DEVELOPMENT OF LARGE PROJECTS (RAILWAYS) FOR AUTHORISATION

A "large project" is defined as a single project with an estimated outlay of £2.0m or more. Certain specified projects with outlays less than £2.0m. may be included if considered appropriate by the Chief Executive (Railways) and the Chief Investment Officer. Similarly, certain annual rolling programmes may require to be developed as large projects in the manner described below, and in these cases the sponsor will be advised accordingly.

The project is an item in the given year investment programme which ensures that the project is, at the least, in line with current business plans and qualifies for a place in the programme.

Following initial development of the project in outline, a "Project development paper" is prepared for submission for consultation by the sponsor to the Chief Investment Officer. The project development paper should be brief and seek formal endorsement of the proposed strategy prior
to development of the submission in detail. The paper should set out:-

a) A brief description of the project.
b) Its relationship to the current Business Review/Plans/Strategic Studies.
c) A preliminary estimate of cost.
d) An outline of the reasons for carrying out the project and the benefits, or otherwise, expected.
e) An indication of whether the proposal meets the primary financial criteria for investment.
f) The alternatives, suggesting those against which the project should be compared.

On completion of each year's investment programme, the Chief Investment Officer lists all proposals for which project development papers will be required.

To ensure that project development papers are considered well in advance of the need to develop schemes in detail, sponsors are required to produce such papers for each designated scheme within a year of its first appearance in the investment programmes. Designated schemes for which project development papers are not produced or for which approval is not given, may be deleted from the following year's programme.
The project development paper is submitted through the appropriate functional steering group (if required) to the Investment Sub-Committee (Railways) for the approval of the Chief Executive (Railways) or for endorsement to the Planning and Investment Committee if this has previously been agreed.

In cases where a project development paper is approved well in advance of the need to prepare the submission document, and to guard against a possible need to qualify such approval as a result of policy changes, etc., which may have occurred during the intervening period, as well as to give more consideration to alternatives, presentation, etc. it is proposed that when development approval is given, sponsors will be advised whether a further approach is required before significant resources are allocated to the development of the project up to the stage of a detailed submission for financial authority.

Such an approach will take the form of a "preliminary consultation paper", the main function of which will be to up-date and amplify the original project development paper in all respects, and to provide assurance on the availability of
resources to develop the scheme. Following consultation with Board Headquarters Offices, the preliminary consultation paper will be noted by the appropriate functional steering group (if required) prior to submission to the Investment Sub-Committee (Railways) or the Planning and Investment Committee where appropriate, if significant changes are involved.

Following approval of the project development and the preliminary consultation paper (where required), development of the scheme will continue; with functional consultation starting as early as possible, so that the sponsor is advised on the financial presentation required and on firm business specifications.

On completion, the submission, supported by agreed plans and the best estimates that can be made on the details available, will be sent to the Chief Investment Officer for consultation with the Chief Officers at Board Headquarters.

After completion of consultation and endorsement by the appropriate functional steering group where relevant, the submission will be forwarded to the Chief Investment Officer. Railway projects will be considered by the Investment Sub-Committee (Railways) prior to endorsement by the
Chief Executive (Railways). Submissions for Non-Rail business and Rail Business where appropriate will be considered by the Planning and Investment Committee. Railway regionally sponsored submissions should also be processed through the Regional Works and Equipment Panel.

INVESTMENT CRITERIA

The primary purpose of investment is to maintain and improve profit contribution after servicing the capital. To this end, investment expenditure will be directed to the replacement of worn out assets in a continuing profitable business, the modernisation of equivalent and the provision of facilities to meet new and increased business activity.

INVESTMENT PROGRAMMES

Annual programmes of investment will be an output from approved 5-year business plans and the financial justification for the programmes will be the profit contribution they make to the marketing plan by maintaining or improving the quality of services or extending their scope, or to the operating results by improved efficiency resulting in cost reduction.
The business plans will thus dictate in general the scope and sequence of investment. Most railway projects are interrelated in the sense that it is only in combination that the full financial consequences can be evaluated (for example, improved track and better coaching stock together contribute to a quality of service which will attract increased passenger patronage).

The business plans and related five-year investment programmes thus provide the focal point for bringing together inter-related projects and assessing their over all financial effects.

The business plans will nevertheless rely on critical financial appraisal of each project, recognising the limitations of considering the parts in isolation from the whole. As a result of individual appraisal of major projects it is likely that the financial evaluation of the business plans will need to be revised as part of the profess of continuous updating.

The extent to which it is possible to evaluate the financial consequences of individual projects will vary. At one end of the scale investments in staff welfare (either under statutotry requirements - offices, shops and railway premises or factories acts - or as good employers) or in operational
safety do not show returns on investment which can be directly evaluated.

Another category of necessary investment, the effect of which will only be to worsen the financial situation in accounting terms by increasing depreciation and interest charges will be projects without notable increment of performance wholly or mainly needed to replace existing assets.

Relatively few railway projects are purely developmental in the sense that they constitute an entirely new venture which will extend the business by the creation of an additional and self-contained tranche of carrying capacity, the receipts and expenses of which are entirely separate from the rest of the railway system. Most projects will be works required to renew in some shape or form the assets of the railway, very few of which will involve a like for like renewal. The content of most projects will be in varying degree a mix of renewal in modern form, which may result in cost reductions being achieved, with some increment of performance or additional works for the development of services and facilities.
It is recognised that the distinction between the renewal, cost reduction and development content of projects will rarely be exact and a decision on how the content of such projects is to be treated in a submission will be arrived at in the process of consultation.

PRIMARY CRITERION

The primary criterion on investment will be whether or not a proposed project will achieve the purpose of maintaining or improving profit contribution, and in this context the principal considerations will be:

a) What is the profit contribution and potential profit contribution of the business sector to which the proposed investment is related.

b) The impact of the investment in each year of the Board's business plans.

c) To what extent and for how long will the Board's finances be improved as a result of the investment compared with what they would be if the work were not undertaken, including possible withdrawal from the particular business sector or area of operation. Where this comparison is unfavourable to the proposed investment, the grounds for justifying the investment must be given, e.g.
safety or statutory requirements, including Board Public Service Obligation.

The strict application of the primary criterion may not be appropriate in respect of the renewal of those assets of a business which are part of the Board's agreed Business Plans in so far as they have been explicitly identified and have been financially justified therein.

SECONDARY CRITERION

The secondary criterion should demonstrate that the proposed investment is better than all other practical alternatives in achieving the objective of the primary criterion and in meeting the Test Discount "non-investment" alternative.

a) In the development of a project a large number of alternatives may be considered. There will, however, be a level and timing of investment which will produce the optimum return and the final result of these calculations should represent the best financial solution.

b) In arriving at this solution, many of the alternatives may be eliminated by a broad examination and the full application of the investment criteria need be made only to those indicating the best prospects of success.
c) In the application of the secondary criterion the main alternatives which should be evaluated are as follows:
   i) the chosen best solution;
   ii) the next best solution:
   iii) the minimum investment to permit the activity to continue:
   iv) the no investment situation:

d) The effect of incremental increase or decrease in the level of investment, timing and project life are to be evaluated and discussed. It should be clearly shown that doing the project now is better than doing it later, subject to allowances being made for the timing of the investment in the Business plan which will need to take account of other proposals and the availability of resources. Where any difference in "internal rate of return" between the proposed project and the next best alternative(s) is narrow, the next best alternative(s) should also be subject to the same timing test.

e) The following questions are to be asked:
   i) is the proposed work the cheapest of the available practical alternatives.
ii) if the scheme is not the cheapest what benefits are to be obtained from the extra investment.

In the case of projects justified by reference to the Business Plan the present value cash surpluses of the recommendation solution over all other alternatives evaluated should be shown.

AN INTERIM APPROACH TO AUTHORISING INVESTMENT

Until the Board has agreed Strategies and Plans for all its Businesses, the following tests should be applied to all major capital investment proposals in the sequence shown:-

a) Compared with present does the investment improve the (profit) contribution towards joint indirect expenses after making full allowance for any new effects on those expenses caused by the investment?

b) Does the net additional outlay of the proposal compared with practicable alternatives show at least a 7% discounted return?

c) Does the investment show at least a 5% discounted return on a total outlay without attributing any share of joint indirects?

d) Is the contribution growing at least fast enough to support the new capital charges from the new investment?
e) Is the contribution rising fast enough to pass test (iv) and maintain at least its proportionate share of the real Joint Indirect Costs, e.g. of Track, Signalling and General Administration possibly rising due to other causes?

subject to the following:

a) Care must be exercised to see that the tests do not constitute a 'straightjacket' and that there would be areas where judgement must be applied. The tests would apply to major capital projects above a threshold size and selected from the Investment Programme;

b) Whilst the tests are intended for use on major capital projects within businesses pending completion of agreed strategies (which would in the main be processed through B.R. Board (HQ) the Railway Regions and other businesses should be advised of the proposals. This would be done by the Chief Investment Officer;

c) The tests are primarily for internal use, but can be quoted to the Department of Transport in support of projects submitted for consent;

d) The adaptation of the tests as appropriate for application to major capital projects from all the Board's Businesses.
FINANCIAL ESTIMATES

At the outset, it should be established that the current costs and revenue concerned are at their most efficient levels, independent of any proposed investment. In particular the sponsor will need to consider the following:

a) Wage costs reflect the actual, and not "establishment" outgoings; (the actual costs may be either higher or lower than establishment costs);

b) No major improvements in working can be made immediately, independent of a proposed investment scheme or variant on such a scheme;

c) Any significant improvements in the use of inputs, particularly labour, that can be achieved over time irrespective of the proposed investment, should be incorporated at this stage;

d) Prices are set such that net revenue over a specified time period is being maximised and the revenues attributable to the project must be calculated after taking account of revenue increases which will be obtained whether the project is carried out or not.
Historical costs and receipts should be shown as actuals and all future financial calculations are to be at a stated price and constant price level as near to the date of authorisation as is practicable. Within these calculations future changes in price levels, whether connected with receipts or expenses will only be shown to the extent that they differ from the general level of inflation. That is, only "real" changes in prices, wages, etc., will be shown.

Where leasing arrangements, property rentals, external rates other prices, whether as an input or output to the cash flows, make no provision for increase in annual amounts and so do not keep pace with inflation, the cash flows concerned should be converted to constant money values by reducing each year's input by an amount equivalent to the estimated rate of inflation. Thus, in effect, such cash flows will be discounted by the product of the test discount rate and the rate of inflation. This therefore conforms to the general principle referred to above.

Stock levels, debtors balances, works in progress and working capital may vary as a result of the investment and any measurable effects of
these changes are to be included in the cash flow calculations.

It is not sufficient to limit long term maintenance expenditure to those specific cash flows that can be foreseen at the time of assessment. Incidence of maintenance is to be estimated using the best technical advice available, and although out of pocket expenses from the basis for cash flows, care will have to be taken to ensure that the long term impact on overheads is taken into account in the calculations. Proposals for new works of any size which include a repairs element should compare the maintenance schedules and staffing of the existing and proposed asset and the actual maintenance savings should be quantified both in terms of money and staff.

The value of land/buildings associated with a project will be dealt with as follows:

a) The project outlay will include the cost of purchase of land and buildings but not that already in the ownership of the business. No credit will be taken for land/buildings released as a result of implementation of the project.
b) Cash flows used in the financial calculation for comparing with the without investment situations and the preferred alternative with other alternatives will take account of costs of land/buildings to be acquired, alternatively values of land/buildings already in business ownership, and sale value of land/buildings released the values so used to be calculated on a basis agreed with B.R. Property Board.

c) Where land/building is to be leased the cash flows are to incorporate the rents involved suitably adjusted for inflation and the submission is to indicate specially any anticipated conditions of the lease such as rent reviews and termination clause which may affect the future profitability of the project.

There are instances where development projects involve the transfer of rolling stock forming part of the existing fleet to the benefit of the project. The "primary criterion" under the "Profit Contribution" section will separately and specifically identify the transferred capital charges arising from the re-allocation of the assets. However, as the transferred capital charges
do not themselves produce any change in the cash flow, capital charges will NOT be included in the d.c.f. calculation.

FORM OF SUBMISSION

A measure of standardisation is essential to facilitate appraisal and approval of the main essentials of the submission. The submission will, therefore, be such as to demonstrate that all the criteria have been adequately applied. Appendices A and B indicate the format of the financial statements, and set out the order in which information is to be presented.

OUTLAY

The outlay will be quoted gross of credits for depreciation type assets and net in the case of amortisable assets, from the recovery value of displaced assets. The date of the estimate of outlay is to be indicated and the financial evaluations are to be calculated on this basis. However, for all DCF calculations the net outlay will be used.

PROFIT CONTRIBUTION

A statement should be presented of the profit contribution of the activity, or sector of the business with which the project is concerned. This
should clearly indicate the position before and after charging depreciation/amortisation and interest at prescribed rates consistent with the "Business Reviews".

The above statement should be prepared.

a) for the "without investment" situation
b) for the "with investment" situation
c) for the principal alternative situation.

A comparison should be made of the net position in the three situations set out in paragraph above.

**DISCOUNTED CASH FLOW COMPARISONS**

a) Using a discount rate of 7% a d.c.f. comparison should be made of the proposal against the alternatives as set out in paragraph above.

b) Project life is to be related to the commercial life of the project, and is not normally to exceed 25 years. Where the project life is greater than the physical life of the assets or associated existing investment, the renewal of assets concerned must be reflected in the cash flows. Conversely, when the physical life is greater than the commercial life then a residual value greater than scrap is to be considered for inclusion in the cash flows.
c) An indication is to be given of the year at which discounted cash inflows and outflows equate (the break-even year). An "internal rate of return" should be employed to facilitate comparisons between alternatives.

EFFECT UPON NET REVENUES

a) The effect of a proposed investment and the principal alternative on future revenue accounts is to be assessed for all projects including those of a statutory or safety nature. The year by year positions, in comparison with the year before expenditure commenced are to be shown, until the financial effects of total physical implementations are achieved. Where the full commercial fructification of the investment is not expected until some years after physical completion, the effect on Revenue Account should distinguish between monitorable and non-monitorable the reasons for their being non-monitorable should be clearly stated.

b) A comparison should be made of the net annual effect of the Proposal with the principal alternative.
c) The Accounting rate of return expressed as the ratio of the improvement in revenue account before interest at full fructification resulting from the project compared with the net outlay is a useful indication of the impact of the project on the viability of plans in the immediate future and should be shown together with the number of years which will elapse before this improvement equals the net outlay.

d) There must be clearly relationship between the calculations revealing the effect on revenue account and the identification of the corresponding effect in annual budgets. The purpose of this requirement is to facilitate the monitoring of financial effects.

e) Normally, the figures used in the Effect upon Net Revenue, and the discounted Cash Flow and the Profit Contribution statements, will be variations from a stated previous year, but where absolute figures are available they should be used, especially for the profitability statements.

GRANTS

Investments often produce effects upon the grants receivable by the Board and it is important
that the changes in level of grants should be recognised and shown in the financial evaluation of "profitability" and "Net Revenue". In general, grants should not be included in d.c.f. calculations because of the uncertainty of the timing of their payment and continuation over the life of a project and the eventual replacement of assets involved.

In particular, the effect of proposals upon the following should be shown:

a) The overall Public Service Obligation grant.
b) The effect upon the Passenger Transport Executive claims (Section 20, Transport Act 1968).
c) Investment grants, as applicable.

TAX LIABILITY

The liability of the Board, and its subsidiaries, to taxation, e.g. Land Development Tax, can have a significant effect upon the net financial returns from investment projects and the effect of taxation should be declared, when applicable, in project submissions.

PROJECT CONTROL

It is not sufficient to submit and implement a project. Controls are required to ensure that plans...
are properly executed within authorised cost and timescale and anticipated returns are in fact achieved. The procedure for controls is set out in the project Control Procedure, Part 4. Back-checks are, therefore, no longer required with such a system of effective control.

Each business should draw up financial monitoring procedures consistent with the intention of these instructions, and compatible with the Project Control Procedure, Part 4 to enable expenditures and financially effects which can be specifically identified with the project to be directly translated into the budget.

RISK AND UNCERTAINTY

Uncertainty arises where previous experience does not enable probabilities to be ascribed to various outcomes. Risk is the measured assessment of the likelihood of probabilities occurring. Therefore, concepts of risk and uncertainty differ. If it is not possible to attribute probabilities to elements of a project then the advice of the Chief Investment Officer should be sought to discuss the most suitable method of expressing the presentation of the uncertainties involved.

In major projects it is essential to take into account the probabilities and uncertainty of the
estimates used. To this end statistical procedures are to be applied to projects of complexity and/or involving economic implication and analysed so as to quantify the effects on the financial outcome of variation of:

a) the capital outlay
b) income and expenditure in any year
c) the project life.

Estimates of the worst and best, as well as of the most likely effects, and their probabilities on a project within each departmental responsibility are required for the analysis. The range from the worst to the best can, and often will, be wide. The limits of probability can be translated by means of a computer program to demonstrate the sensitivity of the project to its more vulnerable aspects as well as defining optimum financial solution. A computer program in current use is P.R.A.M - Project Risk Analysis Method.

The use of risk analysis to provide a measure of the worst that could happen as well as what is most likely will enable management to balance probabilities against expected returns in making a decision. The analysis should give a probability distribution for net present value, discounted rate
of return and break even year and the result of the analysis is to be discussed in the submission.

GENERAL

Where sponsors consider that the application of these criteria may lead to a distorted result, reference should be made to the Chief Investment Officer.

All aspects of the analysis of projects which require to be submitted in the Planning & Investment Officer, and he will therefore adjudicate on the methods used and comment upon the validity and viability of the results.

DANISH STATE RAILWAY (DSB)

DSB'S INVESTMENT PLANNING*

Investment planning is completely integrated with all other planning at DSB; planning takes place throughout the system. An isolated assessment of investments cannot be carried out as there must be a total economic assessment of the complete system. The actual level of investment (e.g. choice of material, establishment of infra-structure, etc.) can thus be abstracted from the operational draft proposals.

What characteristics DSB's planning, including investment planning, is the systematic graduated
step like process whereby overall objectives are first set and defined after which things work down to the overall product planning, from here to systems planning and finally to resource planning.

THE GROUPING OF INVESTMENTS

Apart from the grouping of investments mentioned before, into product areas and priority areas, the following grouping of investments is made:

a) System changes.

This includes investment projects where the basic reasons for the execution of the project is a change in the system. In other words where a project execution is a precondition for a definite change in the product offer.

Such projects will generally lie within a product oriented priority area.

b) Rationalisation.

This includes projects that are carried out to reduce operational costs.

c) Replacement/Reinvestment

This includes projects that are carried out due to wear, safety requirements, etc.

Obviously many investments can be related to several of these groups but practice has shown that
it is possible to use this classification based on an assessment of the main reason.

The classification is important, not least for the choice of method and decision criteria.

Many other divisions of investments - including more detailed ones - are possible, but the one described here has been found practical with DSB, where as mentioned there is also the decision into priority areas.

**CHOICE OF INVESTMENT (METHOD)**

Planning is carried out for whole systems, and the actual investment can be derived from the operational drafts for individual areas.

The setting of priorities and the gradual discarding of alternatives occur as an interactive process where alternatives are worked out based on the principal goals and presented to the decision makers (the Board and politicians). The separate alternatives are modified and discarded as part of a continuous dialogue between the decision makers and the concern's planning and basic organisation, until a final proposal exists that fulfils the overall political objectives and the economic and technical constraints.
The system of setting priorities is thus built on the same idea that lies behind multi-criteria analysis. Instead of making a "technical" ranking of the projects the system is based on a continuous iterative procedure where the alternatives are tested against the decision makers' preferences.

The documentation that accompanies each alternative generally contains economic evaluations. A discounted cash flow analysis is generally made for each of the alternative projects.

Furthermore a feasibility study is always made for each proposal. That is to say calculations of the project's investment costs, running costs, income and personnel requirements are made based on performance data and key figures.

Investments that can be ascribed solely to purposes of replacement or rationalisation generally have their investment priority based on economic criteria (profitability) alone.

Over and above the types of investment projects mentioned previously are the very large single projects that not only affect the whole concern but also play a decisive social role. Examples of this kind of investment are the electrification of DSB's main network, a rail
tunnel between Elsinore and Helsingborg and a combined rail and road connection over the Great Belt. For these projects, for which decisions as yet have not been taken, a real socio-economic analysis will be essential.

In practice such large single projects are made the subjects of socio-economic analysis, most commonly based on a modified form of cost benefit analysis.

CONCLUDING REMARKS

After the above remarks the following comments should be added as a final point to DSB's methods of setting priorities to investments.

- Most of the decisions about single investments made by DSB alone concerned with investments of such size that the resources necessary to mek, e.g. a pure cost benefit analysis cannot be justified.

- Many investments are made as a part of a larger overall national plan, for which decisions have been made out-side DSB. These decisions, which are generally made on a basis of socio-economic evaluations, make it unnecessary and inappropriate for DSB to make very advanced analyses.
It should also be added that DSB's departmental status entails its participation in and advising on the making of the overall sector planning, so that in this way DSB does take part in such analysis.

JAPANESE NATIONAL RAILWAYS (JNR)
INVESTMENT IN FACILITIES

LONG-TERM INVESTMENT PLANNING AND CONNECTION WITH NATIONAL PLANS

National Plans

Of all the national plans, those taken into account the most in JNR's long-term investment planning are the Comprehensive National Development Plan drawn up by the National Land Agency and the economic plan formulated by the Economic Planning Agency.

The Comprehensive National Development Plan generally covers a period of ten to fifteen years and "it serves as a basic plan for attaining balanced utilisation of national land from a long-range point of view, coping flexibly and in advance with future socioeconomic needs". Based on the ideas incorporated in the plan, it is stipulated that "measures shall be taken for the execution of the schemes on a well-planned basis, such as by
formulation of separate five-year plans for each project”.

The economic plan, on the other hand, generally covers a period of about five years. Its aim is "to clarify the direction desired to be taken for economic and social development and indicate the basic policies to be taken therefore by the government, and at the same time, to serve as a guideline for industrial and business activities." Furthermore, the plan states that "the government shall strive to materialize the targets set forth for public investments, so long as no significant changes take place in the assumptions made."

BASIC FRAME FOR LONG-TERM INVESTMENT PLANNING

The authorities in charge of the construction and servicing of roads, harbors, and other transportation facilities, namely the Ministry of Construction and the Ministry of Transport, draw up their respective long-range plans based on the physical aspects of the basic scheme indicated in the afore-mentioned Comprehensive National Development Plan; and in case the Economic Plan is to be revised, the authorities determine the level of buildup to be achieved within the period prescribed and submit it to the Economic Planning
Agency, together with the amounts of investment required.

JNR, also a principal authority in charge of transportation buildup, is authorised to submit, after conferring with the Ministry of Transport, its plans for the buildup of its transportation facilities as a means of social capital formation.

The Economic Planning Agency, upon receipt of these plans proposed, adjusts them as a whole and indicates in its economic plan the amounts of investment for each transport branch concerned.

The basic policy on the buildup of JNR facilities, the level of buildup, and the amount of investment as decided upon by the Economic Planning Agency become the frame upon which JNR draws up its new long-term investment plan.

FEATURES OF JNR's LONG-TERM INVESTMENT PLAN

In drawing up its investment plan, with economic prospects in view, JNR obtains required data from the government and reviews the current investment plan, in parallel with the work of rewriting the Economic Plan by the government, in developing a new plan.

In this case, investment is one of the most important means to be resorted to from the
standpoint of management strategy. However, as an enormous amount of funds is needed for railway investment, especially for infrastructure, and as the period of gestation of the investment is long, the impact on capital expenses is considerable. Care has to be taken, therefore, so that the investment would not become an additional oppressing factor on finances.

Furthermore, as there is a demand to build up the railway as part of social capital, the investment in this case has to be made on the premise of fair cost sharing.

It is from this point of view that the needs both within and without are studied and investment items coordinated to map up the long-term investment plan covering a period of about five years.

The peculiar feature of the long-term investment plan of JNR is, thus, the establishment of the target from a long-range viewpoint and the clarification of the course to be taken.

Furthermore, in making specific investments, the traffic demand and the transport service needs are again checked at the time of planning and the decision is made after the investment efficiency,
The purpose of the capital investment plan and its fundamental indicators.

The dynamic planned development of USSR economy, the increase in its internal and external links, also the systematic increase in the material and cultural standard of living of the Soviet people are giving rise to the greatest requirements in rail transport, which constitutes the principal component of the transport system of the country. To satisfy these requirements, the Soviet Government allocates considerable material and financial means to the railways.

During the last twenty-five years 40.2 milliards of roubles, i.e. about one third of all the credits allocated to transport and communications in the USSR, were allocated to the development of rail transport.

To fulfill the role which rail transport plays in the system of material production and development of the socialist economy, the trends and scales of use of capital investment in
transport are subject to solving its fundamental task, i.e. that of entirely satisfying, with a high output, the requirements of the national economy and of the population in the matter of transport.

These aims are achieved by the following means:

- reconciling the development of the technical means of the railway with the increase in the requirements of the national economy and of the population in the matter of transport.

- co-ordination between the development of rail transport and that of the other modes of transport, the two constituting a single system of transport for the country under the conditions of planned socialist economy;

- full guarantee of an indispensable proportionality in the developments of all the component parts of the transport technical expedients;

- the fastest possible progress in the technical and scientific fields.

On the basis of the measures carried into effect to strengthen the USSR railway system the transport operations are concentrated on the main trunk routes of its regional divisions. This
principle of concentration of trunk routes was already defined in the electrification plan for Russia prepared in 1920, under the direction of Lenin and known as the GOELRO plan. The GOELRO plan provided for creating a basic network of high capacity double-track electrified trunk routes, combining the qualities of an "extraordinary transport capacity with associated cheapness". During the years before the war, and particularly during the five-year plans which followed it, this trend in the development of Soviet rail transport, creating conditions for the effective use of transport techniques and the most elaborate technologies, was widely implemented, thus demonstrating its vitality and great economic values.

The use of capital investments for rail transport, as for the national economy as a whole, follows a capital investment plan in the form of a division between current plans and forecast plans, and at the same time forms part of the investment plan of the national economy.

The following are some of the most important indicator-factors of the capital investment plan:

a) Introduction of the required production capacities during the planned period, but also
of the productive and non-productive objectives and equipment expressed in natural terms and in finance terms (new lines, doubling of tracks, electrification of lines, equipping with p automatic block and centralised traffic control, centralised control of points, all possible objectives for the functioning of the transport process, other objectives such as housing accommodation, schools, cultural establishments, public health establishments, needed to satisfy the needs of the railwaymen and their families).

b) Supply of rolling stock - locomotives, freight wagons and passenger coaches, also containers, machines and loading and unloading equipment, track maintenance machines, spare parts, etc.

c) Capital investments assigned to the development of basic productive and unproductive funds, and distributed according to the fundamental objectives and the branches of the rail economy.

d) The volume of expenditure corresponding to uncompleted construction (for completion) in order to ensure the introduction of the capacities and objectives provided for within the limits of the planning periods.
The determination of the requirements for developing the flow and transport capacities of the railway lines and stations, the strengthening of the effectiveness of the objectives for ensuring the transport process, the for supplies, also rolling stock and various machines and apparatus, is effected by means of technical-economic calculations and statements. The methods used for such calculations, based on the results obtained from the science of transport and Soviet economic science, and also from the combined experience in planning and forecasting in practice, are constantly being improved. At the present time, economic-mathematical methods and the use of electronic computers are being applied to the planning of the development of rail transport, within the framework of the automation system created by the rail transport division (ACYZhT).

The size of the capital investments required for the planning period are fixed on the basis of data relating to the forecast capacities and objectives and their anticipated cost, and also on the basis of standards of capital investment necessary for setting up an authority (of a bridging nature) for introducing the capacities within the next planning period.
In planning capital investments it is necessary to establish their technical and repetitive structure. The first structure provides for the rational distribution of the total volume of capital investments for the construction and installation work, and for acquiring plant and rolling stock. The second structure characterises the expenditure allocated to the maintenance of existing installations (simple repetition) and to new construction, to enlarging old structures, to reconstruction, to technical re-equipment (extended repetition).

The technical structure of capital investments on the USSR Railways is extremely stable. For the last three five-year periods (1961 to 1975) the proportion of construction and repair work amounted to 33 to 34% that of rolling stock to 54 to 55%, that of rolling stock of 54 to 55%, and that of other expenditure and the rest of the equipment to 11 to 13%.

The repetitive structure of the capital investments is characterised by the predominance in its content of expenditure for extended repetition, which amounts to 9/10 of all expenditure. Also, a predominant part of this expenditure in recent
times has been that for extension work (old construction) and for reconstruction. However, in these latter years, mainly in relation to the construction of the main trunk route from Baikal to Amour, the proportion of expenditure for new construction has suddenly increased. Although during the period 1972 to 1974 new construction represented 25 to 30% of the total cost of large-scale work, while in 1976 this expenditure was 50%.

One important requirement when planning capital investments is to ensure that the objectives and productive and non-productive equipment are achieved within the timescales defined in the specifications, that any unjustified increase in their cost is excluded, also the depreciation periods of the financial and material means, and finally that of the capital investments are concentrated in the first instance on the most important construction work started.

Reconciling the work scheduled within the plan and the expenditure in money, materials and labour necessary for carrying it out, together with the limitations assigned by the national economy plan to rail transport, is also extremely important. The non-observance of this compatibility would have a negative effect on the scheduled programme of
capital. This could result in delays in constructing the items intended for transport, the complexity and conformity to the plan for developing the transport capacity and the output of the lines and stations could consequently be affected, the cost of their construction could be increased, and the uncompleted part of the construction work could be more extensive.

CRITERIA FOR ASSESSING THE OUTPUT OF CAPITAL INVESTMENTS

The most important task in the planning of capital investments in rail transport, as in the national economy as a whole, moreover, is to ensure their high profitability by choosing the most economic variants for the work covered by the investment.

The determining criterion for the economic return of capital investments in transport, when there are several variants to be considered, is the obtaining of the minimum national economy expenditure to achieve the corresponding volume of work for a given total quantity of it (in transport production or in the service of the national economy and the population). The approach from the point of view of the national economy means that the variants selected must be the most profitable
ones, not only for transport, but also for the national economy as a whole, which means that account must be taken, not only of the transport expenditure, according to the variants chosen, arising outside the transport field.

In accord with the standard methodological provisions adopted, based on work economy criteria of the undertaking, the choice of planned and projected solutions is made on the basis of an indicator of reduced expenditure $C^r$

$$C^r = C + E^r K^i (i) \quad r \quad i \quad n \quad i$$

Where:

- $C^r$ = annual operating expenditure or cost of transport according to the variants;
- $K^r$ = capital investments or specific investments per unit of annual volume of production for the different variants compared;
- $E^n$ = a normative coefficient of profitability (efficiency). The normative coefficient of profitability characterises the permissible lower limit of the return obtained from the capital
investments. Its value is fixed at present for the whole of the national economy at the level of 0.12 (or 12%). To assess the measures linked with new rail construction, with work on developing the flow and transport capacity of the existing sectors of the railways and of certain other sectors, the output norm adopted is 10%, because of the impossibility of accurately assessing the return obtained. The best variant will be that for which the total reduced expenditure is the lowest.

The variants are also compared on the basis of determining the depreciation period $T$ or form the profitability coefficient $E$ of the supplementary capital investments.

$$T = (K_1 - K_2) (C_1 - C_2) < T_n$$

or $$E = (C_1 - C_2) (K_2 - K_1) > E_n$$

A variant with high capital investments, but with low operating expenditure is economically profitable in cases where the total value of the profitability coefficient is equal to or greater than its normative value $E_n$, or if the depreciation
period of the supplementary capital investments does not exceed the normative period $T^\mathbf{n}$ (for $E = 0.12$ the normative depreciation period $T^\mathbf{n} = 8.3$ years and for $E = 0.1$ the depreciation period is $T^\mathbf{n} = 10$ years).

Variants differing as a result of a different division of expenditure in the course of time are assessed on the basis of determining for each of them, the total value of the day to day expenditure and of the capital investments over a fairly long period (not less than fifteen years).

To ensure the comparability in the course of time the annual day to day expenditure of the last years of the period is, where applicable, reduced to the expenditure for the current basic year, by means of a reduction coefficient:

$$N_t = (1 + E_n)$$

Where:

- $E_n$ is the norm for the reduction of expenditure effected at different times equal to 0.08;
- $t$ is the period of time during which a reduction is to be made (without counting the year to which the expenditure applies).
The use of this coefficient is only permitted, however, for the comparative calculations of economic profitability, and it cannot be used for the planning of capital investments and for preparing construction budgets.

In comparing variants which differ in the matter of the transit time, account is taken of the effect linked to the acceleration of the delivery of the goods and to the shortening of the journey time of passengers. The effect of accelerating the delivery of the goods is measured by the value of the working capital released assimilated to an economy of invested capital. The effect of accelerating passenger transport is measured by the resulting increase in the national income.

In addition to profitability calculations for comparing variants, account is taken when planning capital investments, of the general (absolute) economic profitability indicators, characterised at the level of the overall national economy by the ratio of the annual increase in the national income (of the net product), under the given conditions of its material structure and within the framework of the various specific branches or undertakings benefitting, to the capital investments bringing about this increase. Unlike the compared
profitability calculations effected on the basis of a comparison, in this case indices are taken for the period previous to the one being assessed, and the output criterion is the obtaining of the maximum national income. It should be pointed out that two output criteria, i.e. the economy in the work of the undertaking and the increase in the national income (or the profits of the various branches and undertakings), are closely linked with each other, it being understood that for given levels of production the economy of expenditure on materials and labour determine the increase in the net product and the profit.

The increase in general profitability of capital investments in transport is calculated by the following formula:

$$ R = (P_{tr} + P_{en}) (K)^{-1} $$

Where:

- $P_{tr}$ = profit for the period assessed, obtained as a result of the increase in transport and the increase in its cost.
- $P_{en}$ = the increase in profit of the national economy linked to the estimates of capital invested in transport;
$K = \text{the capital investments giving the increase in the production funds of the transport during the period of assessment.}$

To the number of general profitability indices must also be added the specific capital investments which are calculated by subdividing the total capital investments for the estimated year in accordance with the increase in transport during the year (over the various lines), or in accordance with the increase in the output and transport capacity of the railway lines.

The general economic profitability for rail transport is defined when preparing the annual and forecast plans for its development, and also when assessing the results of carrying the capital plans prepared into effect. The aim of such calculation is to fix the amortization of the capital investments, and to determine the profitability of the planned solutions adopted on the basis of the choice of a variant. As when assessing the compared profitability it is necessary here to take account of all expenditure of the national economy and of the effects obtained.

In addition to the financial indicators for the economic assessment of capital investments,
natural indicators are also used. In the first place, these include labour expenditure with variants, which is very important because of the shortage of labour, the saving achieved in energy resources, particularly liquid fuel, the saving in materials in short supply, guaranteeing safety of movement, and other factors. Great importance is attached, when assessing the profitability of capital investments, to the social factors of the return - to improving the working and living conditions of the railwaymen, also to ecological factors.