

UNIT-II

Infrastructure Planning: Typical infrastructure planning steps, Planning and appraisal of major Infrastructure projects, Screening of project ideas, Life cycle analysis, and Multi-criteria analysis for comparison of infrastructure alternatives, Procurement strategies, Scheduling and management of planning activities, Infrastructure Project Budgeting and Funding, Regulatory Framework, Sources of Funding.

- **Introduction**

Formal planning is not normally needed in developed regions where infrastructure provision is merely a series of incremental improvements on already adequate services. There may be important exceptions however. With the deterioration of older infrastructure, such as many urban drainage systems, it may become clear that a major programmed of renewal is required. This will require planning. Another exception would be the need to incorporate a new technology, such as a central controlled traffic system or a light rail network. The increasing popularity of BOT proposals is in itself a good reason to develop a comprehensive plan within which judgments can be made concerning the social desirability of one scheme over another. In developing regions, proper planning is a necessity. If the type, scale and distribution of infrastructure are to be socially defensible then planning is required. This may seem obvious to an engineer, but the simple logic of this position is not quite so obvious to politicians determined on smaller government and less control over industry and commerce.

Sustainable urban planning frameworks also apply to critical infrastructures. This article presents a frame-work for better linking the planning of cities and their critical infrastructure so that they will become more sustainable. The first large scale city planning operations in history were infrastructure interventions. They range from the first known water management systems that separated drinking water from waste water in Indus Valley cities five millennia ago to the aqueducts. All city planning was abet-ted by infrastructure. Transitions from one historical era to the next were marked by leaps in city building and infrastructure inventions. Infrastructures enabled cities at a scale and density not possible without them. Infrastructures are so intrinsic to urban life that power, water, transportation, and telecommunications net-works are called critical infrastructures.

- **Typical infrastructure planning steps**

Following process included in infrastructure planning steps:-

- Problem diagnosis
- Goal articulation
- Forecasting and design of alternatives
- Plan testing
- Economic evaluation

- Financial evaluation
- Environmental evaluation
- Implementation
- **Problem diagnosis**

A great deal of data collection and evaluation may be required. At the very least a baseline study of the area is required which attempts to describe the nature of the status. If major transport infrastructure is involved, the study will typically describe population types and distribution, reasons for travel and present infrastructure provisions. Surveys of contaminated land and other pollution problems may be required; also areas for wildlife protection, hot spots of social dislocation and patterns of migration. The list could go on. But this only describes the present situation. Planning is inevitably about the future and the diagnosis of problems must involve some assessment of future states. Data may be collected for demographic forecasting, predicting changes in land use patterns or the prediction of infrastructure capacity limitations. This data can then be used as the basis for the complex projections and predictions necessary for land use planning. Often the most useful source of problem definitions is the people who have had to work in and administer the region being considered. Public servants and community leaders may well have at hand a fund of knowledge unavailable to formal strategies. Extracting this information is no easy matter. Interview techniques using cognitive maps are useful. Brainstorming sessions and workshops are common. Modeling of the information in the form of value trees may serve to place practical boundaries around the problems.

- **Goal articulation**

It is possible to plan without well defined goals. Indeed, much planning in well developed areas is merely a process of incremental changes to existing plans. When the rate of social change is small, comprehensive plans based on negotiated goals are unnecessary. However, this is almost never true of planning in the developing world. Here, change is rapid, with industrialization increasing in volume and diversity, populations expanding in inappropriate places and infrastructure becoming quickly overwhelmed. Goals are abstract statements concerning what the plan hopes to achieve in the long term. They are expressions of the social values that are to be used to guide the planning process. They may exist in tentative form before the problem diagnosis phase but can only be precisely articulated when the baseline data is analyzed and the problems to be addressed are clear. These goals must then be translated into operational objectives which are stated in a form that can be measured and used to evaluate the merits of alternative planning solutions. Although goals and objectives may spring naturally from the problem diagnosis phase, a wise planning team would take the time to carefully negotiate them with the client body. There is nothing more frustrating than the expenditure of months of work on a report that is then rejected by the client because it has different aspirations from the planners. The client must sign off on the goals and objectives early in the planning process and, in turn, the planner must demonstrate that they have been faithfully used to design and evaluate alternative solutions. The process of planning may require the alteration of some of the goals or objectives.

- **Forecasting and design of alternatives**

The problem diagnosis phase may have required a degree of forecasting to predict the impacts of the natural development of the status quo. This may predict traffic congestion, urban blight or electricity shortages. Similar techniques of trend analysis and scenario building will be required to test the likely impact of alternative forms of new infrastructure. Various degrees of uncertainty will be attached to these forecasts depending on the timescale and the dynamics of social change. For this reason High, medium and low forecasts are often made to enable different infrastructure plans to be outlined. Sometimes it may be possible to explicitly take account of uncertainty by modeling outcomes using probabilities. Often, however, the limits of uncertainty are nothing more than a guess. Under these circumstances the high degree of uncertainty should be reflected in the robustness and flexibility of the plans. The design of plan alternatives is essentially heuristic in nature and heavily dependent on team experience. Given the objectives, the planning team has to search for indicators of likely solutions that would satisfy these requirements. Experience of similar exercises will hopefully stimulate the recognition of attribute patterns.

Where the design process can be constrained by simple technical criteria such as soil type or the minimization of route length, a degree of modeling may be utilized and the process is close in nature to formal engineering design. Generally, however, such things as land use transportation interactions, multi-modal issues and socio-political pressures make the design of alternatives more ambiguous than this.

Interactions of design and plan testing can be performed at a number of levels of detail until closure is achieved. In practice, it is difficult to separate the process of design from plan testing and evaluation.

- **Plan testing**

Plans are tested against objectives and constraints. Constraints and objectives may well be alternative ways of conceptualizing the same factor from different points of view. Thus, the production objective of the machine shop may be a constraint on the sales department. In terms of our planning process, however, we will define objectives and constraints in terms of how they may be evaluated. Objectives have a scale such that plans may perform better or worse against that objective. Constraints are upper or lower limits to some attribute of a plan. For example, alternative highway plans may perform better or worse in terms of public land uptake (an objective) but some may be rejected because their estimated cost exceeds the money available (a constraint).

We shall briefly consider the following important constraints with the caveat that in particular circumstances others may also be important:

- Physical
- Operational
- Regulatory
- Safety
- Environmental
- Resource capacity
- Cost and time.

- **Economic evaluation**

The outcome of plan testing is usually one or two serious plans that are then subject of a more formal and detailed evaluation. The three main types of evaluations that aid in the selection of a particular plan for implementation are economic, financial and environmental. The boundaries between them are not as clearly marked as the foregoing statement might suggest. Each type of evaluation contains varying degrees of the other types. This chapter discusses economic evaluation. Financial and environmental evaluations are discussed in the next two chapters. It is worth noting here that at this stage of infrastructure planning there is a perceptible shift in nomenclature - the word 'project' begins to emerge at the expense of the word 'plan'.

Economic evaluation - popularly known as cost-benefit analysis (CBA) or project appraisal - is quintessentially a technique for assessing the economic soundness of an investment. More precisely, it is used to ascertain whether economic benefits exceed economic costs over the useful life of an investment. The term 'economic' is used to connote the wider social context of evaluation.

CBA is perhaps the most used (or misused) of analytical techniques available for evaluation of infrastructure plans (projects). Its mass appeal as an evaluation tool lies in its technocratic aura, pecuniary orientation, apparent simplicity, neatness and methodological exactness with an emphasis on rationality, and its all-encompassing and altruistic nature with a direct focus on social dimensions of infrastructure development. Technocratic professionals in the planning team might view CBA as a source of demonstrating their professional astuteness, and hence claim to respectability. Investors, especially private, could view it as a filter to assess the prudence of their investment decisions, while hopefully at the same time establishing their social credentials as responsible citizen.

- **Financial evaluation**

Financial evaluation is an important aspect of infrastructure planning and often precedes an economic evaluation. Indeed, for some infrastructure, it provides a first-cut decision rule on which to build economic evaluation. Such infrastructure projects, if found to be financially unviable, are unlikely to proceed - notwithstanding their economic viability. The importance of financial evaluation of infrastructure projects has further increased in recent times as commercial considerations have come to dominate our decision making and as the traditional dominance of the public sector in infrastructure provision is increasingly challenged by private transnational interests. Much of this challenge is evinced in the form of private and joint public-private endeavors in infrastructure provision, epitomized in a variety of contractual arrangements such as build, operate, own (BOO), build, operate, transfer (BOT), and build, operate, own, transfer (BOOT). In our discussion, we will use the acronym BOT to generically represent these various arrangements. At this stage we should clarify a potential source of confusion, or perhaps add to the confusion that already exists in the abundant literature on this topic. In our discussion we are not concerned with the sources of capital (equity, loan, grant) for establishing and operating the project or the financial implications of its repayment. Instead we focus on assessing the extent to which the financial revenues received from selling the project output will cover

the capital and operating costs of the project as they occur over the economic life of the project.

- **Environmental evaluation**

In the planning stages of infrastructure development, a formal environmental impact assessment is rarely required. Nevertheless, the techniques developed over the years for the production of EIA reports may be useful if planning is centered on making decisions on the type or scale of specific types of infrastructure. An example that comes to mind is the choice between future airport sites at (say) three levels of capacity. The planner will know that it is pointless attempting to collect and analyze sufficient data for each site to produce a formal EIA report for each. Nevertheless, the data that is required for the comparison between airport sites may usefully be gathered and examined in such a way that it will inform the scoping stage of a later EIA when one site has been selected.

- **Implementation**

The results of the economic, financial and environmental evaluations may tend to pull the plan in different directions. The economic and financial evaluations may well have prompted plan modifications to cut costs or reduce construction time. On the other hand, the environmental assessment may have indicated that more money may have to be spent in some areas to reduce the impacts to tolerable levels. For example, high costs may encourage the planners to move a freeway onto an above ground route rather than a tunnel, but potential pollution problems at tunnel portals may indicate an expensive off-line vent stack is needed. The money/environmental conflict are inevitable, and it is likely that, within the constraints of the social and environmental factors, the resulting plan will have to be modified to produce a more economical solution. Luckily, the plan testing phase should have ensured that the modifications to the preferred plan resulting from the economic, financial and environmental evaluations will be of a detailed nature.

- **Planning and appraisal of major Infrastructure projects**

Project appraisal means the assessment of a project. Project appraisal is made for both proposed and executed projects. In case of former project appraisal is called ex-ante analysis and in case of latter 'post-ante analysis'. Here, project appraisal is related to a proposed project

Project appraisal is a cost and benefits analysis of different aspects of proposed project with an objective to adjudge its viability. A project involves employment of scarce resources. An entrepreneur needs to appraise various alternative projects before allocating the scarce resources for the best project. Thus project appraisal helps select the best project among available alternative projects. For appraising projects its economic, financial, technical market, managerial and social aspect is analyzed. Financial institutions carry out project appraisal to assess its creditworthiness before extending finance to a project.

Method of Project Appraisal:- appraisal of a proposed project includes the following analyses:

- Economic analysis
- Financial analysis
- Market analysis

- Technical analysis
- Managerial competence
- Ecological analysis
- **Economic Analysis :**
Under economic analysis the aspects highlighted include
 - Requirements for raw material
 - Level of capacity utilization
 - Anticipated sales
 - Anticipated expenses
 - Proposed profits
 - Estimated demand

It is said that a business should have always a volume of profit clearly in view which will govern other economic variable like sales, purchase, expenses and alike.

- **Financial Analysis**

Finance is one of the most important prerequisites to establish an enterprise. It is finance only that facilitates an entrepreneur to bring together the labour, machines and raw materials to combine them to produce goods. In order to adjudge the financial viability of the project, the following aspects need to be carefully analyzed:

- Cost of capital
- Means of finance
- Estimates of sales and production
- Cost of production
- Working capital requirement and its financing
- Estimates of working results
- Break-even point
- Projected cash flow
- Projected balance sheet.

The activity level of an enterprise expressed as capacity utilization needs to well spelled out. However the enterprise sometimes fails to achieve the targeted level of capacity due to various business vicissitudes like unforeseen shortage of raw material, unexpected disruption in power supply, instability to penetrate the market mechanism etc.

- **Market Analysis**

Before the production actually starts, the entrepreneur needs to anticipate the possible market for the product. He has to anticipate who will be the possible customer for his product and where his product will be sold. This is because production has no value for the producer unless it is sold. In fact, the potential of the market constitutes the determinant of possible reward from entrepreneurial career.

Thus knowing the anticipate market for the product to be produced become an important element in business plan. The commonly used methods to estimate the demand for a product are as follows:

1. Opinion polling method

In this method, the opinion of the ultimate users, this may be attempted with the help of either a complete survey of all customers or by selecting a few consuming units out of the relevant population.

2. Life Cycle Segmentation Analysis

It is well established that like a man, every product has its own life span. In practice, a product sells slowly in the beginning. Barked by sales promotion strategies over period its sales pick up. In the due course of time the peak sale is reached. After that point the sales begins to decline. After sometime, the product loses its demand and dies. This is natural death of a product. Thus, every product passes through its life cycle. The product life cycle has been divided into the following five stages: Introduction, Growth, Maturity, Saturation and Decline.

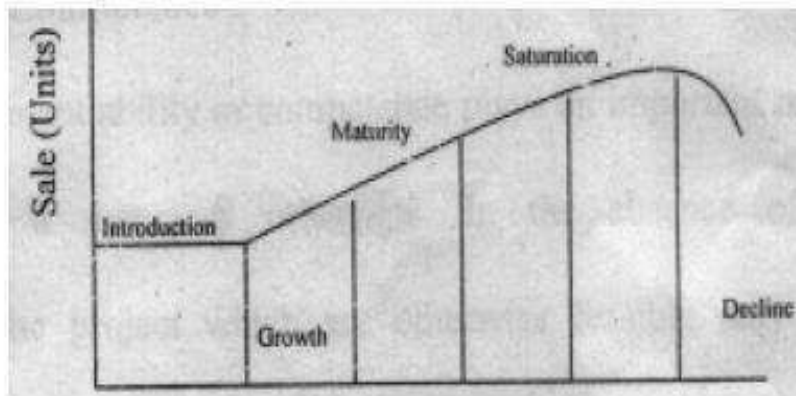


Fig: Product Life Cycle

• Technical Analysis

Technical analysis implies the adequacy of the proposed plant and equipment to prescribed norms. It should be ensured whether the required know how is available with the entrepreneur. The following inputs concerned in the project should also be taken into consideration.

- Availability of Land and site
- Availability of Water Power, transport, communication facilities.
- Availability of servicing facilities like machine shop, electric repair shop etc.
- Coping with anti pollution law
- Availability of work force
- Availability of required raw material as per quantity and quality.

• Management Competence

Management ability or competence plays an important role in making an enterprise a success. In the absence of Managerial Competence the project which is otherwise feasible may fail. On the contrary, even a poor project may become a successful one with good managerial ability. Hence, while doing project appraisal, the managerial competence or talent of the promoter should be taken into consideration.

• Ecological Analysis

In recent years, environmental concerns have assumed great deal of significance. Ecological analysis should also be done particularly for major projects which have significant implication like power plant and irrigation schemes, and environmental pollution industries like bulk-drugs, chemical and leather processing. The key factors considered for ecological analysis are:

- Environmental damage
 - Restoration measure
- **Screening of project ideas**
 With the list of potential new product ideas, you now need to decide which ideas to pursue and which to discard. Consider your competition, your existing products, their shortcomings, and the needs of your market. Draw on the customer needs list you have developed, and the areas for product improvement you have identified. Develop a set of criteria to evaluate your ideas against include:
 - most prominently identified customer needs
 - product improvements most needed
 - the benefits to your target market
 - the technical feasibility of the idea
 - the level and scope of research and development required
 - The profitability of the idea. What is its potential appeal to the market? How would you price it? What are the costs in bringing it to market - overall and per unit?
 - Where the product fits in the market. Is there a gap? How close is it to competitor products?
 - the resources it will require in development
 - the marketing potential of the idea
 - The fit with your business profile and business objectives.
 - **Scheduling and management of planning activities**

Project time management includes two high-level groups of processes for planning and scheduling project activities and tasks necessary for timely completion of the project. Project activities planning and scheduling is the first process group of project time management. Developing the project implementation schedule is the second group. In this article we will review the planning and scheduling process group. We will talk about the key actions the project manager must take to undertake project activities planning and scheduling in an efficient manner.

Plan and schedule project activities and tasks the project manager needs to take the next four steps:

- Set up activities.
- Define relationships between activities.

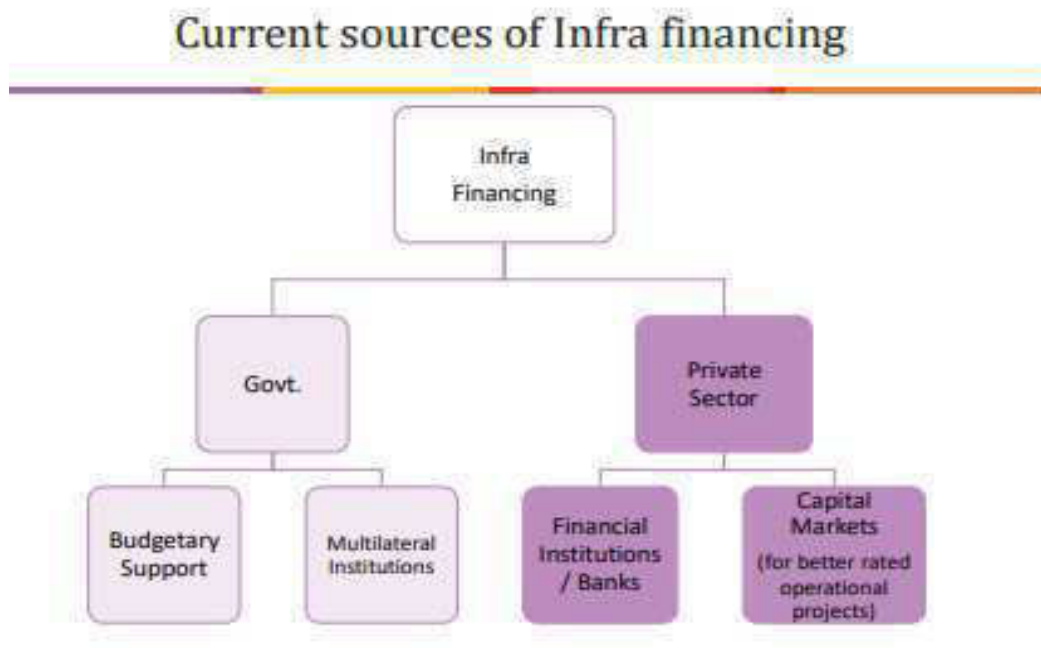
- Estimate resources required for performing activities.
- Estimate durations for activities.
- **Set up Activities**
 - The first step of project activities planning and scheduling requires the project manager to define what amount of actions and tasks are necessary for producing project deliverables in a timely manner. The input for this process will be the project deliverables statement. The project manager can use this document to define high-level activities that will be used later in creating the project implementation schedule. The project manager should also work on developing project activities templates that help simplify the process of project scheduling and planning.
 - In cooperation with experts and the project team, the manager should make project activities lists that will be the output of the process for project activities planning and scheduling. For each of the listed activities accurate milestones should be identified and approved. All the identified milestones should be gathered into a single milestones list.
- **Define Relationships**
 - The next step for planning project activities and tasks requires the project manager to make a sequence of all the activities identified at the previous step. The manager will use project activities lists, the milestones list and the product scope statement to define relationships among the activities. With help of project management software that person can set up priorities for each of the project activities and make task sequences organized and sorted by importance and urgency.
 - There is also a need to define dependencies between the activities. Dependencies can be internal and external. Activities with internal dependencies refer to any actions that the project team will take to produce the deliverables within the existing working environment. Activities with external dependencies refer to non-project factors that define success of project-related activities.
 - Both types of activity dependencies should be identified and added to sequenced and prioritized activity lists. Once the relationships are defined, the project manager should update project activities templates, outline the dependencies and link them to the product scope statement.
- **Estimate Resources**
 - At this step, the project manager needs to review stakeholder requirements and the product scope statement to estimate an amount of resources required for performing project activities and tasks. Also expert judgments and alternatives analysis should be used for this purpose.
 - The constraint of time needs to be considered when estimating activity resources. The project manager in cooperation with experts and the team should develop resource calendars and define types of required resources. Once all this information is collected and analyzed, it should be used to make a decomposition of activity

resources categorized by types, priorities and time. This decomposition is critical to creating the project implementation schedule.

- **Estimate Durations**

- The final step in project activity planning and scheduling requires the project manager to define and estimate an amount of working time required for accomplishing each identified activity. This is about setting up durations for project activities and tasks. Durations will depend on 1) the amount of work effort and 2) available of activity resources.
- The project manager should review the resource decomposition and project activities templates to estimate the number of work periods required for completing the identified activities and producing the deliverables. The output of this process is activity estimates that are linked to resource calendars. This information will be used later in developing the implementation schedule.

- **Infrastructure Project Budgeting and Funding**



There are broadly two major sources of financing for infrastructure projects: public finance and private finance. The governments both at the central and provincial levels have been the major source of funding for infrastructure projects in developing countries like India. Plans for investment to various infrastructure sectors are undertaken by the governments through formal planning exercise wherein allocation of budget is done. The budgetary allocation is influenced to a great extent on the emphasis by the government to accelerate or promote growth in certain sectors which are categorized as high priority in the plan period.

Participation of private sector has been sought in various infrastructure sectors. Governments have adopted innovative procurement route like public private partnerships for involvement of

private sector in the development of infrastructure projects. Private sector provides financing to infrastructure projects using a wide range of financial instruments. The chapter will discuss in details the funding of infrastructure using private finance.

- **PUBLIC FINANCE**

The budgetary resources from government to fund the infrastructure projects come from two major categories of the sources: tax collection and public sector borrowings. Borrowings from the market are in the form of either government stock or bonds. The other source of revenue for the government is in the form of tax collection and duties besides aids and donation, though this forms a small portion of public finance. Taxes are levied by governments on income, payroll, property, and goods and services. For instance, taxes and duties imposed by the government can be in the form of income tax, value added tax, vehicle excise duty, capital gains tax, custom duties and stamp duty. In addition to this, dedicated funds are also created by government for development of specific infrastructure sectors by imposing various types of duties. For example, a dedicated central road development fund has been created in India by charging a duty of INR 1 per liter of motor spirit and INR 1 per liter of high speed diesel oil. The proceeds from this fund are allocated for development of rural roads, development and maintenance of national highways and state highways.

Funding of the infrastructure projects is normally through the traditional route where the public finance is used to finance the activities of the projects over the entire lifecycle. Capital and operational expenditures of infrastructure projects are funded entirely with public finance. Public finance is also nowadays used to leverage private finance in case of infrastructure project funding. Governments used the public finance in the form of grants and provided as viability-gap funding to fund a limited portion of the funding required for infrastructure while the remaining portion comes in the form of private finance.

- **PRIVATE FINANCE**

Besides the major funding from the governments, private finance has also been used to fund infrastructure projects to a limited extent in both developed and developing countries. Governments provide public finance for development of infrastructure projects with the goal of meeting the social and economic objectives. On the other hand, private sector participates in infrastructure projects and provides private finance with the objective of furthering their business interests. Maximizing the return on their investment into infrastructure projects have been amongst the key business interests of private sector.

- **Infrastructure Projects – Cash Flow Profile**

Private sector looks primarily at the cash flow profile of the project in assessing the revenue earning potential of the project. The cash flow profile of the infrastructure projects exhibits the timing of the cash flows over the lifecycle of the project. The lifecycle of an infrastructure projects can be divided into three major phases of appraisal, construction and operation & maintenance. The typical cash flow profile of infrastructure projects has cash outflows during

the development and construction phases of the project followed by cash inflows during the operation phase (refer Figure 1). During the appraisal and construction phases of the project lifecycle, cash flow is negative in nature on account of the expenditures incurred towards the execution of appraisal-related studies such as feasibility study, engineering design, and construction of the infrastructure facilities. Commissioning of the completed infrastructure facilities marks the commencement of project operation phase. The provision of infrastructure services will generate revenues for the project along with the expenditures for operation and maintenance of the facilities. The cash flows in this phase is the net project revenues after deducting the operation and maintenance expenditures.

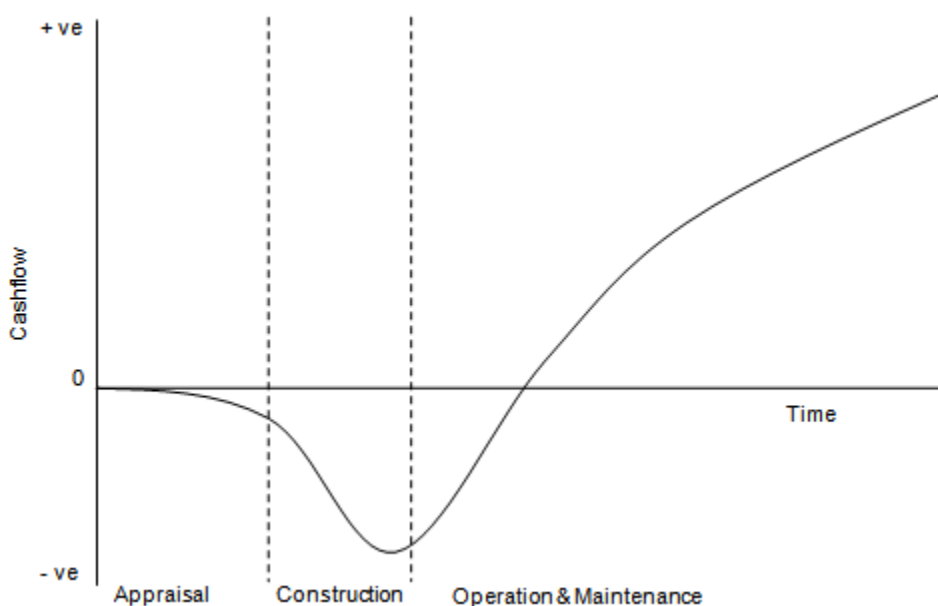


Fig: Typical cash flow profile of infrastructure project from private sector's perspective

The shape of the cash flow profile is influenced by the time taken in finalizing the various objectives and achieving the milestones of the projects as they affect the timing of the cash outflows related with the project. Issues such as time taken in obtaining the statutory approvals, design finalization, finalization of contracts, and finalization of financing arrangement will determine the duration of the appraisal phase. While, rate and amount of construction and operation speed will influence the duration of the other phases.

The amount of fund that can be raised to finance the infrastructure projects with private capital depends on the future cash flows of the projects. Proper packaging of the project cash flows in accordance with the needs of the project and taking into consideration of the perspectives of the private sector providing private finance is necessary to make the project attractive to them.

- **Financial Instruments for Funding Infrastructure Projects**

A thorough knowledge of the financial instruments and financial markets is required while packaging the project cash flows. Financial instruments are the tools for raising financing to fund

the infrastructure projects with private capital. The financial instruments also define the amount and the priority of claims on the future cash flows and assets of the infrastructure projects. Depending on the nature and seniority of claim on cash flows and assets, financial instruments can be classified into three major types: equity, debt, and subordinated debt. Equity gives ownership interest of the common stockholders in the project to the provider of equity capital and has the last claim on project cash flows and project assets. Debt instruments obligate the borrower to make a payment of specified amount at a particular time. The priority of claims on project cash flows and assets is senior to that of equity capital. Subordinated debt has an intermediate position between the debt and equity regarding the priority of claim on project assets and cash flows. Regarding the return, equity capital has a comparatively higher return than the debt. With respect to return, subordinated debt return is in between the returns of debt and equity.

There are various types of financial instruments, which are categorized as debt, used for funding infrastructure projects. Term loans, debentures, and export credit are some of the common financial instruments used to provide debt financing. Debt financing is the act of the firm raising capital by borrowing mostly from banks. Term loan, which is the most common form of debt financing to infrastructure projects, is provided mostly by banks and financial institutions (collectively known as lenders). Besides, charging interest, lenders also charge other fees such as management fee, commitment fee, underwriting fee, and success fee while extending term loans to infrastructure projects. The terms and conditions based on which the banks and financial institutions provide term loans to infrastructure projects include, inter alia, the interest rate, tenure of the loan, and repayment profile. The interest rate could be fixed for the entire tenure of the loan or linked to prime lending rates of the bank/index. The tenure of the loan could vary with the prevailing norms in the particular infrastructure sector. The repayment of the loan can be in the form of: (i) repayment of the loan amount in equal amount over the loan tenure; (ii) repayment of loan amount according to schedule of pre-determined proportion of loan amount over the loan tenure; (iii) repayment of entire amount at the end of the loan tenure. Debentures are loans which are divided into securities and sold through capital markets to investors. Debentures have a repayment undertaking on a specified date along with the periodic payments of interests between date of issue and date of maturity. Since debentures are traded in capital markets, it could be liquidated (sold off) easily resulting in high liquidity unlike the term loan. The security interest in case of debentures could be either fixed or floating. Security interest in the form of floating charge allows the investors to lay claim on the future assets of the infrastructure projects besides the charge on the assets existing at the time of securing the funding. As part of the strategy to promote exports, loans in the form of export credit are also provided by government agencies in exporting countries, exporter of equipment, or banks in exporting countries.

- **Sources of Funding**

Ordinary equity is one of the most common forms of private finance to infrastructure projects. This is one of the most common forms of financing available at the early stage of project lifecycle. Most of the project activities executed in the appraisal stage are financed typically with the equity capital. The return on the equity capital is paid in the form of dividends.

Dividends are paid from the retained earnings left after settling the project related expenditures relating to operation & maintenance and paying the debt claims. In worst-case scenario of project failure, nothing would be left for equity investors since priority of dividend payment to equity provider has lowest claim on project cash flows and assets, equity investors therefore demand greater return on equity.

Bonds are another type of financial instruments, which are treated as debt instruments, through which private finance is provided to infrastructure projects through the capital markets. Bonds are considered to be one of the most appropriate financial instruments for financing infrastructure projects as the maturity profile of bonds is in line with the tenure (duration) of the infrastructure projects. The par value, coupon, and maturity are the important characteristics of a bond. The par value is the amount the bondholder will receive on maturity of the bond and coupon is the interest rate at which the bondholders will receive the annual interest income. Different types of bonds are available in the capital market with different arrangements relating to the coupon and par value. The coupon rate in case of floating-rate bonds are linked to short-term interest rate. Such kind of bond helps in mitigating the effects of inflation fluctuations. In case of deep-discount bonds, bondholders are not being paid interest and bonds are being sold at a discount to par value. Income bond is a variant of the conventional bond where the coupon payments are made depending on the borrower's income. Income bonds are a cheaper form of financing from issuer's perspective and issuers are not at default even in the event of financial distress.

Privately financed infrastructure projects are funded using a debt instruments and equity capital in different proportion. The ratio of debt to equity (which is known as capital structure) primarily depends on the risk profile of the projects. Infrastructure projects with less exposure to project risks attempt to opt for a highly leveraged capital structure (high debt to equity ratio). While, in case of projects with high risk profile, lenders are reluctant to participate in the financing and as a result the major portion of the private financing is in the form of equity capital.