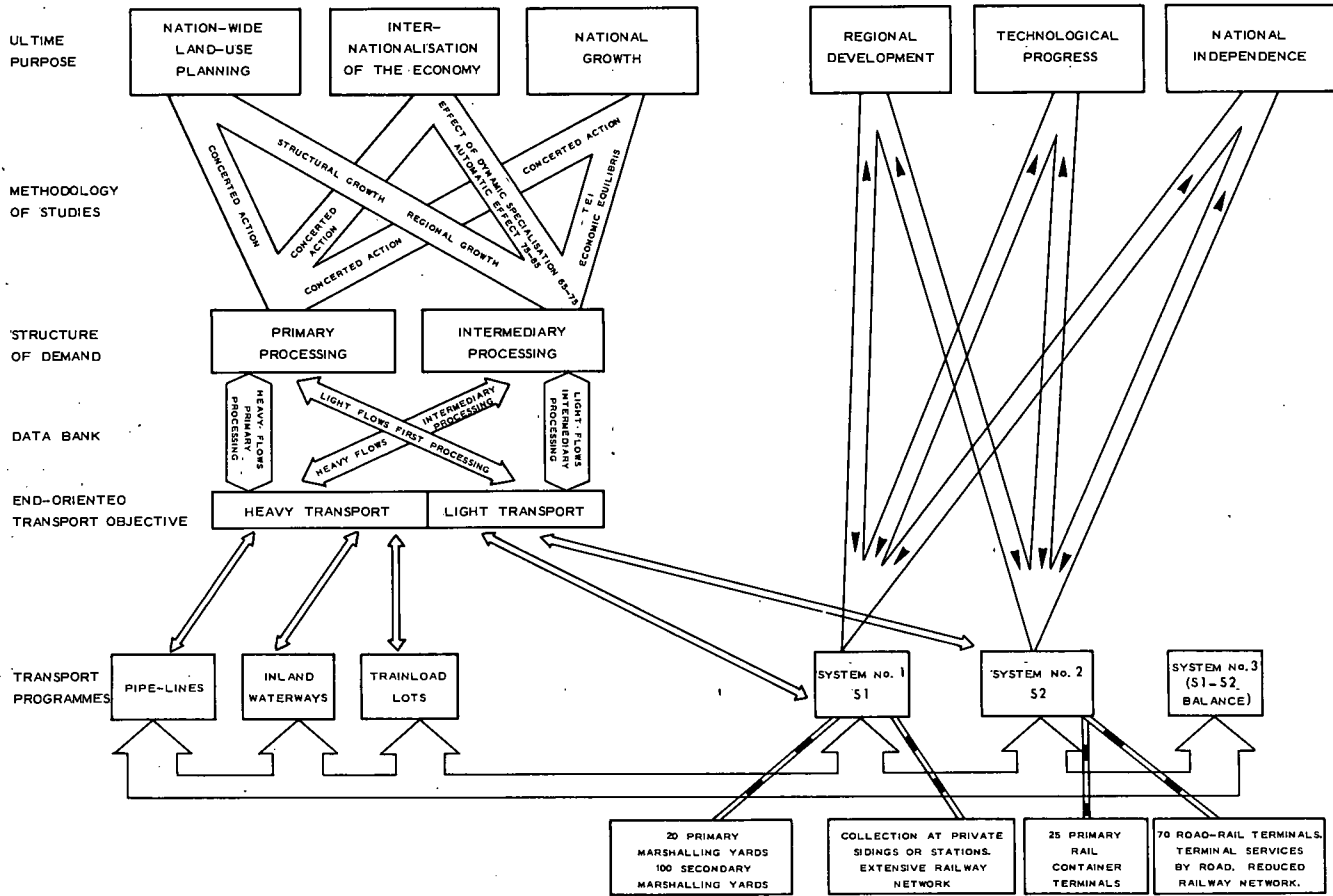
(1) Copies available from Mme SUBRA-SAEI - 6 rue du Général Camou, Paris 7^e, SOL. 99-99.

These actions cannot be shown here in detail; they are contained in the three volumes of the Transport Commission's report on major options.

Ultimately a number of objectives were worked out for the VIth Plan, as follows:

- Objective 1 - Gradual specialisation and development of inter-regional public transport in the most profitable sectors of operation.
- Objective 2 - Adjustment of regional transport to the new circumstances arising from widespread car ownership and to the requirements of regional activity.
- Objective 3 - Reversal of current trends in the field of urban transport.
- Objective 4 - Improvement of the general environment of French industry.
- Objective 5 - Development of port hinterlands and strengthening of international competitiveness of French transport operators.
- Objective 6 - Long-term orientation of the French transport system and reaffirmation of a long-term development policy.
- Objective 7 - Preparation of the entire sector for containerisation in inland transport.
- Objective 8 - Maintenance of the conditions for the development of motoring outside towns whilst limiting its negative effects especially as regards safety.
- Objective 9 - To create, by social measures and by the adjustment of occupational structures, favourable conditions for the labour transfers resulting from technical change.
- Objective 10 - To promote innovation by commercial experiment.

OVERALL ILLUSTRATION OF STUDIES RELATING TO FREIGHT TRANSPORT IN 1985



Objective 11 - To stabilise the balance of passenger and freight receipts for French shipping.

Objective 12 - To make the three main French port areas (Basse-Seine, Dunkirk, Marseilles-Fos) competitive with foreign ports.

Objective 13 - To improve links between airports and conurbations, especially with regard to Orly and Roissy-en-France.

Objective 14 - To provide air transport with the infra-structures needed for its development.

These objectives were selected by a process of constant iteration between transport techniques and the major guidelines indicated by the authorities at horizontal levels concerned with the Plan. To this end, three Committees were appointed within the "Commission des Transports du Plan" to cover air transport, maritime transport and land transport; two "working groups" worked out the joint implications for goods transport and passenger transport.

The first stage of the process consisted in asking the Committees to formulate, in the light of a "balance sheet" concerning the Vth Plan, the problems to be encountered at technical level during the next five years. The Plenary Commission made a synopsis of these elementary requirements and of the guidance obtained from the preliminary investigations of the "horizontal" commissions (more especially the Commission de l'Economie Générale et du Financement, and the Commission Nationale d'Aménagement du Territoire) in the light of which definite guidelines were given to the Committees and the latter worked out their own objectives with due regard to five broad lines of approach, i.e. priority to industrialisation, "quality of life", solidarity, participation and an outward-looking attitude. On this basis, the Commission selected what it judged to be the essential objectives which matched these ultimate aims.

2.1.3. Once the French Parliament had voted on "major options" (June 1970), the so-called programming stage began and is due to be completed by another parliamentary vote in June 1971. The purpose of this programming stage is to translate in terms of

practical action the objectives which emerged in the course of the "major options" stage. This is of course the point where the problem of investment choice arises in concrete shape. The methodological aspects are dealt with in more detail at the end of this paper.

The actual presentation of the Plan deserves some attention since it is as nearly as possible based on the methods in question. With the report on major options, the contents of the Vith Plan were already clear in the following respects:

- General and consistent information on the foreseeable trend of all economic and social activities, and a forecast concerning the national accounts for the final year i.e. 1975.

- Government commitments on a number of points:

- (1) The overall public investment appropriation for each sector.
- (2) The activities regarded as deserving priority which will be officially classified as such and which will be presented in terms of results, not resources. This means that the commitment will refer to the objective it is intended to achieve, and that the Plan will provide for the resources needed in the light of present prospects, but it being understood that these resources would be revised from year to year and readjusted according to the prevailing situation to suit the objectives.

Furthermore, as work on the Plan proceeded, a new concept was introduced, namely, the "end-objective" programme. Applied to a particular priority activity, an "end-objective" programme experimentally presents this activity according to P.P.B.S. principles and so involves a far more elaborate formalisation of the objectives-resource relationships of the indicators in order that progress towards the objectives can be judged. For the transport sector, four "end-objective" programmes were studied: road safety, vocational training, airport-city links and the development of the merchant fleet. The first of these programmes for which a pilot P.P.B.S. study was conducted is dealt with later on in this paper. As a general rule such

programmes constitute an orderly pattern of actions embracing investment, operating activities, regulations, training, etc.

This stage, with reference to transport, was dealt with in the Commission's report. As regards the choice of investments in the preparatory stage of the Plan, it must be emphasized that the methods in question were always applied to a more elaborate degree than had been the practice hitherto. This means that in making choices, a great deal of weight was attached to classical appraisals of profitability for the community and to D.C.F. methods. These appraisals were carried to the utmost lengths and the Commission's report contains a table showing the profitability of each project.

2.2. THE BUDGET

In France as in most other countries the real decision concerning an operation comes when the annual budget is adopted. Investments are covered by two budget entries: first when the expenditure is committed, i.e. the so-called "autorisation de programme (A.P.)", secondly the appropriation for actual payment, i.e. the so-called "crédit de paiement". The methods under review are of course particularly relevant at the first stage of preparation and discussion of the budget, and this accounts for the adoption of the initials R.C.B. (Rationalisation des Choix Budgétaires) for French Planning Programming Budgeting Systems. The development of the programme budget concept was the normal outcome, that is the submission of budget proposals in a new form, namely, action programmes. An action programme is something which reflects the views of the central government on a series of mutually consistent actions: the responsibility for its performance can be assigned to a single individual. It normally embraces several objectives and, in this respect, is not "end-oriented": an action programme may contribute to several end-oriented programmes and an end-oriented programme usually encompasses parts of several action programmes. For instance, "construction of franchised and non-franchised link motorways" is an action programme whereas "reduction of road accidents" (with a quantity criterion) is an end-oriented programme.

In France, the main effort has been concentrated so far on the presentation of the budget in action programme form and the end-oriented programme aspect has been tackled only to a limited degree.

The budgets of the Ministry of Equipment and Housing and the Ministry of Transport are already presented in this way or will be by 1973. Two examples can be given to illustrate this; the guidelines for an action programme are summarised in a table which is partly completed with a programme selected for purposes of illustration; there are a hundred or so action programmes in the budget of the Ministry of Equipment and Housing.

Such forms must of course be accompanied by an analysis of the programme justifying the proposals and relating aims to corresponding costs. A procedure of this kind thus implies the development and, in the long run, the general practising, of the economic, technical and social research in the light of which the decision-maker will be able to arbitrate as needed.

Apart from this, studies of wider scope involving several government departments are carried out to provide the general frame of reference for the definition of policies. In the transport sector, the following topics were selected after the road safety study:

- inter-regional passenger transport, (in connection with a special E.E.C. study);
- urban passenger transport, in connection with the E.E.C. pilot study;
- economic and social welfare transfers through transport channels.

After this description of the area within which these modern methods of investment selection operate three examples will be given to show how they are applied in actual practice.

EQUIPMENT FOR INLAND WATERWAYS

HYPOTHESIS

N° 3122

Identification	N° of programme	Agent: Director of "P.M.V.N."	General approach: - Survey valleys to provide as quickly as possible a good route between the major ports and industrial areas to the large standard gauge. - Restore the 'small gauge' ways not to be closed and carry out limited work as the level of traffic justifies.
Objective	- Establishment of ways to new large standard gauge - Improvement of existing large standard ways - Limited work on ways to the small standard and with heavy traffic		
Work	Nature	New ways or improved Average time limit	
Related works to be achieved	- Works on locks, barrages, etc. - Work on bief: dredging, banka, reconstruction and modification of ways		Consequences for the next three years: Pursue in accordance with the programme of the 6th Plan: - develop Nord Basin (Dunkerque-Denain, Beauvais-Lille) - develop Seine (Paris) Basin - develop Rhône and Saône Basin - canalise the Moselle and upper Reaches of the Frouard - restore and modernise certain 'small gauge' ways.
Services concerned	Specialized navigation services and local groups (in administrative areas)		

EQUIPMENT FOR INLAND WATERWAYS

(Cont'd)

HYPOTHESIS

1969 (real)	1970 (estimate)	PHYSICAL RESULTS OF ACTIVITIES	1971 (proposed)	1972 (proposed)	1973 (proposed)	Objectives of 6th Plan	Realised since begin- ning of Plan	To complete before 1975

OBSERVATIONS

1969 (real)		1970 (estimate)		AMOUNT OF FINANCIAL RESOURCES	1971 (necessary)		1972 (necessary)		1973 (necessary)	
235.000	239.800	213.920	180.000	Through Finance Act	217.400	200.000	350.000	255.000	403.000	327.000
234.414	357.395	273.434	301.604	Total of available credits	269.705	246.000	407.000	306.000	467.000	388.000
214.511	299.222			Total of useable credits (in thousands of francs)						

1969		1970		USE OF FINANCE (PLANNED NATURE OF EXPENDITURE)	1971		1972		1973	
				Staff						
				Other operating costs						
				Land purchase						
				Equipment and large items						
				Works						
				Studies						
				Investment grants						
				Other grants						
				Not allocated						
234.414	357.395	273.434	301.604	TOTAL (in thousands of francs)	269.705	246.000	407.000	306.000	467.000	388.000

CONSTRUCTION OF NEW ROUTES IN RURAL AREAS

Hypothesis N° 1

Identification	N° of Programme	Agent:	<p>General approach: Assure the lowest cost of regular transport, quick and safe, for passengers and goods; improve level of service on the national roads to <u>recreate conditions in 1975 equal to those in 1965</u> ;</p> <p>- improve safety on national routes to reduce people killed in 1975 on national roads by 750. - reduce public costs and produce effects valuable for regional <u>development.</u></p> <p>Consequences for the next 5 years: 1) Development of level of service on national roads will require overall expenditure of 12,000 MF. 5,000 kms of road will be developed. By 1975 13,000 kms of road will have passed their traffic threshold and will be carrying 38% of total traffic; among the 13,000 kms, 1,900 will have passed the congestion threshold and will carry 9% of total traffic. 2) Developments proposed for safety will require an expenditure of 1,030 MF.</p>
Objective	Maintain and develop the system of national roads in rural areas.		
Work	Nature. Construction of new roads and development of existing routes.		
Related works to be achieved	Technical and economic studies; land acquisition, planning and financing work; execution of work (new roads, widening, local improvements, bridges, passing places on existing roads); control and monitor work		
Services concerned			

CONSTRUCTION OF NEW ROUTES IN RURAL AREAS

(Cont'd)

Hypothesis N° 1

1969 (real)	1970 (estimated)	PHYSICAL RESULTS OF ACTIVITIES	1971 (proposed)	1972 (proposed)	1973 (proposed)	Objectives of the plan	Realised since beginning plan	To complete before 1975
21	22	by-passes completed (in km)				2-3 lanes		
60	100	other deviations completed (in km)				1,000 km		
188	168	widening completed (in km)				2-4 lanes		
52	45	passing peaces				4,500 km		
207	274	re-alignments and improvements (in km)						
89	120	new roads (in km)						

1969 (real)	1970 (estimated)	AMOUNT OF FINANCIAL RESOURCES	1971 (necessary)	1972 (necessary)	1973 (necessary)
		Through Finance Act (in th. of fr.)			
		Total available credits (in th. of fr.)			
		Total useable credits (in th. of fr.)			

OBSERVATIONS

The work planned to reduce deaths by 750 in 5 years will produce a reduction in casualties of 11,300. Work on black shots (500 killed and 11,000 injured) and on road widening from 9 to 10.5 m. (250 killed and 300 casualties less).

1969	1970	USE OF FINANCE (PLANNED NATURE OF EXPENDITURE)	1971	1972	1973
		Staff			
		Other operating costs			
		Land purchase			
		Equipment and large items			
		Works			
		Studies			
		Investment grants			
		Other grants			
		Not allocated			

TOTAL (in thousands of francs)

III. APPLICATIONS

P.P.B.S. techniques have been used in various studies such as those listed below. This list is not exhaustive but gives some idea of the variety of topics to which P.P.B.S. can be applied in the transport sector:

- definition of a transport objective-programme structure;
- P.P.B.S. pilot study on road safety;
- study of the Lyon and Marseille Undergrounds;
- Paris area investment programme for the VIth Plan;
- P.P.B.S. study on level crossings;
- checking the observance of road haulage regulations;
- renovation of urban centres;
- school buses.

These studies have usually involved teams of specialists from various government departments concerned with the outcome, for it is not the action of a single administrative body that has to be taken into account; due regard must be paid to all the "means of intervention" affecting the problem at issue. Such studies cannot therefore be sectoral. They are inevitably horizontal.

Three practical examples are discussed below:

(1) Definition of a transport objective-programme structure. This is a methodological study intended to prepare the determination of particular objectives relating to concrete projects. [This study in fact provided the framework for "Methodological Note No. 2" for the planning of operations likely to be adopted for the transport sector in the VIth Plan.]

(2) The P.P.B.S. study on level crossings. This is a relatively unambitious study since it is restricted to a single objective, i.e. minimisation of cost, but it does help to show, within the context of a programme budget exercise, what techniques involving the systematic analysis of alternative programmes can produce as compared with analyses of conventional type.

(3) The P.P.B.S. study on road safety, which is a major exercise in rational decision-making on road safety by systematic investigation of objectives, resources and parties concerned which seeks to cover the road safety system as a whole.

3.1. OBJECTIVE-PROGRAMME STRUCTURE FOR TRANSPORT

Classical economic theories concerning optimisation are applicable in clearly defined conditions which do not usually match those encountered in actual practice in the transport field. Calculations such as those concerning overall costs and benefits for the community run up against the impossibility of quantifying other than direct effects. Choice criteria based on purely economic considerations do not therefore suffice. That is why, as explained in the first part of this report, it is so useful that government operations should be marshalled around specific objectives.

A general rethinking of transport policy implies choices which have to be translated into "sets of options". This leads to the building of an "objective structure", in the form of a chart, which shows how to move from the general to the particular. Objectives at a given level tie up with different "dimensions" of the chosen policy. To ensure clear-cut decisions, there must therefore be no overlapping or ambiguity.

A structure of this kind is not universally valid. It depends on a particular concept of transport policy at a given time and must be the true image of it. Nor should it be confused with a programme structure, the purpose of which is to classify projects as such. Bearing in mind that a given operation in the transport field usually contributes to several objectives, the latter cannot also be used for the classification process.

The structure here presented has been built up on the basis of the work of the "Transport Commission for the VIth Plan", for the stage which consists in determining major options. The angle of approach is government action: no attempt is made to seek objectives for all those involved in the sector concerned, but only for those acting on behalf of the State. Hence, what this structure sets out to do is to reclassify the Commission's

options by theme, show their inter-relationships, and their content in such a way as to avoid any overlapping or ambiguity.

By working out a typological pattern of objectives in this way, it is possible to throw light upon every aspect of a transport policy, supplement the original list of options, and clarify the implications so as to pave the way for clear-cut decisions at operational level.

3.1.1. OBJECTIVES STRUCTURE

Here, the aim is to chart the general "assignments" of transport together with all the more detailed objectives which follow from them or which translate them in practical terms. The procedure for this purpose is to ascertain how these explicit objectives can be fitted into a logical pattern.

This can be done in three ways, depending on which of the following groupings is judged appropriate:

3.1.1.1. The main objectives of a general order that the State seeks to attain, that is, the goals or assignments that it sets itself (raising the standard of living, for instance).

3.1.1.2. The form of State intervention: such action on the functioning of the transport system may be short (e.g. through regulations), medium or long-term (e.g. investment or research).

3.1.1.3. The sector covered by State intervention, that is the type of activity in the transport field which is affected by State action.

We will now consider these three groupings in closer detail:

3.1.1.1. Transport "assignments"

Transport "assignments" may be sub-divided according to three transport "functions" referred to at the major options stage.

- (a) An economic development function, i.e. to help towards economic development and promote a dynamic industrial policy. This function has a sectoral component (to ensure the sectoral development of the economy) and a geographical one (to ensure regional economic development).
- (b) A collective function, that is, to improve the living conditions of the French people in their day-to-day work and leisure activities.
- (c) An internal potential function which consists in minimising the cost that the community has to pay for the transport system. In some cases, options relating to the internal potential function clash with the economic development and collective functions: some sectoral or regional development options are seen to conflict with the concern to choose investments showing the highest rate of return in the context of classical economic analysis. Trade-offs are accordingly necessary.

3.1.1.2. Forms of State intervention

State intervention in the transport system comprises short-term actions (on the running of the system) and medium and long-term actions (on the adaptation of the system). The following distinctions can be made:

- (a) actions concerning the running of the system (i.e. short-term actions);
 - (a)(1) modernisation (raising of productivity given constant demand: actions on infrastructure and equipment);
 - (a)(2) resource management;
 - (a)(3) regulations and pricing;
- (b) actions concerning adaptation to changes in demand (i.e. medium and long-term actions).
 - (b)(1) adaptation of occupational structures and methods;

(b)(2) innovation policy;

(b)(3) adaptation to changing and growing requirements.

3.1.1.3. State intervention classified by sectors

State intervention can be classified by sectors according to "trip category" or "type of activity".

(a) Trip category:

urban transport,

regional transport,

inter-regional transport

international transport

(b) Type of activity

transport undertakings

makers of transport equipment

infrastructures

(c) Mode of transport concerned

- land

- sea

- air

3.1.1.4. Classification of objectives

A particular transport objective is defined by reference to its formal relationship with each of the three categories defined above, in the sense that it contributes to the fulfilment of an assignment in a particular sector of intervention and by given means of intervention.

For instance:

"to regulate the use of cars in high-density urban areas" stems from the following cross-references:

Assignment: to ensure that an operation complies with a minimum standard of service.

Means of intervention: regulatory and pricing policy.

Sector of intervention: urban transport.

The objective structures are shown in Tables 1 to 4.

3.1.1.4.1. Internal potential function

Table 1bis shows the internal potential function.

This function covers a single assignment: optimal operation of the transport system, which means that it must run at least cost for the community whilst adapting itself to changing requirements. There are two ways of breaking down this function depending on whether it applies to a given sector (e.g. road transport) or to co-ordination between sectors. These two approaches are complementary. The first approach, by sectors, is shown on the left of Table 1bis; the second is shown on the right.

3.1.1.4.2. Economic development function

"The transport system must help towards economic development and foster industrial policy consistent with the Plan."

This assignment is matched by objectives related to the type of zone (Table 2bis) (i.e. depending on whether the zone is classified as "high-density", "due for restructuring" or "economically underprivileged".)

3.1.1.4.3. Collective function

Table 3 covers the assignments relating to the collective function, i.e. a better standard of transport service, less pollution, more safety and the achievement of the desired social transfers.

3.1.2. CLASSIFICATION OF OPERATIONS

Analyses of P.P.B.S. type involve the systematic search for variants of a given operation. This can be more easily done by choosing a frame of reference within which every possible

variant can be both determined and classified. But it must be borne in mind that an operation which brings into play a whole series of resources (financial and manpower resources, etc.) usually contributes to several different objectives and it follows that the "objectives structure" cannot be used for this type of classification.

Let us start with a simple frame of reference, bearing in mind that operations can be classified:

- by type of intervention (short or medium-term actions);
- by sector of intervention (actions on a particular type of transport).

As an operation falls within two classification categories, a frame of reference for classification thus becomes:

- all the actions relating to the operation (mode of intervention) of urban transport (sector of intervention).

3.1.3. THE LINKING OF OBJECTIVES AND PROGRAMMES

Use of the objectives structure for programming

Major options (as formulated in the objectives structure) essentially come into play at two levels in the planning process:

- (a) at the strategic level (major programmes) when a combination of forecasts results can be matched with resource requirements. Examples of this are:
 - (i) restoration by 1975 of the traffic conditions prevailing in 1965 and the corresponding "overall input" of resources;
 - (ii) stabilisation of the freight and passenger item of the balance of accounts, and the corresponding "overall input".

Here, quantification of the objectives is essential for "ex post" appraisal, that is, after completion of the programme - within the context of a commitment extending over several years, for instance.

- (b) at tactical level (choice of variants) when it is possible to set the main objectives and the corresponding criteria for making a choice on the basis of systematic analysis of the performance and costs of each variant.

The programming stage brings into play these two lines of approach which are, incidentally, inter-linked from a theoretical standpoint. It is, however, generally recognised that rationalisation of the kind shown under (a) above, i.e. at "overall input" level must in practice come before the choices made under (b) at programme, or even project, level.

An extract from "Methodological Note No. 2", which concerns methods for planning decisions on transport sector operations likely to be incorporated in the VIth Plan, is shown below to illustrate this point. The purpose of this Note is to show how economic justification "in the broad sense" should be construed and outline its practical framework.

"Starting from 'overall inputs' the aim in each field should therefore be to seek the most appropriate means in the light of a sufficiently consistent technique for planning the selection process. Operations proposed for inclusion in the Plan should accordingly be backed by economic justification 'in the broad sense': in other words, the aim should be to link the guidance given by economic analysis with the major options relating to economic development and its geographical and social implications, and also link it with the major options concerning the 'collective function' of transport and its impact on the quality of life and the environment. The following paragraph indicates the practical framework for presenting the operations to be taken into account for the programming of the VIth Plan."

I. PRESENTATION OF THE PROGRAMME OR OPERATION

1. Definition

(a) Main programme: description of the operation in physical and economic terms.

(b) Other actions needed to make the main programme fully effective and the costs these actions imply. The intention here

is to cover certain complementary operations which are not strictly part of the main programme but have a direct bearing on it (e.g. a motorway to link up with the Channel Tunnel).

2. Schedule of expenditure

The table should as nearly as possible be set out as follows:

Elements of the programme	Origin of resources	1971	1972	1973	1974	1975	1976	Beyond 1976
		AP CP	AP CP	AP CP	AP CP	AP CP	AP CP	AP CP
A.	Central government Loans Local authorities etc.							
B.								

Note AP = Autorisation de programme (commitment authority)
CP = Credit de paiement (appropriation).

3. Options

Have options been studied - or can any be envisaged - which contribute to the same objectives (to be shown in Part II). If so, please describe them. If not, please explain why they have not been studied in detail.

II. JUSTIFICATION OF THE OPERATION

(1) Classical economic analysis: this essential part of the process will show:

(a) the d.c.b. and the immediate rate of return (outlined in the internal Methodological Note No. 1);

(b) the assumptions on which these calculations rest and, in a broader sense, the justification of the investment. For instance:

(i) Traffic demand: show how the forecasts have been drawn up, what is their reliability, what economic and social assumptions, and what assumptions as to competition from other sources of supply, have been taken into account.

(ii) Valuation of non-market benefits: three main parameters should be used for all projects:

- value of time: specify the values adopted for each use category and the average values selected;

- cost of safety: has the cost of accidents been taken into account? If so, how? If not, why not?

- bonus: has a bonus for quality of service been taken into account? How and why?

- other non-market benefits taken into account;

- cost appraisal: on what assumption as to price trends is this appraisal based? How accurate a knowledge have we got of costs (i.e. investment and operating costs)?

(c) The sensitivity of the results having regard to the uncertainties surrounding the various assumptions.

(2) Role of the operation with regard to economic development

The implications of the proposed programme should be shown under three heads:

(a) Geographical aspects of the programme: the operation inevitably has a geographical impact. To which land-use planning options is it mainly geared, and how effective is it in this respect? (i.e. organisation of high-density zones, links between these, conversion and restructuring of certain regions, dynamic development of economically under-privileged regions).

(b) Sectoral aspects of the programme: does the operation especially benefit certain activities?

- "downstream": transport users (this applies to passenger and goods transport alike);
- "upstream": the building and civil engineering trades and the construction of transport equipment;
- internally: (i.e. for transport undertakings themselves).

An attempt should be made to give a quantified evaluation in terms of employment growth rate, value added, Gross Fixed Capital Formation of the sector concerned, etc.

(c) Assessment of the operation as regards its effect on the balance of foreign trade

(3) Role of the operation as regards improving the living conditions of the community

This point should be tackled from three angles:

(a) Standard of service provided: to what extent does the proposed operation improve, or prevent the deterioration of, the standard of service provided? For each aspect of this standard of service (time saving, regularity, frequency, comfort) indicate the characteristics of the project, and if possible, the user categories affected.

(b) Improvement of the environment: what impact will the programme have on safety and pollution? If possible give figures (number of road deaths, decibels, etc.).

(c) Social transfers: will the operation entail certain transfers as between user groups and economic agents or between the community as a whole and certain target-groups. If so, an attempt should be made to estimate them.

(4) Other considerations in favour of the project

Any justifications not given under the foregoing headings.

3.2. P.P.B.S. PILOT STUDY ON LEVEL CROSSINGS

The following description of the P.P.B.S. pilot study on level crossings essentially concerns the methodology adopted, the successive stages of which are as follows:

- analysis of the system;
- choice of objectives and criteria;
- determination of programmes;
- evaluation of alternative programmes.

3.2.1. STATEMENT OF THE PROBLEM

Level crossing operating costs in 1969 were Frs.595 million, and were rising at the rate of 9.5 per cent per year. The costs are broken down as follows:

- manning costs: Frs.367 million
- maintenance: Frs.68 million
- overheads: Frs.109 million
- financial charges: Frs.55 million

Manning costs accounted for 77 per cent of the total in 1969 as compared with 70 per cent in 1968.

Under the new contract between the S.N.C.F. and the French Government, the latter will cover 50 per cent of total costs in respect of level crossings from 1970 onwards. This implies a much bigger grant as compared with previous practice. For the year 1969 alone, it would have been Frs.299 million, i.e. 13 times as much as the amount actually paid (Frs.23 million).

In 1969, there were 302 accidents at level crossings and 115 persons were killed, 49 per cent of them pedestrians. On the basis of the cost of an accident as shown in the circular on road investment project appraisal, the loss to the community may be valued at some Frs.50 million a year.

Table 1

GRAPHIC OUTLINE OF THE INTERNAL POTENTIAL FUNCTION

OBJECTIVES

Examples of quantified objectives

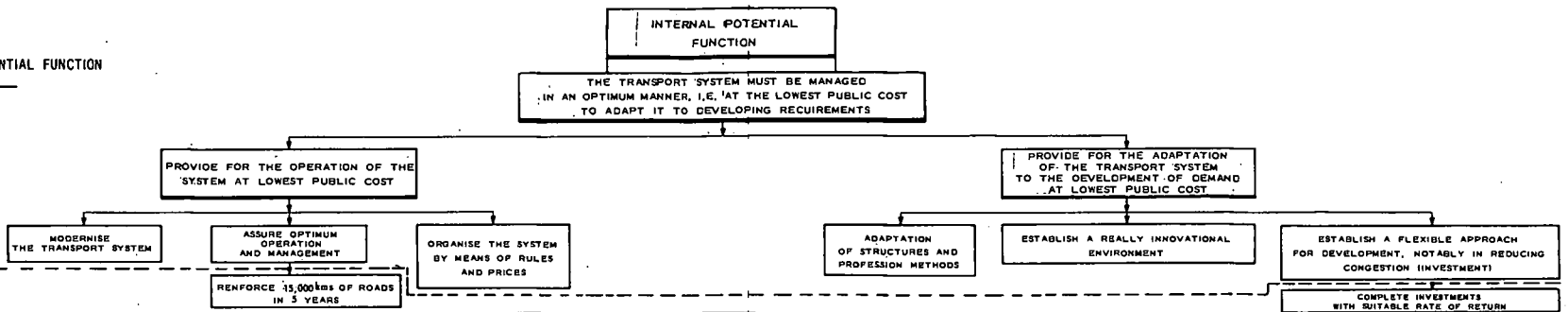


Table 1B

DETAILED OUTLINE OF THE INTERNAL POTENTIAL FUNCTION

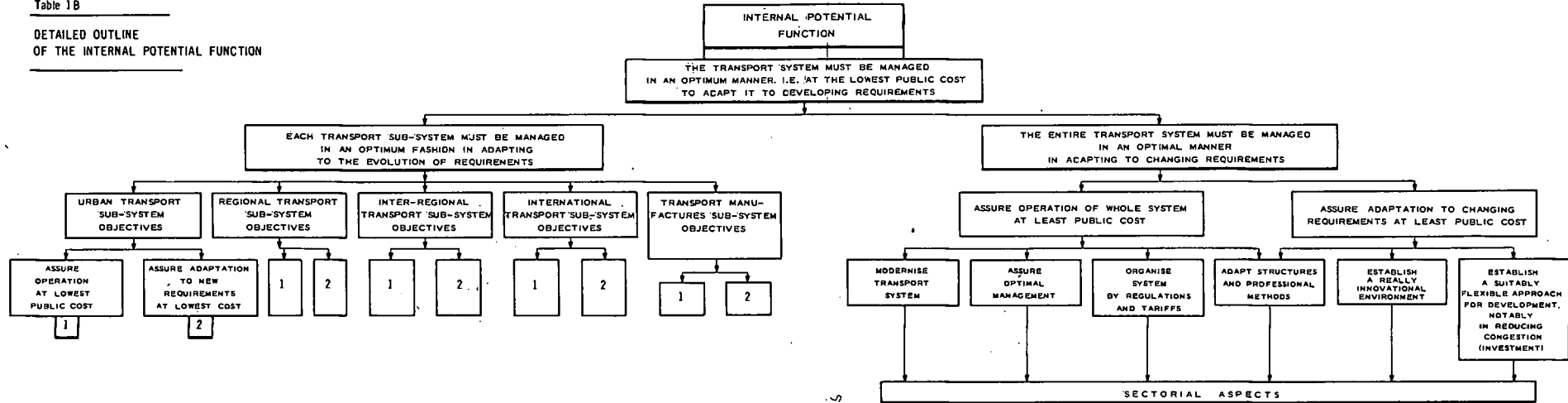


Table 3

OBJECTIVES

Examples of quantified objectives

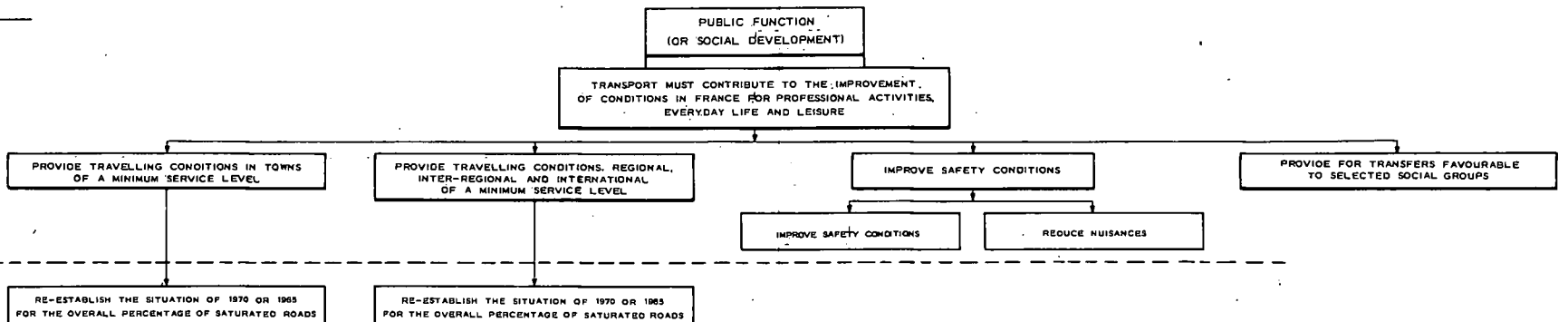


Table 2
GRAPHIC OUTLINE
OF THE ECONOMIC
DEVELOPMENT FUNCTION

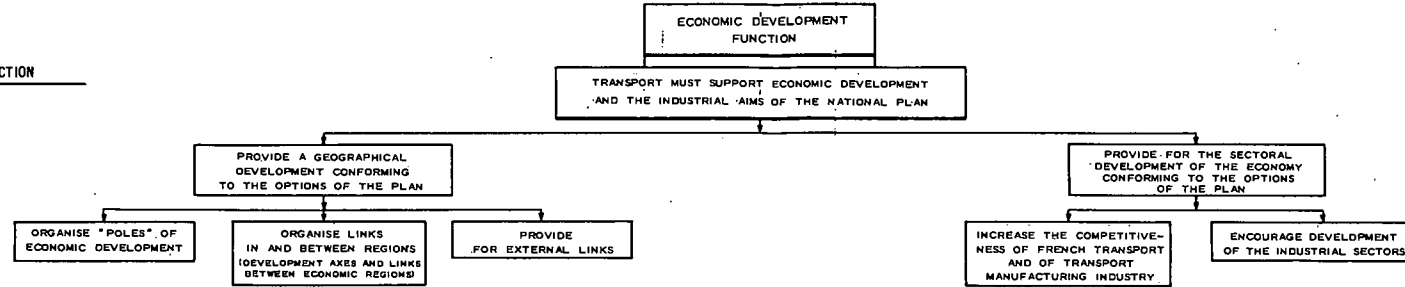
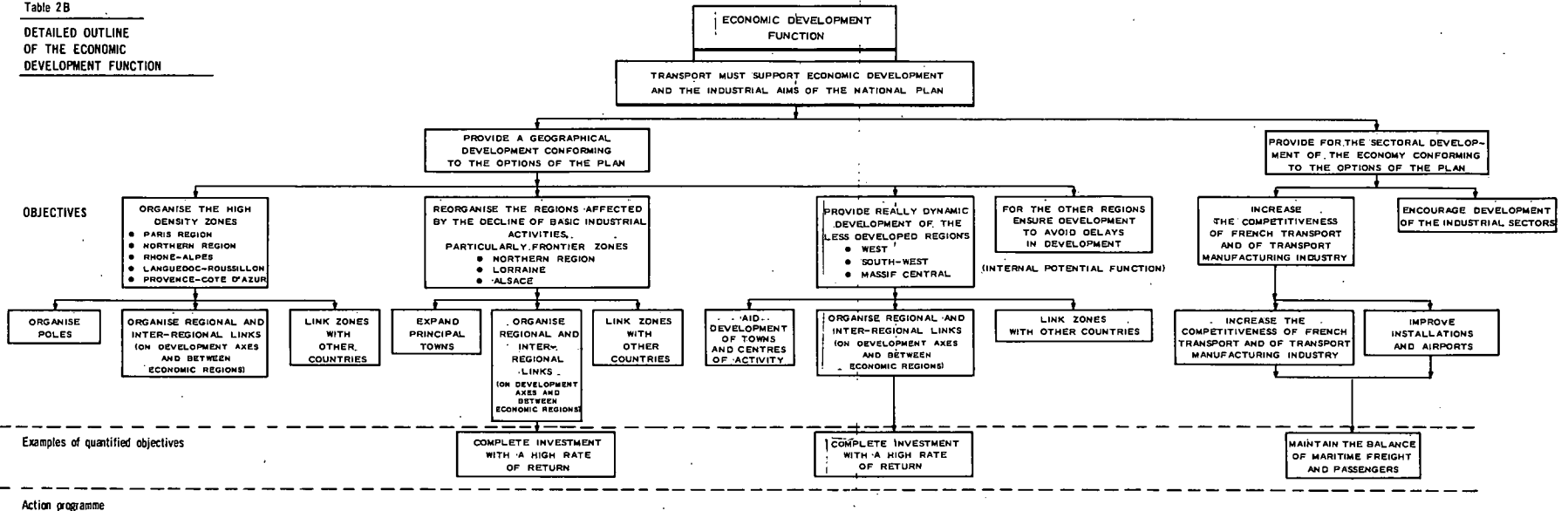


Table 2B
DETAILED OUTLINE
OF THE ECONOMIC
DEVELOPMENT FUNCTION



ACTION PROGRAMMES	LIAISON ACTION PROGRAMMES OBJECTIVES																		
	1. INTERNAL POTENTIAL FUNCTION					2. ECONOMIC DEVELOPMENT FUNCTION					3. COLLECTIVE FUNCTION								
	1.1 ASSURE OPERATION OF SYSTEM AT LEAST COST		1.2 ACHIEVE THE ADAPTATION OF THE TRANSPORT SYSTEM TO CHANGES AT LEAST COST			2.1 ASSURE GEOGRAPHIC DEVELOPMENT OF THE ECONOMY IN ACCORDANCE WITH PLAN			2.2 ASSURE SECTORAL DEVELOPMENTS OF THE ECONOMY IN ACCORDANCE WITH PLAN		3.1 ASSURE TRANSPORT IN TOWNS AT THE MINIMUM LEVEL		3.2 ASSURE REGIONAL AND INTER-REGIONAL TRANSPORT AT THE MINIMUM LEVEL		3.3 REDUCE HUMAN INCONVENIENCE		3.4 ASSURE SOCIAL TRANSFERS		
	1.1.1 MODERNISATION	1.1.2 OPERATIONAL MANAGEMENT	1.1.3 REGULATIONS AND TARIFFS	1.2.1 ACHIEVE A CLIMATE FOR INNOVATION	1.2.2 ESTABLISH A SITUATION THAT AVOIDS CONGESTION	2.2.3 ADAPY STRUCTURES & PROFES. METHODS	2.1.1 ORGANISE DENSE ZONES	2.1.2 CONVERT AND RESTRUCTURE CERTAIN REGIONS	2.1.3 ASSURE SOLID AND DYNAMIC DEVELOPMENT OF WEAK ECONOMIC REGIONS	2.2.1 IMPROVE TRANSPORT COMPETITIVENESS AND THAT OF MANUFACTURING SECTOR	2.2.2 AID DEVELOPMENT OF INDUSTRIAL SECTORS	3.1.1	3.1.2	3.2.1	3.2.2	3.3.1 SAFETY	3.3.2 NUISANCE	3.4	
URBAN TRANSPORT																			
REGIONAL AND INTER-REGIONAL TRANSPORT																			
INTER-NATIONAL TRANSPORT																			
TRANSPORT MANUFACTURING INDUSTRY																			



3.2.2. THE LEVEL CROSSING "SYSTEM"

The aim here is to set the problem in its geographical and economic frame of reference, a distinction being made between variables that are amenable to action and those that are treated as exogenous.

Traffic, i.e. both train and car traffic, was regarded as being exogenous. Cases where a level crossing may be eliminated by cutting the road were, however, envisaged. Traffic was characterised by two variables: road traffic and the moment of both traffics (i.e. the product of frequencies).

3.2.3. OBJECTIVES AND CHOICE CRITERIA

The objective was twofold:

- to ensure safety (and in particular make it no worse by comparison with the existing situation);
- minimise the cost to the community.

These two criteria were merged as the cost of an accident can be valued on the basis of existing data (i.e. the circular on the assessment of road deaths and injuries for road investment appraisals). Hence, the outcome was a single choice criteria: the overall cost benefit balance of the operation for the community.

3.2.4. DETERMINATION OF PROGRAMMES

Possible programmes were systematically sought. They concerned:

- (1) Investments:
 - (a) provision of new types of level crossings;
 - (b) elimination of level crossings (underpasses and overpasses);
- (2) Signs and signals.
- (3) Regulations.
- (4) Organisation of the decision-making process.

The method adopted implies that in addition to actions with a direct impact on the budget i.e. investments (which would be the basic pattern followed for a conventional study), account must also be taken of other means of action such as regulations.

3.2.5. PROGRAMME EVALUATION

The choice criteria for items (1) (Investments) and (2) (Signs and Signals) under 3.2.4. above were those relating to the overall cost/benefit balance for the community.

The following were taken into account:

- installation costs;
- yearly maintenance costs;
- manning costs;
- users' time losses;
- the "cost" of accidents at level-crossings;
- quantifiable psychological factors (e.g. the "caution reflex" entailing a longer crossing time).

3.2.6. CONCLUSION

The outcome of the study was:

- definition of the desirable "field of utilisation" for the equipment referred to in typical cases and of the procedure to adopt in special cases;
- new proposals for regulations concerning level-crossing equipment;
- a time-schedule for Central Government and S.N.C.F. expenditure on equipment which implies substantial savings as compared with previous programmes;
- a project for the reorganisation of the decision-making process involving in particular the institution of Level-Crossing Commissions in each "Département". Institutional arrangements for collecting information adapted to requirements are also recommended.

3.3. P.P.B.S. PILOT STUDY ON ROAD SAFETY(1)

This study on the rational planning of decisions concerning road accidents was conducted as part of the Rationalisation des Choix Budgétaires - R.C.B. (i.e. P.P.B.S.) Project submitted to the Council of Ministers in April 1968.

It systematically analyses alternative actions for reducing the number of accidents and their harmful effects. The findings are intended not only to enlighten the decision-making process as regards budget expenditure but also to bring out proposals for administrative and regulatory decisions.

Its characteristics as a P.P.B.S. study are as follows:

3.3.1. Planning-programming budgeting is a conceptual approach which aims to widen the field of enquiry and define it more clearly

P.P.B.S. implies the systematic investigation of the means that can be used for achieving clearly defined assignments. This means that an attempt is made to measure the advantages and draw-backs of each of the alternative solutions taken into account. Analysts endeavour to reinsert each phenomenon in its context and to analyse as nearly as possible every aspect of it with the help of various specialists.

The road accidents study involved engineers, economists, a statistician, psychologists, sociologists and members of the medical profession (a surgeon and a psychiatrist) and representatives of the various government departments concerned were called in as required. As a consequence of the multi-disciplinary composition of the team engaged in this work, the problems at issue were analysed in the light of many criteria, i.e.:

- monetary costs and benefits to the community,
- budget expenditures or revenues,
- monetary costs and benefits to users,
- number of lives saved,

(1) This is an extract from the general report on the P.P.B.S. Pilot Study on Road Safety.

number of other casualties avoided,

time losses and savings,

psycho-sociological implications (reaction of public opinion, individual feelings of frustration, aggressiveness),

implications for certain groups more particularly concerned (motor manufacturers, the drink trade, regional interests, etc.)

international repercussions (regulations, import-export) long-term implications.

3.3.2. The analysis of the various aspects of the problem led to the formulation of a programme structure

A road accident may be analysed as the failure of a complex system involving human beings, vehicles and an environment embracing the infrastructure.

The primary aim must therefore be to make this system work effectively (i.e. prevent accidents) and next, if accidents do occur, to mitigate the harmful effects (i.e. to "repair" the damage).

Actions intended to fulfil these assignments may be directed to any single "sub-system" such as human beings, vehicles, the infrastructure, or to their inter-relationships, e.g. human being-vehicle relationships or human being-vehicle-infrastructure relationships.

Actions directed to human beings are sub-divided according to the changes they are intended to provoke, for instance:

- actions designed to improve human knowledge;
- actions designed to improve psychological fitness for driving;
- actions designed to adapt personal behaviour to the requirements of driving as part of a "group".

This is the rationale behind the formulation of a programme structure which classifies logically and, if possible, comprehensively, all the possible means of action for fulfilling the assignments.

A diagram to illustrate this is shown below.

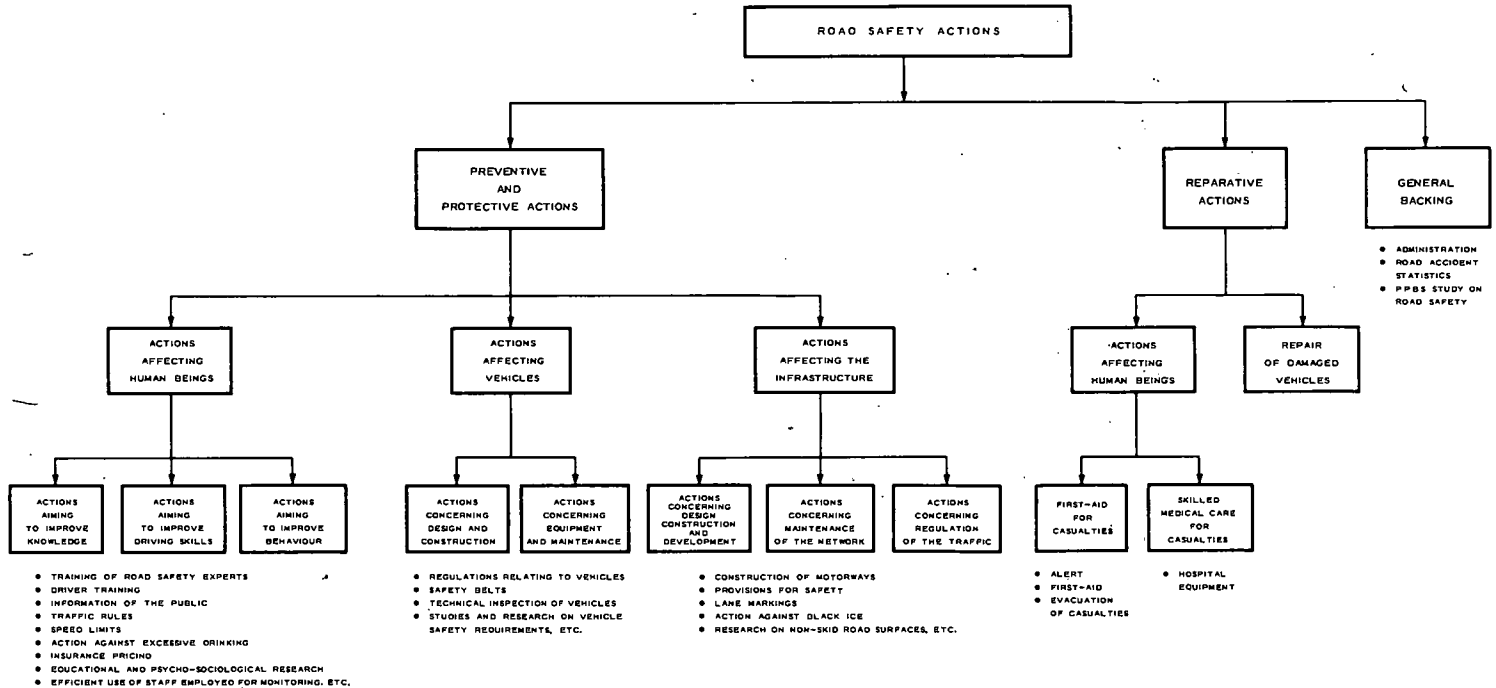
3.3.3. The programme structure makes it possible to define different road safety policies. Cost/benefit analyses are carried out to compare these policies

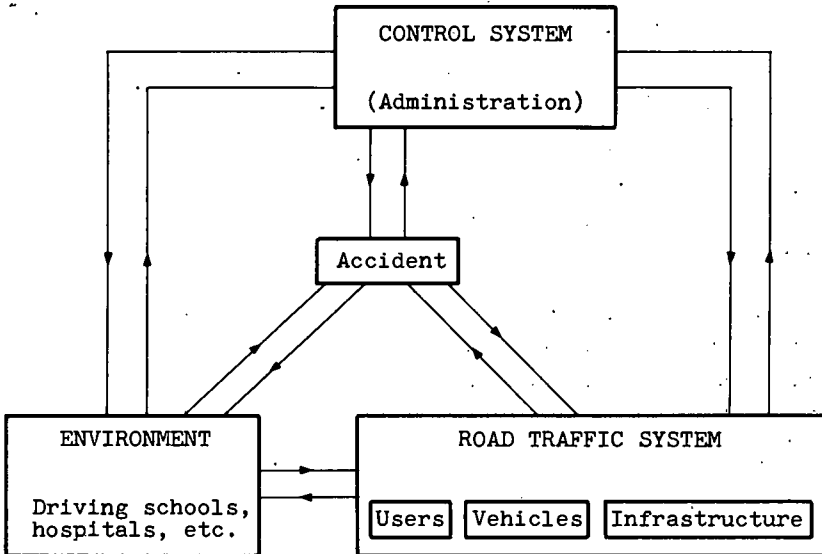
Such analyses aim to establish correlations between measurable magnitudes or indicators:

- characterising the programme of action (programme indicators);
- indicating the effects of actions on the target group (impact indicators);
- showing how far the action affectively contributes to the aims pursued (end-objective indicators).

The indicators corresponding to the list of criteria are shown in paragraph 3.3.1.

ROAD SAFETY PROGRAMME STRUCTURE





THE ROAD TRAFFIC SYSTEM

For instance, in order to measure the effectiveness of a television road safety campaign, the aim will be to establish correlations between:

- programme indicators such as the number of "spots" devoted to the following theme "before overtaking, look in the mirror and see whether it is safe to do so";
- impact indicators such as the percentage of drivers that are sensitive to this theme;
- objective indicators such as the number of accidents caused by drivers who move into another lane without looking.

3.3.4. The pilot study is concerned with the rational planning of decisions and consequently oversteps the strictly budgetary framework, in particular by investigating the effectiveness of road safety regulations

If a study is to contribute effectively to decision-planning, it must be based on a continuing interchange between the team of analysts appointed to deal with it and the administrative and political authorities.

The study was assigned to the Ministry of Equipment and Housing, but because of the kinds of problems which arose in connection with road accidents, it was carried out in consultation with the main government departments concerned.

The government departments concerned with road safety which took part in the study were as follows:

Ministry of Equipment,

Ministry of Home Affairs,

Ministry of Finance (Insurance Directorate),

Ministry of Defence (Gendarmerie),

Ministry of Justice,

Ministry of Social Affairs (medical care for road casualties),

Ministry of Industry (motor-car industry),

Ministry of Information (broadcasting),

Ministry of Education.

To ensure liaison between the main Directorates concerned and the team appointed to carry out the study a permanent correspondent was appointed in each Directorate.

MAIN ACTIONS PROPOSED

The study produced a full range of proposals concerning programmes of action (see table).

OPERATIONS	COSTS OR INCONVENIENCES										BENEFITS						
	Monetary					Non-Monetary		Reduced Accidents 1st year			Monetary				Non-Monetary		
	For the State		For the users	For others	For the State	Loss of time	Social and psycho- logical	BODILY			For the State		Users 1st year	Assurers 1st year	For the State 1st year	Time savings	Social and psycho- logical
	1970	1971-75					Death	Inju- red	Mate- rial	1970	1971-75						
1. ADMINISTRATION																	
1.1 Central Administration																	
a. Operating group for safety																	
b. Information Office																	
c. Vehicle office																	
d. P.P.B.																	
1.2 Road Information Office																	
1.3 Training centre for road safety experts																	
1.4 Regional pilot bureau																	
1.5 Total accidents records of the insurance Cos.																	
2. ROAD SAFETY WORK																	
2.0 Training																	
Standardising the training of driving school instructors																	
2.1 Information(1)																	
2.2 Speed limits																	
2.3 Anti-alcohol																	
2.4 Infrastructures																	
a. Safety work																	
b. Road materials																	
c. End of level crossings																	
d. Fight against skidding																	
2.5 Vehicle																	
a. Technical control																	
b. Seat belts																	
2.6 Insurances																	
a. Drivers records																	
b. Tariffs for bad drivers																	
2.7 Help for injured																	
2.8 Studies and Research(2)																	
a. P.P.B.																	
b. Psychology and Sociology																	
c. Vehicles																	
d. Infrastructure																	
e. Aid to injured																	

SPECIFIC EXPENDITURE FIGURES OMITTED IN THE ENGLISH VERSION

(1) Costs of publicity in France represent about 1 per cent of the national revenue. If this proportion is applied in this field it would give over 100 MF per year.

(2) General road safety policy costs.



CONCLUSIONS

The application of P.P.B.S. to the choice of investments in the transport sector should help to make decision-making more coherent than it has been in the past, but the difficulties it entails must not be underestimated.

(1) Objectives must be clearly defined and, if possible, quantified. Objectives and programmes cannot be truly linked up unless the objectives are made absolutely clear. In the present state of knowledge, however, objectives extraneous to transport often prove difficult to quantify.

(2) Due regard being paid to present limitations concerning the collection of data, programme evaluation criteria should be selected in such a way as to cover both the implications for users of transport systems and the implications for non-users (i.e. external effects) in order to make the evaluation procedure as realistic as it can be.

Furthermore, when multi-criteria techniques are applied, the weighting of the criteria has to be explicitly formulated. This raises an awkward problem especially for taking into account objectives that are extraneous to transport (e.g. "assignments" concerning general policy, national independence, national prestige, economic development and land-use planning).

(3) External effects should be determined as comprehensively as possible, both in order to measure more closely the overall effectiveness of the transport systems concerned and to take into account the many interests that these public resource-allocation exercises involve.

However, this review of the difficulties of P.P.B.S. must not conceal the considerable benefits accruing from the improvement of the decision-making process, more particularly:

- government action is clarified because the government has to set itself well-defined objectives;
- traditional procedures (especially as regards budgeting for choosing action programmes are subjected to entirely fresh thinking;

- methods of evaluation are closely linked with decision-making mechanisms as they exist in actual practice, which means that the interests of a very wide range of groups is taken into account;
- political decision-makers and analysts each operate at their respective levels; the analyst can thus confine himself to his own technical sphere while the political decision-maker is safe in the knowledge that choices which fall within his jurisdiction have not been made in the course of the analysis underlying the information provided to enlighten his decision.

It follows that P.P.B.S. should ensure a better integration of the "techniques" for planning decisions and the processes for giving effect to them, it being expected that these decisions will remain "political" in the best sense, that is, open and sensitive to the claims of all the interests - many of them conflicting - of the many social groups concerned by transport strategies.

SUMMARY OF THE DISCUSSION

1. Discussing the basic question of why economists should concern themselves with government planning, there was general agreement among the participants that the increasing complexity of the problem facing governments today had changed the goals to which government financial planning should be directed. The increasing proportion of G.N.P. administered by the government required a change of attitude from the concept of the "public accountant" that previously dominated this field. Governments must now concentrate on managerial functions, in the sense of ensuring efficiency in the use of its funds, rather than providing assurance that these have not been misappropriated.

2. Discussion made it clear that the possibility of applying new techniques to improve on the traditional planning machinery was arousing great interest in many countries. With doubtful results, the term P.P.B.S. had gained for itself an aura of complexity and sophistication that suggested a technique beyond the capability of existing administrative organs to absorb; this was clearly not the case as in its essentials the P.P.B.S. concept is founded on simple ideas that have been in the minds of planners for many years. Although the use of a P.P.B.S. system, as the Introductory Report showed, was normally aligned to the most recent developments in economics, these are simply means to an end; the aim being to introduce a rational framework for the planning and decision process designed to optimise government expenditure.

3. A good indication of the need for a P.P.B.S. framework could be seen in the difficulties, found apparently in many countries, in the way of making a comprehensive overview of broad policy options available. The fundamental reason for this lay in the system that did not have objectives framed in terms that represented the real goals of society but were a loosely defined assemblage of traditional fiscal divisions, sometimes made even more complex by piecemeal changes introduced to meet particular problems.

4. The origin of the P.P.B.S. system studied in Europe was the system developed in the United States. The American system was developed for a number of reasons that ranged from the pressure of heavy expenditure on defence to the fragmentation of decision-making that characterises the federal arrangement of the United States. As no system can be grafted simply from one country to another, with the heritage of different attitudes and cultures, clearly the P.P.B.S. system formulated in the United States could serve only as a guide to the possibility of adopting similar practices in Europe. It was noted that the introduction of P.P.B.S. methods in the United States had seemingly not led to the widespread benefits that might have been expected following its Presidential sponsorship; however, this fact accepted, the general feeling was that the concept of an integrated planning process was potentially useful and warranted research into the possibility of application.

5. The Introductory Report described the progress that has been made in applying the concept of P.P.B.S. in the French planning procedure. The first essential point noted in relation to the French experience was that the system of central planning in France was, in many ways, more formal and had a firmer background than in many other European countries. In view of the state of development of the French planning system with its well developed linkages between the various stages of planning, attention had been directed at the possibility of utilising the concepts of economic appraisal, inherent to the P.P.B.S. approach, to improve the evaluation procedures for the preparation of the budget. In the United Kingdom, where conversely the planning process had not such a formal framework as in France, adoption of P.P.B.S. implied significant changes in the way government planning and budgeting was carried out. Partly for this reason the new P.A.R. (Programme Analysis and Review) system was selective, covering only part of public expenditure and was consciously experimental. In addition, attention was being devoted to specific weaknesses identified by the Fulton Commission that the longer term tended to get sacrificed to the short. P.P.B.S. was being explored in particular departments (Home Office, Education). Far from indicating any general disagreement on the aims of the P.P.B.S. approach, the difference of emphasis between the United Kingdom and France was felt to display a logical determination to develop

the basic elements of the system in a way that best meets the requirements of the state concerned; this was accepted as an important factor to be considered at an early stage of an appraisal of the possibility of adopting a P.P.B.S. approach to budgeting.

6. The use of the concept of P.P.B.S. in France is termed Rationalisation of Budgetary Choice (Rationalisation de Choix Budgétaire - R.C.B.), a title that clearly expresses the emphasis that is placed on the aim to improve evaluation procedures. In order to draw upon the experience that had been gained with the application of the techniques of P.P.B.S. and R.C.B., the discussion focused on the practical results that had been achieved by the methods in France and the United Kingdom.

7. The discussion revealed that the emphasis in both the United Kingdom and France was to establish a situation that allowed complete preparation for a decision rather than concentrating on the decision itself. In France the aim of the R.C.B. approach is to integrate political and economic problems whilst in the United Kingdom the system was applied to broad areas that were felt to require extensive examination. A full P.P.B.S. system concentrates on the three stages of the decision process:- planning, programming and budgeting; however the emphasis in France is on the final stage, budgeting. In both countries it is recognised that policy objectives must be clarified, and expenditure and other policy tools, such as regulation, should be systematically related to these objectives. The paper provided an example of the application in one field - road safety.

8. The discussion of planning principles revealed numerous problems that remained to be solved.

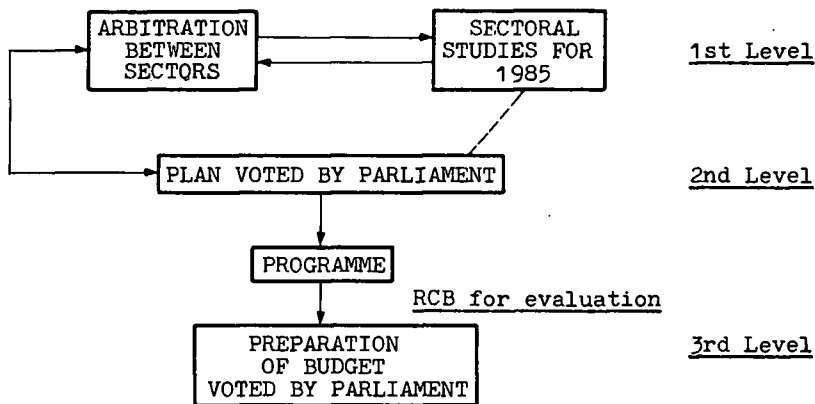
Firstly, there are fundamental difficulties in arriving at objective functions that relate the ideas of politicians to concepts that are usable for economic analysis.

Secondly, although the difficulties in the techniques of Cost/Benefit analysis have been discussed extensively there are many problems remaining in the valuation of intangibles (the example of the value of time is mentioned later).

Thirdly, an area of special difficulty lies in the necessity to make as objective a decision as possible between programme packages that include items that have not been expressed in economic terms. The Introductory Report discusses this question and outlines the possibilities of various multi-criteria techniques that have been devised. However, evaluation methods have not yet reached the stage that anything other than subjective weights can be applied in these methods and they have not yet been applied in practice.

Research work was underway in these fields and in the future it is certain that progress will be made. As mentioned later, it was thought valuable if arrangements could be made for the progress made, in all Member countries, to exchange views regularly and hence accelerate developments in the establishment of this new technique.

9. Looking at the progress that had been made to date in the application of P.P.B.S. techniques, and here it should be noted that the French work is still of the nature of initial exploration of the field, the main lesson that was drawn was that the techniques would have a different value to different countries. A review of the planning process in France (a diagrammatic outline is shown below) served to focus the discussion.



The Position of R.C.B. in the French Planning Process

An interesting practical aspect of the French experience, and one that is generally relevant, is the fact that the inception of this technique requires a heavy input of experienced managerial effort which may be difficult to provide. The requirements in terms of human effort of a P.P.B.S. system is one of the most relevant, practical points to consider and may suggest that a limited goal, at least initially, such as the French R.C.B. programme, may be the best way to progress.

10. The outline of the French system and the description of how the aim of R.C.B. is to improve planning at the third decision level prior to the completion of the budget led to a discussion as to whether the R.C.B. system would be most valuable when confined to this fairly low planning level. It was argued by a number of participants that the main value of a P.P.B.S. approach lay in the opportunity to examine and compare high level policy options, this would imply that the technique incorporates the processes that are used at the initial planning level to devise the main objectives of the Plan. In support of this argument, it was pointed out that a substantial part of the governments' programme is involved with on-going projects that need as careful control as the new work and that the R.C.B. approach might lead to these fields not receiving sufficient attention.

11. After a general review of the practical work, it was agreed that possibly the most difficult problem lay in the construction of objective functions. The role of the politician was crucial and it was essential to make as clear and precise statements of government goals as was possible, and to indicate how these change over time, in order that the objective function may adequately reflect aims and changes in the political and social world. This process of clarification and adjustment of the political/economic goals is especially important if the economist constructing the planning system is not to be accused of exceeding his role as an advisor to the politicians charged with overall responsibility for the management of the economy. The weighting criteria applied when projects with different forms of benefits and costs are examined must essentially stem from a process of political choice. Similarly, to establish a discount rate to apply to projects with differing time horizons, it is important to establish the preference of the politicals to

the options available. As economists have not settled the problem of the discount rate that should be used for appraisal, it was felt to be essential to present the case for the various alternatives to politicians and to seek guidance on the rate to be used. In the Netherlands, and possibly in other countries also, the use of a discount rate that approximated to the opportunity cost of capital would result in a rate that was considered to be unacceptably high to apply to the public sector; in this situation, the final decision must be a political one.

12. Again concentrating on the very difficult interface between economic and political decisions the question of intangibles was considered. Notably, the valuation of time presented a problem in connection with the consequences on income distribution of alternative valuations. If a value is used that relates the valuation of time, particularly leisure time, to the income of the people concerned, this could have the result of creating a situation in which income redistribution occurs in a way that is likely to conflict with the expressed aim of most governments to support the poor. The solution to this, adopted in the United Kingdom, was to formulate a view that was argued before the Minister who then took the decision on which course to adopt.

13. The impossibility of attaching monetary values to all intangible factors was accepted; the formulation that best allowed the politician to attach values to the factors that were not included in the analysis seemed to be to separate the part of the analysis that related to factors that had been evaluated, making the basis of evaluation completely clear, from those factors that had not been expressed in a monetary form. The second group of factors would be laid out clearly and a statement given of any relevant information on the consequences for income distribution, etc. of particular courses of action.

14. Looking to the future, it was thought that to be fully useful, and ignoring the question of political constraints, a P.P.B. system should be a continuous process that reviews all the main policy areas. If a P.P.B. system could be developed to cover the whole of government action, it should enable public expenditure to be controlled by a series of objective studies.

In a Transport Ministry there might be only four or five broadly defined areas that encompassed all the activities of the department. However, for the immediate future, it is necessary to consider how deeply it is practical to take a comprehensive planning process and how far it is feasible to hope to apply economic analysis. However, the main concepts that P.P.B.S. introduces - that government planning is a continuous cyclical process and that it is necessary to think deeply of the fundamental objectives of policy - are clearly relevant to whatever system of planning is adopted in the public sector.

SUMMARY AND CONCLUSIONS

15. Far from being a highly sophisticated economic creation, the P.P.B.S. technique is founded on the long felt need of administrations to create a framework in which their increasingly difficult problems can be examined and alternative solutions compared. The term P.P.B.S. may be new but the basic principles that underlie the system are not; its originality for the administrative process is its aim to achieve a balanced mechanism to direct the use of all government funds in a logical manner. In Europe the planning situation differs from country to country and, of course, differs from the United States; under these circumstances, although there seems to exist a considerable degree of unanimity on the part of governments to improve their planning system, there will be different solutions to the problems that are seen to be of prime importance.

16. To orientate a system along the principles of P.P.B.S. that have been adopted in the United States implies a complete inter-linking of the currently separate functions of establishing goals, devising alternatives and establishing a budget. A P.P.B.S. approach incorporates all the various functions, by whomever undertaken, into a single multi-stage exercise directed to the best use of expenditure on a clearly defined goal and on a wider level at government expenditure in general.

17. As to the internal nature of the planning process, it is clear that its design must incorporate a continuous review process and not consist of a random series of loosely connected studies. It appeared that a continuous review process was likely to be more useful for the planning system than an

occasional extensive review directed to satisfy some current requirement. This is not to imply that the framework of the P.P.B.S. system cannot be adapted to meet some specific requirement that does not seem to be satisfied by the current system but that rather there should be a continuous planning base onto which desired sections can be grafted or modification undertaken over time.

18. The efficiency and real value of a P.P.B. system depends heavily on the success that can be achieved in establishing well defined objectives. This process is absolutely vital as without clear objectives the operation of the system is considerably clouded and its usefulness impaired. Given the initial establishing of objectives, it is equally necessary to ensure that these objectives are adjusted to relate to the changes that occur in the goals of the politicians overtime. For this to be achieved, an iterative process must be instituted in the initial stage of the planning system to allow the political decision-maker to make clear and possibly to clarify for himself the goals that he wished to achieve.

19. Given agreement on the objective goals that the planners are to aim for the next difficulty occurs in the inception of real alternatives. This is a fundamental problem for a government machine that is orientated to administration and not to fundamental thinking about problems, especially those of the distant future. There appeared, for the moment, to be no immediate answer to this difficulty but it was thought to be important to realise that the difficulty existed and that the establishment of a highly logical and efficient system to evaluate projects and select the optimum must also consider how it is to be sure that the "optimum" solution is not ignored in the alternatives that it undertakes to appraise. At the overall planning level, the problem may be thought of as non-economic in nature as the alternatives are basically for the politicians to evolve, but at the programme stage this question needs consideration and requires that the general information system of the planning process has to be as comprehensive as possible.

20. At the stage of the preparation of the budget, the limitation that the system of an annual budget imposes, especially in a highly dynamic economy, received considerable attention. The

need to formulate the budget in terms relevant to the fiscal management of the economy was also touched on as this conflicted with the basic criteria for evaluation of the public sector programme. It was felt that the use of resource costs and shadow prices was important when there was likely to be a difference between the real cost of an input and the monetary cost. However, to evaluate programmes entirely in terms of resource costs leads to considerable extra effort and makes for a difficult adjustment process to convert the system back to monetary terms for the fiscal budget.

21. For the future, all the participants were agreed on the value of an integrated planning system and felt that the steps necessary to achieve this should be considered by governments. Full implementation of a P.P.B. system would involve improvements, not only in evaluation procedures but also in forecasting and speculating about the future, in devising measures of achievement and improving the data available to analysts. However, it was recognised that there were many practical difficulties in moving to any fundamentally new approach, especially in those countries where there was in any case a shortage of trained staff available to the government. In essence, it was felt that the decision could only be taken in the light of the current problems that faced individual administrations and the difference in the return that would be achieved by concentrating effort now on a P.P.B.S. framework which would essentially bring benefits in the longer term and a more short term policy designed to attack current difficulties. Whatever view is taken, it is clearly necessary to have more evidence on the practical difficulties that are faced when a P.P.B.S. approach is instituted and to arrange for an interchange of experience between administrations on the difficulties and the benefits of their experience.

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