CHAPTER 3
PROJECT FEASIBILITY STUDY

A Feasibility study should arrive at definitive conclusions on all the basic aspects of a project after consideration of various alternatives. The conclusions and recommendations should be explained and supported by evidence. For convenience of presentation, the feasibility study should begin with a brief executive summary outlining the project data [assessed and assumed] and the conclusions and recommendations, and supporting material [statistics, results of market surveys, technical descriptions and equipment lists, plant layouts etc.] This should be presented in a separate annex to the study.

The feasibility covers the following aspects:

- Project background and history
- Market analysis and marketing concept
- Raw materials and supplies
- Location, site and environment
- Engineering and technology
- Organization and overhead costs
- Human resources
- Project implementation schedule
- Financial analysis and investment appraisal
- Conclusions and recommendations

1. MARKET ASSESSMENT

1.1 Market Analysis

For all investment projects, including those with the primary objective of resource utilization, market analysis is the key activity for determining the scope of an investment, the possible production programs, the technology required and often also the choice of a location. Market analysts have a clear understanding of the quantity and quality of the products and by-products involved and of possible alternatives with regard to economic size, as determined by the input requirements, as well as by technological and locational constraints.

The demand or market analysis must be carefully structured and planned in order to obtain the required information within the time and cost limits, and

to determine the possible marketing and production strategies required to reach the basic or corporate objectives. Planning of marketing research requires an understanding of the marketing system, the determination of the objectives and scope of research, and proper structuring of the market to be analyzed.

In general, the first step in the market analysis is the preparation of a detailed estimate of the actual market volume (for example, current sales in a certain market or market segment) and the market potential or maximum possible demand of the total market. The second step is to project the development of the future market volume on the projection of marketing data. This is the basis for the question of the actual or envisaged market share of the enterprise. The targeted market share provides the basis for the projection of sales quantities, and therefore for the production program, plant capacity and derived requirements for materials and inputs, labor, investment etc.

Export markets

The possibility of extending the market to other countries should be explored for most projects of any size, as export sales have to be taken into consideration in determining plant capacity.

International competition is furthered especially through economies of scale, for example, in production or marketing, through comparative locational advantages, the development of international cooperation, access to technologies etc. On the other hand, international marketing may be hampered by high shipping and warehouse costs, sensitivity to terms of delivery, different national product requirements and trade barriers. Such as import restrictions, foreign exchange control and stringent industrial standards.

Fore products that developing countries are contemplating, or have just started, manufacturing and these would be the majority of goods and services from developing countries the starting-point should be an analysis of past imports in to the home country, the unit cost of such imports, the exporting countries and the characteristics of the imported product. Such information is necessary, even from the view point of domestic production, to test the competitiveness of product.

First, the price and quality of the product in the international market should be determined, **secondly,** the geographical divisions of possible exports should be defined in the context of a particular product. The export market

survey can start with certain principal markets to be penetrated initially and gradually extended to other countries as plant capacity is expanded to meet increased market demand.

The possibility of extending the market to other countries should be explored for most projects. Export surveys could range from projections of past imports in an external market with general projections for the future to a detailed demand forecast in any particular external market using the forecasting techniques.

Analysis of the channels of distribution

Sales or distribution channels are the chain connecting producers and end-users. This mediation function is usually performed by specialized enterprises, agencies or representatives, using their own marketing instruments. In addition, these channels are also lines of information between manufacturers and consumers. Either separately or in combination, the three main routes to the end-customer are as follows: through wholesalers to retailers; through retailers only; directly to consumers. The choice of distribution channels should be based on the results of the market research.

Distribution through wholesalers

This channel performs a particularly valuable function where many different articles are involved, and when distribution must be made too many small retail outlets. The advantages of this distribution channel are as follows:

- The wholesaler often accepts large commodity consignments to hold in stock or inventory;
- The wholesaler reaches a majority of the small shopkeepers;
- The transport problems of the manufacturer, invoicing and credit control are comparatively simple;
- Relatively few salespersons are needed by the manufacturer

Distribution through retailers

Distribution may be unrestrictive or selective, the former being feasible for some branded articles such as cigarettes, which are bought by a very wide variety of consumers at frequent intervals, and for certain unbranded items which are similarly purchased. Selective distribution is suitable for products of high quality, branded and advertised nationally or regionally, and which may require skilled installation with after-sales service; some consumer durables are likely to be distributed thus.

Distribution directly to consumers

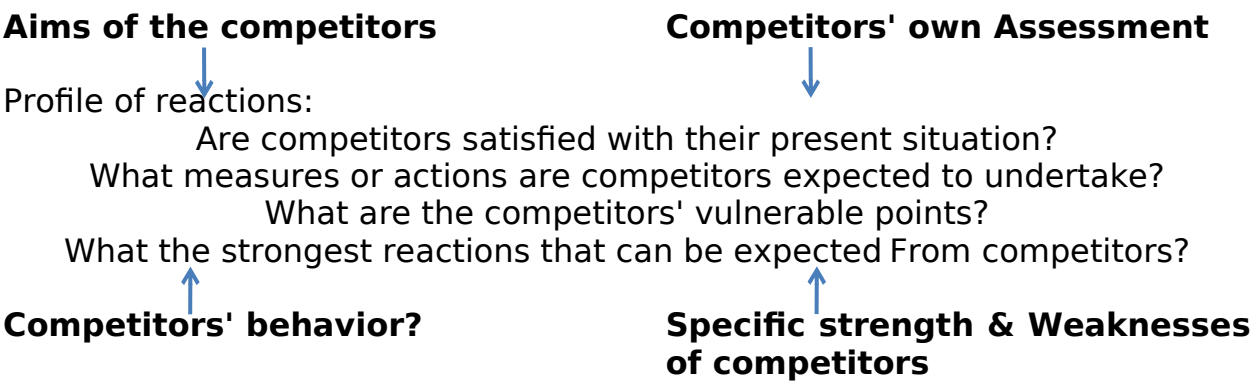
Direct sale is the usual channel for industrial products and capital goods, for which it is ordinarily most cost-effective, although the appointment of distributors can be necessary in certain industries.

Analysis of the competitors

Assessing the project situation must also take in to account the intentions of competitors. In analyzing the competitors, it is essential to focus on important individual competitors or on groups displaying similar behavior. In a second step the analysis will have to be further elaborated, giving special attention to the following questions.

- How do the competitors use their marketing tools?
- Which target groups (segments) do they work on and how extensively?
- In which segments have the special strengths and what are their weaknesses?

Figure XIV. Assessing the profile of possible reactions of competitors



Analysis of the socio-economic environment

The market research should include an analysis of the industrial sub sector concerned, as well as an assessment and analysis of the relevant economic and social environment of the project. The sub sector analysis should provide an answer to the following main question:

What are the key success factors in a competitive environment, and what significant opportunities and risks are sector-specific? The analysis should in principle concentrate on the life cycle of the sub sector, its profitability and the wider socio-economic environment of which the industrial sub sector is a part.

A sub sector comprises a group of enterprises manufacturing products that could almost replace each other. It should be noted that because of technological innovations, for example, an industry in the maturity phase may become a sub sector in the growing phase again.

Analysis of the wider socio-economic environment

The objective of the analysis of the wider socio-economic environment is to determine social and socio-economic aspects relevant to the preparation and evaluation of the project strategy and marketing concept. Such aspects may reflect the society and its culture, social and economic policies, and related regulations, customs and habits. They are relevant to the extent that they have an impact on project opportunities and risks.

Marketing research

It mainly deals in the analysis of demand [end-use trading] and competition, consumer behavior and consumer needs, competitive products and marketing instruments and the impact of social, ecological and economic factors. The research work proceeds step by step, in line with the planning process, as reflected in the following figure. Any errors made in the research phase would result in wrong marketing concepts, and may place the whole project in jeopardy.



Figure. Marketing research and preparation of a marketing concept

Objectives and Scope of research:

There are three principal requirements of demand and market analysis.

1. Market-project relations should be made transparent
2. Strategic constraints and problems should be identified
3. Strategic options for the project should be outlined.

Sources of Data for research

There are basically two options:

Desk Research: - The overall quantitative estimates are based entirely upon the results of desk research. It is the assessment of existing information contained, for example, in statistics and reports that were originally collected or prepared for other purposes.

Field survey- refers to the assessment of information directly by interviews, tests and observation. Here the more detailed quantitative findings and those of qualitative nature emerge from this. No field survey should be undertaken before the full potential of desk research has been exhausted.

Most marketing studies include data on the following:

1. General economic indicators relating to product demand like population level, growth rate, per capita income and consumption, GDP per capita and growth rate- income distribution.
2. Government policies-production-consumption-imports-exports-restrictions-duties-taxes-incentives-credit controls-forex regulations
3. Present level of domestic production-value-volume-intended production for internal consumption.
4. Present imports, value and volume
5. Imports of substitutes and near substitutes
6. Critical inputs and complementary products
7. Production targets in national economic plans, substitutes and complementary products.
8. Present levels of exports and
9. Consumer habits, responses and trade practices.

The period to be covered by a demand and market studies varies. In one case, data over 10 years may be adequate because of abnormal fluctuations during the period. In another case data may be coverable for three or four consecutive years. One year should not be used as a basis for projections.

Steps in marketing research

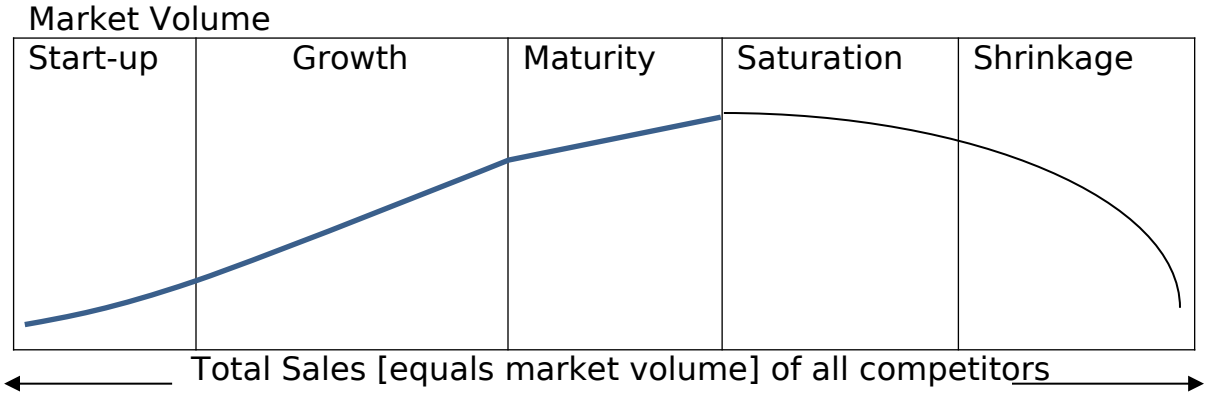
The first step of demand and market analysis is to determine the target market of the project and to describe and analyze the structure of this market. It is important to assess and describe significant relations between the elements of marketing system, which is the structure of the industry [suppliers, types of enterprises, organization of the industry or branch], consumer profiles, patterns of employment and competition and structure of distribution.

1. Determine the target market –structure of the industry, customer profiles and competition.
2. Customer analysis-needs and behavior, what-why-when-how much and where to buy.
3. Market segmentation-based on geographical, rural, urban, linguistic, socio, demographic, age sex, income education, psychological, purpose, status etc.
4. Market analysis-actual market volumes, future market volume and market share of the enterprise.
5. Export market analysis-plant capacity, economics of scale, price and quality
6. Analysis of the channels of distribution-relative measures and demerits.
7. Analysis of competitors- their aims and their SWOT.
8. Analysis of the socio-economic, environment and life cycle of a sub-sector [group of enterprises producing same or similar product] in the context of world economy or economy of a country.

   Life cycle of a sub-sector: A sub-sector comprises a group of enterprises manufacturing products that could almost replace each other.

   The following are the examples of sub-sectors in different phases: solar energy [start-up]; electronics components [growth]; cars and food [maturity or saturation]; and shipbuilding [shrinkage]. Identifying the phase of the life cycle is important because it also implies conclusions regarding the present and future development of the market potential, the market volume and the market share. To be successful, different strategies will have to be applied for each individual phase of the life cycle.

The Life cycle of a sub-sector



9. Internal analysis –in cases of existing companies planning for expansion, modernization-all areas like production, finance personnel management to cover and SWOT analysis.
10. Projecting marketing data to cover quantitative and qualitative data about supply and demand in the market, market share and competitive situation. Some of the techniques used for demand forecasting are: a]. the trend method, b]. the consumption level method, c]. the leading indicators method and d]. Regression method.

Project strategy

A project strategy is a set of objectives and principles defined for a project with a view to determining the allocation of resources over a period of time. The project strategy is central to both the preparation and the evaluation of an investment project, and to the design of a proper marketing concept. It also has a determining impact on the choice of location, technical plant parameters [capacity, technology etc.] and resource requirements. One of the tasks of marketing research will be to examine a preliminary project strategy from the marketing point of view, and to identify alternative strategies.

Determination of the marketing strategy

In the feasibility study alternative marketing strategies should be assessed because it will have an impact on the project parameters [scope, type of project, technology and location etc.] and must be related to the project strategy.

a) **Competition strategy:** This strategy aims at gaining market shares from competitors. The firm with a greatest market share in general changes to a competitive strategy later than the smaller ones. The following competitive strategies can be distinguished- aggressive price strategy-dumping prices; imitation strategy-competitors marketing efforts; profile strategy--focusing on quality performance and brand name.
b) **Market expansion strategy:** This strategy geared to the creation of new markets or to demand intensification [more consumption]. The following aspects are necessary for this strategy—the current phase of subsector life cycle; the possibilities of influencing market; structure of production costs vis-à-vis the competitors; sale price and building up of a special image.

Marketing Concept

The marketing concept comprises the marketing strategy and the operative measures required to implement the project strategy and reach the project or corporate objectives. The marketing strategy to be considered involves the following dimensions: identification of target groups and of the products likely to win their favor; and determination of competition policies, that is whether allow price strategy or differentiation strategy should be pursued to defeat competition

DEMAND FORECASTING TECHNIQUES

A. Employment of demand forecasting techniques

The utmost caution should be exercised in the use of demand forecasting techniques, in order to avoid misleading results.

Important points:

- Characteristics should be precisely defined. For example distinction between different gases [oxygen, carbon dioxide] must be made in the analysis.
- A fairly large number of observations should be taken while finding averages, norms, standards, trends and co-efficient as a measure of statistical tests of significance. [4 year period is not a valid for long-term forecast].
- Data and coefficients associated with one market cannot be applied to others. For example, income elasticity of demand for low income groups is not the same for high-income groups

- Assumptions made in the analysis, the formulation of coefficients and correlations must be distinctly expressed without reservation.
- The selection of statistical techniques for analysis should be appropriate to the nature of product, market, and data patterns.
- Reference data should be used with the necessary adjustment.
- Weighted averages should be preferable

Consideration of competition from domestic and foreign suppliers

Forecasting of demand and projections of supply of a product are a matter of judgment, since they depend on the availability of a product through increased domestic production or imports. In countries where a system of industrial licensing or governmental approval operates, it is possible to project estimates of manufacturing capacity to a reasonable degree. In other cases, an independent assessment of domestic manufacture of a particular product has to be made. Imports of products are influenced by government policies.

Projection of exports

The possibility of extending the market to other countries may be possible through expansion of plant capacity. Though a project may be conceived primarily as an import-substitution measure but it may have export capability either immediately on commencement of production or within a reasonable period during which productive skills can be developed.

In case of evaluation of export markets, particularly for the products currently exported, starting point is the collection and evaluation of data relating to the quantities exported, units, unit prices for exports, the importing country and the product quality, brand name and use of a particular selling agency. A further survey then has to be undertaken of the size of the market in importing countries and other countries that are similar in terms of development, import policies, shipping costs etc.

In the case of products that developing countries are contemplating or just started manufacturing, the starting point should be analysis of past imports into the home country, the unit cost of such imports, the exporting countries and the imported product features. Secondly, the geographical divisions of possible export markets should be defined. If proposed product is considered to be internationally competitive in terms of quality and technological input, the global market should be tackled step by step.

For some products, economies of scale may prove a determining factor in defining export markets. A plant intended to start production of 50,000 cars cannot expect to compete in external markets with other manufacturers of who produce 300,000 cars. However, the possibility of exporting trucks is much greater, as economies of scale may allow operation at a much lower level of production.

In the case of intermediate products, their export could be determined by transport costs, and comparable quality. For capital goods, export markets have to be gauged in terms of the possible acceptability of particular products by principal users and the stress is on quality, prices and availability of spares and after-sales services.

After outlining the geographical divisions of possible export markets, a market survey may need to be undertaken in selected countries. Export surveys could range from projections of past imports in an external market and a demand forecast fore future.

Information on imports and its sources into developed countries can be obtained with less difficulty. Most developed countries have agencies to collect economic data on possible export markets. In the case of developing countries, visits to selected countries may be necessary for collecting information.

Total demand

Total demand, present and projected, should therefore cover both domestic and export markets and relate to the phasing of market penetration for a particular product. The demand study should include in terms of pricing, quality, technology and consumer preferences for particular brands. An effective demand survey can determine the plant capacity and market strategy to be followed.

Market penetration

An essential feature of demand projections is an estimate of the market penetration for a particular product and would be related to the degree of competitiveness, either domestic or foreign; consumer response; and the amount of substitution that would be possible. The conditions of market penetration such as product quality, packaging, marketing and distribution arrangements and after-sales services for machinery and other products must be defined to achieve a sales and income target. Where a particular product is to be manufactured in a country for the first time and a system of

licensing and import controls is operating, consumer reaction and possibility of product substitution would be determinant factors.

Techniques

Trend (extrapolation) method

The trend method, a quite common technique is based on the extrapolation of past data, and involves the determination of a trend and the identification of its parameters. Two of the alternative trend curves for forecasting are indicated below.

Arithmetic (linear) trend. The equation is:

$Y = a + bT$

Where Y is the variable being forecast and T is to be estimated.

Exponential (semi-log) trend. The equation is:

$Y = ae^{bT}$

or = inY = In a + bT

This trend assumes a constant growth rate ‘b’ within each period.

The first step in measuring a trend is to take a moving average of two to three years, in order to correct for major annual fluctuations. Where such a moving average results in a smooth curve, a growth pattern will be discernible. It is, however, possible that fluctuations will cover a period longer than a year (for example, the demand for power-generating equipment when attributable to an intensified program for expanding capacity). Correction should be made for such fluctuations. Figures for one year are sometimes missing, in which case statistical interpolation may be necessary.

Consumption-level method

The consumption-level method considers the level of consumption, using standard and defined coefficients, and can be usefully adopted for consumer products. Thus the demand for cars can be estimated by determining the ratio of cars per 1,000 inhabitants, or the coefficients of car ownership among identified income levels, industrial units and Government. Once the total requirements are known, the actual car population is subtracted from the total to arrive at the new demand. Replacement requirements can be added to this forecast.

A major determinate of consumption level is consumer income, influencing, inter-alia, the household budget allocations which consumers are willing to make for a given product. With few exceptions, product consumption levels demonstrate high degrees of correlation differ between products. An

example of products being negatively correlated with income levels is the consumption of such items as cheaper varieties of cloth and paper by the poor.

End-use or consumption coefficient method

The end-use or consumption coefficient method is particularly suitable for assessing intermediate products. It involves the following.

- All possible uses of a product are identified; including, for example, input to other industries, direct consumption demand, imports and exports;
- The input-output coefficient of the product and the industries using the product are obtained or estimated. It is then possible to derive the demand for a product, that is, for consumption plus its exports and net of imports, from the projected output levels of the consuming industries.

In order to forecast the demand for methanol, for instance, industries using methanol would initially be identified. These would include the formaldehyde. Fertilizer and pharmaceutical industries. The planned manufacturing programs of these three industries would define the future requirements of methanol, after allowing for demand from other users (who would be grouped together).

A similar approach could be adopted for some items of machinery, such as compressors or industrial turbines. The technique can also be used for consumer products and for mixed types of product. For example, the demand for cement can be assessed by estimating the requirements of cement for various construction activities, such as private and public housing, dams, public works and other types of construction.

The end-use method utilizes consumption coefficients, and is therefore also called the consumption coefficient method. When identified, the coefficient appropriate for a consumption goal is multiplied by the size of the activity to arrive at the forecast consumption level.

Regression models

In the regression technique, forecasts are made on the basis of relationship estimated between the forecast (dependent) variable and the explanatory (or independent) variables. Different combinations of independent variables can be tested with data, until an accurate forecasting equation is derived. Unfortunately, projection of the independent variables is difficult.

Leading indicator method

The leading indicator method is a variant of the consumption-coefficient and regression methods. Leading indicators are variables that react to change before, and which can be used to predict, other variables. Thus the demand for electric fans might be found to lag, for instance, two years behind the housing investment of various agencies. To use these indicators for forecasting purposes, at first the appropriate leading indicators would have to be identified, and then the relationship between them and the variable being forecast is determined.

Production Program and Plant Capacity

Production Program

After having determined the required sales program, a feasibility study should define the detailed production program. A production program should indicate the levels of output to be achieved during specified periods, which should be related to specific sales forecasts. Within the overall plant capacity, there can be various levels of production activity during different stages. Full production may not be practicable for most projects during the initial production operations. Owing to various technological, production and commercial difficulties, most projects experience initial problems, which lead to gradual growth of sales and market penetration. Even if full production were to be achieved in the first year, marketing and sales might prove a bottleneck.

Determination of production program

Depending on the nature of the industry and local factor situations, production and sales target of 40-50 percent of overall capacity for the first year should be reasonable. It is only towards the third or fourth year that full production levels can be achieved and operating ratios effectively determined and adequately planned for. Growth of skills in operations can also be a limiting factor in a number of industries, particularly the engineering goods industry, and production has to be tailored to the development of such skills and productivity. Full capacity may be achieved in such cases only after some years.

The determination of a production program during the initial production years vary considerably from project to project. This can be illustrated by type of industries like Cement [single product], oil refinery [multiple product], engineering workshop [batch-order job production], and motor cars [assembly and mass manufacture]. In the first case, the growth of sales may

not be a problem but production problems may be critical. In the second case, both production and sales problems may arise. In the third case, a production aspect present's difficulties, obtaining a satisfactory order book would be critical. In fourth case, the sales aspects in relation to price would be dominant.

Input requirements: Once a production program defines the levels of output in terms of end-products, intermediate products, the specific requirements of material and labor should be quantified in each stage. For this purpose, a material- flow diagram should be prepared, showing the materials and utilities balances at various stages of production. The input requirements and costs have to be assessed for basic materials, semi-processed and bought-out items; major factory supplies [auxiliary materials and utilities]; other factory supplies; and direct labor requirements.

Detailed estimates in this regard should be prepared for the stages of initial as well as full production. It is also necessary to provide for wastage, damage or rejection elements in preparing the material consumption estimates and for reserve labor needs. Sales program should serve as planning base for determining the production program and scheduling the cash flow table. For this purpose, the different envisaged capacity utilization rates should be inserted.

Technology: An important factor in determining the production program and plant capacity is the technology and know-how to be utilized in the project. Specific processes are often related to certain levels of production or become technically and economically feasible only at such levels. This is particularly applicable to the chemical industry, where certain processes can be utilized far more effectively at specific levels of production, but the principle can be extended to other industries.

2. RAW MATERIALS AND SUPPLIES

Different materials and other inputs required for the operation of the project should be identified and their availability. Supply and method of estimating operating costs should be analyzed.

a) Raw Materials: Classification

1. **Agricultural Products:** If the basic raw material is agricultural products, its quality, present and potential quantities should be identified. In food processing industry. Only the marketable surpluses of agricultural products should be viewed as basic raw

materials, after meeting the consumption and sowing requirements. If the project requires large quantities, the production of agricultural products should be increased by extending area of cultivation (sugar cane) or adding one more crop

To estimate availability, the data on the past crop to be collected and also to study their distribution by market segment. Storage and transpiration costs to be considered. Future cultivation studies should be based under varied conditions and the quality and suitability to be tested.

2. **Livestock and forest products:** specific surveys are conducted for viability of an industrial project to have a more dependable and precise database.
3. **Marine products:** To assess the potentials of availability, yield and cost of collection need to be considered. Other considerations include ecological factors, national polices, bilateral and multilateral agreements, fishing quotas by quantity related licenses and danger of over fishing.
4. **Mineral products:** Information about metallic, non-metallic and clays and their exploitable deposits, proven reserves, viability of open cast or underground mining, location, size, depth, quality of deposits, impurities etc. should be gathered. Deposits from different locations may differ in chemical properties. Analysis and test results of ores and minerals should be indicated in project reports.
5. **Processed industrial materials and components:** To define requirement of base metals. Semi processed material parts and components and specifications to be detailed. Their availability and prices may be unstable in international market. Substitutes and FOREX constraints should be enquired into. Careful analysis should be conducted regarding sources of chemicals and petrochemicals. Both in the domestic and foreign markets. Their costs and backward linkages.
6. **Factory supplies:** These include auxiliary materials like chemicals, additives. Packing materials, paints, vanishes, maintenance materials, oils, grease, cleaning materials wear and tear parts and tools etc. An estimate of utilities include: Electricity: An analysis of energy situation, sources, cost, power demand, and load aspect. Stand by arrangements, consumption level and rejection of thermal power plants for environmental reasons are certain points to consider in the study.

7. **Fuels:** while using large combustion materials, environmental protection and technologies to be integrated in the planning. Usage of coal is resulting in worldwide carbon dioxide pollution and increased global temperatures.
8. **Water:** the requirement needs to be estimated considering recycling arrangements. For various purposes, where water is short in supply, closed circuit process may be helpful. The quality of water should be tested to avoid problems at a later stage.
9. **Packing materials:** To hold and protect the products at various stages of distribution and achieving the marketing objectives, appropriate containers, boxes, bottles and other materials should be defined.

Recycled waste:

Dumping of wastes is no longer possible. Proper technology usage and sophisticated recycling methods should be suggested.

Spare parts: To avoid break downs essential spare parts and tools should be identified and kept in stock. They may comprise large number of small items.

Social and external needs: If the project is proposed in remote location, all requirements for work force like food, health, educational, housing etc. should be provided. In addition Maintenance of roads, railways and water pipe lines may have to be looked after.

b) Specification of requirements

All requirements of materials and supplies should be identified and specified in the study considering all socio, economic, commercial, financial and technical factors. Project characteristics and envisaged technology determines the requirement of materials and supplies. Flow sheets for materials and other inputs indicating quantitative flows should be prepared. The quality of various inputs and their quantities are estimated based on the user demands and market expectations about the products of the project. The nominal and feasible plant capacity will have to be defined on the basis of varying supply conditions, number of shifts and products, skills of the labor force and marketing strategies. To identify the characteristics of materials and inputs, the analysis should cover physical properties, mechanical properties, chemical properties and electrical and magnetic properties.

c) Availability and supply

The sources of materials availability, their users and prices of inputs are to be analyzed. The interdependencies between project design, material and input requirements and supply of these items should be considered. The machinery, equipment, production process, capacity etc. may have to be revised if inputs with the specified characteristics and quantities are not available. Data regarding locations of availability, area of supply, whether concentrated or dispersed, transportability, transport costs and alternate usage of such materials need to be collected. If the material has to be imported, the implications of such imports should be assessed. There may be a lack of knowledge of alternative external sources of inputs. The implications of domestic production of materials that were being imported should be analyzed. If alternative materials are used, the discussion should also include an assessment of the environmental impact of each material.

d) Supply program

Making use of the marketing research information, suppliers to be identified and input quantities should be determined. The objectives of supply marketing are: 1). Cost minimization, which will have significant impact on profitability. The 80-20 rule should be followed .2). Reliability of supplies--Quality wise, quantity wise and timing. Late deliveries of lack of quality may have serious consequences for the production process. 3). to cultivate good business relations with suppliers for smooth and mutual trusting transactions. Purchasing prices and conditions largely depend on the bargaining power of the project and its management. The systematic observation and analysis of supply markets is of central importance. Purchases can be made directly by the enterprise or through agents/cooperatives depending on the market conditions.

A supply program should deal with the following:

1) Identification of sources and supplies, considering location, ownership, main activities, financial strength, production capacity, key customers and business experience.
2) Agreements and regulations that include letters of intent regarding supply contracts and obligations, period of validity, payment terms, currency conditions and guarantees, Import policies and regulations, Possible tax exemptions and duty free imports etc.
3) Quantities and qualities that can be supplied from various sources should be indicated.
4) Consignments.

5) Means of transport, for key materials and inputs, by air, water; road or rail and their reliability should be indicated in the study. Alternative means of transport could be used or project-owned facilities may be made for stand by purposes
6) Storage facilities along with loading and unloading should be analyzed indicating the capacities of ports and railway stations in handling the required materials.
7) Risk and uncertainties in the supply program should be assessed to make suitable modifications and to alert the user of the study to potential risks including failure of suppliers to meet their obligations, delayed consignments, supply shortages, quality defects, transport breakdowns, strikes, climate variations, changed government regulations regarding import polices and FOREX.

e) Costs of raw materials and supplies

The costs of materials and other supplies have to be analyzed in detail to determine project economies. In case of domestic materials. Current prices have to be viewed in the context of past trends and future projections of the elasticity of supply. The costs of alternative means of transport should also be considered. For imported material c.i.f prices to be adopted together with loading and unloading, port charges, tariffs, insurance and taxes, cost of international transport and other clearing costs.

Estimates of annual operating costs for materials and supplies are to be made explaining the price mechanism and key factors affecting prices including price controls by the government. Cost estimates are to be divided into foreign and local currency components at specified exchange rates. Some costs may vary with capacity utilization and production levels and others may be fixed. It is advisable to divide cost items into variable and fixed. Cost estimates may be expressed either as the cost per unit produces or in terms of a certain production level to conduct sensitivity analysis. The amounts resulting from environmental protection and pollution control measures should be included in indirect costs element in addition to overhead costs at the level of services, administration and sales centers.

3. LOCATION, SITE AND ENVIRONMENTAL ASSESSMENT

Location

A feasibility study should determine the location and site suitable for an industrial project. The choice of location should be made form a fairly wide geographical area, within which several alternative sites can be considered.

The traditional approach to industrial location focused on the proximity of raw materials and markets, mainly with a view to minimizing transport costs. The modern view requires consideration of commercial, technical and financial factors but also of the social and environmental impact of a project. Further, the public policies must also be considered in the location and site of industrial investment projects.

The main criteria or key requirements for selecting proper locations and sites should always be identified at an early stage.

Location analysis has to identify locations suitable for the industrial project under consideration. The project promoters may sometimes suggest a location at an early stage. However, the location in question should fulfill the key requirements identified as essential for a feasible and viable implementation and operation of a project. The impacts and requirements to be identified may be classified as follows:

- Natural environment, geographical conditions and project requirements
- Ecological impact of the project, environmental impact assessment
- Socio-economic policies, incentives and restrictions and government plans and policies.
- Infrastructural services, conditions and requirements, such as the existing industrial infrastructure, the economic and social infrastructure, the institutional framework, urbanization and literacy.

The strategic orientation of the choice of suitable locations requires an assessment of, inter alia, market and marketing aspects, the availability of critical project inputs such as raw materials and factory supplies, technical requirements, type of industry, technology and process, characteristics and products or outputs, size of the plant, organizational requirements and management structure.

The identification of key requirements helps to reduce the number of potential locations and sites at an early stage.

In a feasibility study, a good starting point for the final selection of a suitable location is the location of raw materials and factory supplies, or-if the project is market oriented- the location of the principal consumption centers. The best choice of location would be one where the costs of products sold [marketing and production costs] are a minimum. However other environmental [ecological and socio-economic] factors, including the climate and social welfare facilities, will also influence the selection of a feasible location and site.

Projects based on specific raw materials are for obvious reasons located at the source. Water, oil, coal, minerals, timber, agricultural products etc. will have to be exploited where the quantities, qualities and other conditions are adequate.

The simplest locational model is to calculate the transport, production and distribution costs at alternative locations determined principally by the availability of raw materials and principal markets. Projects based largely on imported materials may need to be located at ports or near terminals. On other hand, perishable products or agro-processing industries are market oriented, and it is advantageous to locate such production near the principal consumption centers. In case of petroleum products and petrochemicals for example, can be located at source, near consumption centers. Engineering goods including machine building, assembly and subassembly plants, and other locational factors exert considerable influence.

For projects that are not unduly resource oriented or market oriented, an optimum location cloud well combine reasonable proximity to raw materials, markets, labor, adequate power, reasonable taxes, transport, water supply and favorable environmental conditions.

Regarding financial feasibility on alternative locations, the following data and its related risks should be assessed:

- Production costs [including environmental protection costs]
- Marketing costs
- Investment costs [including environmental protection]
- Revenues
- Taxes, subsidies, grants and allowances
- Net cash flows.

The study should identify significant differences and analyze the underlying causes.

A location where the project can be expected to face problems in the future if certain condition change should be avoided, if better alternatives exists.

For the choice of location and site, referring some studies on industrialized countries is also an important factor. Most industrial projects have been located to places where the owners and key decision makers grew up, were educated and trained. Local partners obviously prefer a project to be located in an area where they have personal connections. Foreign partners tend to prefer areas where they have either previous experience of local conditions or resident representatives. Preferences may be based on strictly technical or financial considerations.

Site selection

The feasibility study should analyze and assess alternative sites on the basis of key aspects and specific requirements. Site alternatives should be defined in the feasibility study. This will requires an evaluation of the characteristics of each site. The structure of site analysis is basically the same as for location analysis, and the key requirements, identified for the project, may give guidance also for site selection. For sites available within the selected area, the following requirements and conditions are to be assessed:

- Ecological conditions on site [soil, site, hazards, climate etc.]
- Environmental impact [restrictions, standards, guidelines]
- Socio-economic conditions [restrictions, incentives requirements]
- Local infrastructure at site location [existing industrial, economic, and social infrastructures, availability of critical project inputs such a labor and factory supplies]
- Strategic aspects [future corporate strategies on supply and marketing policies]
- Cost of land
- Site preparation and development, requirements and costs.

The importance of these characteristics varies depending on the nature of the project, type of civil construction contemplated, heavy equipment items, effluents and the number of workers.

A project may depend on particular site conditions. Heavy machinery and foundation works, transports and technical installations may require specific ground conditions. A survey should be made of soil conditions, qualities and subsoil water level at alternative sites.

Topography, altitude and climate may be importance for a project, as well as access to water, electric power, roads and railways or water transport.

Recruitment of managerial staff and labor may be a critical factor for the viability of a project. Skilled labor and management staffs are often in scarce supply, and recruitment of labor with less skill and experience may jeopardize the whole project.

It may be necessary to develop a social infrastructure next to the envisaged site-housing, primary schools, medical, and social centers- to attract the required staff and labor force.

Plant location and site location can be undertaken simultaneously. Generally alternative sites are considered in conjunction with wider locational considerations so that much of the information required is collected simultaneously. It is useful and important to tabulate the locational conclusions to facilitate to incorporate into the next stage of project formulation.

It is often necessary to limit the choice of plant site and location in line with the provisions made by the project sponsors [public, institutional or private], which reduces the tasks of feasibility study.

4. ENVIRONMENTRAL IMPACT ASSESSMENT

Environmental impact assessment is designed to develop an understanding of the environmental consequences of a newly planned or existing project and of any project-related activities. The analysis will cover the impact of the project and its alternatives [in terms of size, technology etc.] on the surrounding area, including population, flora and fauna. These consequences and the beneficial or adverse effects of such human activities on the environment are assessed and evaluated from a technical, financial and socio-economic point of view, to the extent that they are significant for the project implementation decision.

In a comprehensive socio-economic evaluation of the feasibility of a project, environmental effects on the quality of life are considered along with other criteria. Some economically quantitative environmental impacts are also included along with other economic factors in the cost-benefit appraisal of the project.

Environmental effects are measured both qualitatively and quantitatively. Techniques have been developed for deriving monetized valuations of impacts that may or may not be directly linked to markets. These techniques can be used to assess the impact of environmental regulations and also for economic evaluation of environmental changes.

In countries, where the law requires it, the usual procedure is for the promoters of the project to prepare an extensive environmental impact statement that must be submitted to the authorities for examination and clearance. When the intention is to apply for international financing, many of the international development finance institutions require assessment of the environmental impact of industrial investment projects. The basic data for such assessment should include all the documentation currently available on the project, in particular test results and calculations from university institutes, regional and urban data collection units or networks, documents from central statistics institutes, United Nations bodies and other organizations.

In principle, environmental impacts should be assessed on the basis of legal regulations and emission standards and guidelines established in the country where the project is located. In countries where environmental protection standards are not yet defined, standards published by UNOs' such as the Food and Agriculture Organization of the UN, the United Nations Environ-program [UNEP], WHO and the World Meteorological Organization or other international, regional or national institutions may be used as reference for environmental impact assessment.

Some projects may have environmental conflicts. This might also lead to compensation claims, substantial costs for purification and equipment, and possibly a risk that the plant will have to be closed down. These aspects should be seriously considered in the feasibility study and ensure that development projects are environmentally sound.

The environmental impacts of project cycle: During the planning phase, for example, the environmental effects may be strictly social and economic. The impacts of the construction phase are one-time effects, while those of operational phase will be recurring.

The performance of an environmental impact assessment also involves the following steps: the definition of the problem; the technology description and forecast; the social description and forecast; and the identification, analysis and evaluation impacts. The environmental impact assessment of industrial

investment projects is then usually followed by policy analysis, fixing suitable investment strategy and corporate environment policy. Finally, if required, the environmental impact statement is prepared.

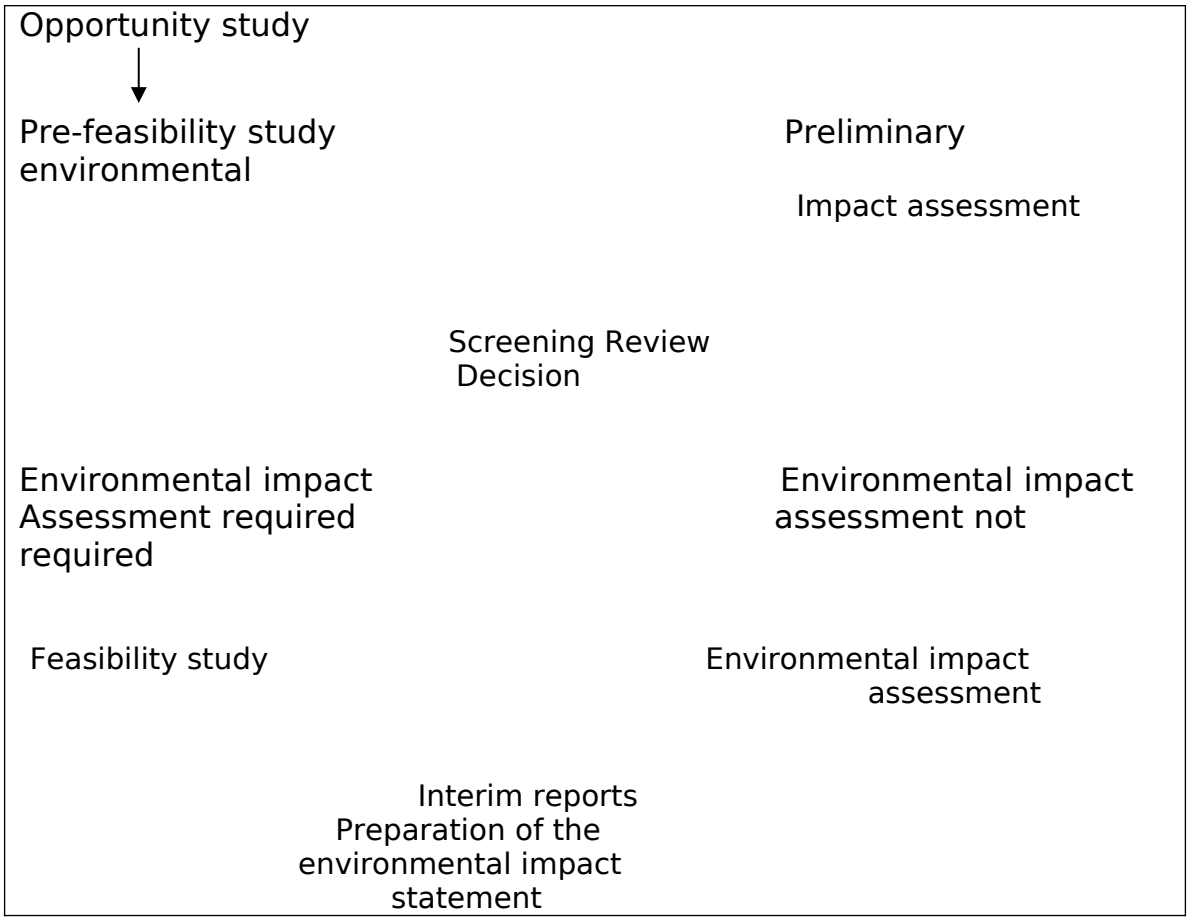
Sometimes only three phases of environmental impact analysis are distinguished. At first, a preliminary impact analysis is performed using a checklist. The second phase consists of identification and evaluation of environmental impacts resulting from the project. A site visit with all members of the assessment team is essential. The third phase consists of preparation of the environmental impact statement and this statement should specify if any mitigation measures required.

As a preliminary step, the impacts of production processes and factory operations are examined individually and jointly. Ancillary activities such as the handling of products, raw materials, factory supplies, transport utilization, waste control and safety and process failure controls are considered. Applicable regulations and limitations are determined and preliminary public reaction is sought to identify public concerns and local insights.

The primary purpose of the environmental impact statement is to ensure that the policies, goals and aspirations of the proponents, the government and the affected population are incorporated in the decision process. It should provide full and fair discussion of significant impacts and inform decision makers and the public of reasonable alternatives to avoid adverse impacts if any.

The assessment process: The figure XXV1 shows the environmental impact assessment and the techno-economic study and the study should be carried out concurrently and interactively. The preliminary environmental impact assessment is reviewed along with the pre-feasibility study, with comprehensive consideration of the technical, socio-economic and environmental features. If the project warrants no further environmental analysis and is technically and financially feasible, it can be recommended for approval to the environmental authority. If approved by the authority, the project can be implemented, provided it complies with all existing environmental regulations. If the authority recommends further assessment, the scope of the assessment should be established in consultation between the environmental authority and promoters of the project.

Figure . Phases of environmental impact assessment



Methodologies and tools: several methodologies and tools that are useful in the performance of environmental impact assessment have been developed. The methodologies will provide:

- Comprehensive identification of all relevant impacts
- Cause and effect relationships between project and environmental factors and impacts.
- Promotion of interdisciplinary approach to assessment
- The temporal distribution of impacts
- Criteria for assessment in both qualitative and quantitative terms
- Indication of environmental impacts producing primary, secondary, tertiary etc. impacts.

Interaction matrices: Matrices are arrays of data with a horizontal list of project activities across the top and a vertical listing of environmental parameters. A simple interaction matrix indicates linkages between project activities and environmental parameters. Quantified and graded matrices

provide a means of analyzing impact magnitude and importance. However, matrices are generally not alone sufficient for decision-making.

Overlays use a set of transparent sheets on each of which is indicated the degree of impact of the project on a particular environmental parameter.

Networks are used to analyze the cascade series of effects resulting from project activities. It displays factual information.

Various models are helpful in assessment. Simulation model provides a replica of the project and its environment. Optimization models seek the best solution in consideration of project and environmental constraints according to an objective function.

The following basic steps should be observed when performing environmental impact assessment:

* Identification of impacts

Define development objectives of the project and key constraints and identify options for achieving the same.

Identify key linkages of development with natural resources, ecological, social and socio0economic systems.

Determine the scope and requirements for environmental impact assessment [legal and other procedures.]

Assemble baseline data for natural and social systems

Analyze the proposed investment project to identify resource demands and outputs and their environmental impacts.

* Environmental impact forecast

Prepare a projection of the magnitude and severity of the probable future effects of the proposed investment project

* Evaluation

Assess the significance, distribution and performance of predicted effects on affected population, economic impacts and ecological consequences.

Establish real resource costs and benefits associated with the environmental impacts of the project into the overall economic evaluation.

* **Communications:** This includes determining the presentation of the results of environmental impact assessment and making description of the possible measures for reducing and controlling negative environmental impacts if any.

Cost-Benefit Analysis of Environmental Impacts

Environmental impact assessment and cost benefit analysis are in some respects parallel and over lapping activities. Several cost-benefit models have been constructed for use in developing countries and aimed to use in management of natural resources. These would include UNEP Test model and Viet Nam Environmental Research program.

Cost-benefit analysis is generally applied at the project level to consider all the economic benefits and costs resulting from the employment of national resources and from the production of good and services. Environmental externalities, which are quantified in economic terms, may be internalized by including the economic values in the cost benefit analysis. At the level of commercial analysis, the environmental consequences of a project represent neither direct costs nor the source of revenue.

The environmental consequences of the project may be in the form of environmental improvement or degradation. If the project is affected by the environmental factor and need regulation, then financial costs will accrue to the project for compliance measures.

The assessment of benefits and costs of the environmental impact require different approaches to valuation on the basis of principles of incremental analysis. Various scenarios and the consequences are outlined below.

Project	Regulation	Cost	Benefit
Exists	Under Consideration	Financial & economic Cost of compliance	Improvement of environmental Quality to regulation
Under Study	Exists	Financial cost of compliance to the Project	possible environmental improvement
	Economic cost of Compliance is		

	Sunk cost. Residual environmental Degradation.		
Under Study	Concurrently under consideration	Financial and economic cost of compliance	No economic benefit for maintaining envir-onmental status quo.
Under study	Unregulated	Environmental degradation	possible environmental improvement.

Assessment of environmental costs and benefits: The assessment refers to the value that may be placed by society on environmental improvement or degradation. These benefits and costs can be expressed monetarily in terms of willingness to pay for environmental improvement or willingness to accept as compensation for environmental degradation.

Direct monetary methods: The cost saving [or cost impact method estimates the changes in household expenditure and in production cost for other industrial activities affected by the environmental change.

The damage function method develops a dose-response function to assess physical changes in receptor organisms or materials and converts to monetary units by assessing the value of changes. For example if the environment affects a crop, the change in the economic value of the crop is a monetary measure. In Human-capital approach, the financial costs associated with the health impact-medical costs and the present value of lost earnings is determined.

Direct survey-based methods: This method determines the value that the affected population places on environmental changes. The people for an improvement will consider maximum amount and the data are statistically analyzed and aggregated across the households to arrive at a valuation of the environmental change.

Indirect market-based methods: The hedonic method attempts to impute values for environmental change by identifying their effect on the market price and price movement of economic resources.

The travel cost method would be applicable in cases where the environmental effect of the project alters transport patterns of the public to recreational or other sites.

Environmental Parameters: It is useful to classify environmental impact factors for assessment. Common systems classify as affected environment [atmosphere, land water, flora, fauna, social community etc.] and the nature or types of impact [physical, chemical economic, and aesthetic.]. These categories are to be assessed and evaluated in terms of changes in the quality of the human habitat.

TECHNOLOGY SELECTION

Technology is knowledge of using tools and machines to do tasks efficiently. Technology allows people to make more and better products. Technology has helped develop more advanced economies.

The selection of appropriate technology and know–how is a critical element in any feasibility study and should be based on a detailed consideration and evaluation of technological alternatives and to socio-economic and ecological conditions. Competitive production capability in the intended markets is one of the most crucial factors for technology choice, and the related plant capacity can be a major determinant of such capability.

Technology choice must be directly related to market, resource and environmental conditions and the corporate strategies recommended for a particular project. The industry, the form of foreign participation, national objectives and policies, industrial growth strategy, availability of local resources and skills, and several other factors can impinge directly on technology choice. It is also necessary to take into account new technological developments and applications and their impact on plant capacity. Consideration of environmental aspects in modern project engineering and technology assessment should include minimizing pollution, preservation of natural resources and saving of non-renewable resources.

The primary goals of technology assessment are to determine and evaluate the impacts of different technologies on the society and national economy [cost-benefit analysis, employment and income effects, satisfaction human needs etc.], impacts on environment.

To allow the careful assessment of the suitability of the technological alternatives required and available for the project under study, the following logical sequence of steps should be followed: problem definition, technology

description, technology forecast, impact identification, impact analysis, impact evaluation, policy analysis and communication of results. These steps should be applied by a process of iteration by repeating earlier steps until satisfactory results are obtained.

The technology required is defined not only by the marketing concept, availability of raw materials and factory supplies but also by various socio-economic, ecological, financial, commercial and technical conditions. The feasibility study should identify, describe and assess the critical elements of technology required.

The preparation of plant layout and design is essential for every project. The preliminary project plan and layout should be based on production activities and the technological alternatives envisaged. The second stage of project layout and design can only be drawn up when the details relating to technology, plant capacity and machinery specifications are finalized.

The setting up of data banks for industrial and technological information has therefore become imperative for the promotion of industrial development.

A technology forecast is essentially important for investment projects in highly innovative industries. Developments in new technologies, particularly micro-electronics, biotechnology and new materials and energy technologies are having a significant impact on products and processes in various industries and their implications need to be assessed, together with the corresponding skill applications and development and the absorptive capacity that these may require.

An issue of major significance in technology choice is the level of integration or local value added that can be with respect to a particular technological usage. The parameters of the appropriate level of integration should be indicated in the feasibility study, particularly for engineering –goods production, since capital equipment requirements and production planning may largely depend on the integration level sought.

Public policies with regard to the acquisition of foreign technologies, technology absorption and development have to be identified.

Alternative technologies should be evaluated in the feasibility study to determine the most suitable technology for the plant. The evaluation should be related to plant capacity and should commence with quantitative

assessment of output, production build-up and gestation period and a qualitative assessment of product quality and marketability.

The selection of technology has to be related to the principal inputs that may be available for a project and to an appropriate combination of actor resources for both the short and the long term. A technological process based on indigenous raw materials and inputs may be preferable to one for which the principal inputs have to imported indefinitely, particularly if serious foreign exchange regulations affect the inflow of such materials.

Selection of machinery, equipment and technology are interdependent. In cement, production and operational technology is part and parcel of the supply of equipment. In cases when technology has to be independently acquired, the selection of equipment should follow the determination of technology as the two are closely linked.

The degree of capital-intensity considered appropriate could define the technology parameters. In countries with a shortage of labor, capital-intensive techniques may be appropriate and economically justified. In countries with excess labor, labor saving techniques may prove unnecessarily expensive.

When new industries or industrial plants are introduced in developing countries, care must be taken to avoid “environmental dumping”, which means that polluting industries are transferred to countries where pollution restrictions are either non-existent or less stringent.

Full account should be taken of investment and operating costs when judging the appropriateness of more capital-intensive techniques. Both the preference for labor-or capital-intensive technologies and the choice of technology can only be judged on techno-economic grounds, and should be subject to a careful cost-benefit analysis in the feasibility study.

Together with the selection of technology, alternative sources of such technologies should be located. Consultancy organizations are usually a valuable source, particularly for specialized products and techniques. An experienced spinning master or a good foundry worker may be quite adequate for the transfer of know-how in a spinning mill or foundry. For an engineering-goods industry, petrochemical production, process technology another enterprise in the same industry may be required.

When technology has to be obtained from some other enterprise, the means of acquisition have to be determined. These can take the form of technology

licensing, outright purchase of technology or a joint venture involving participation in ownership by the technology supplier. The implications of these methods of acquisition should be analyzed.

The costs of selection and acquisition of technology and the related technical services should be estimated in the feasibility study. An assessment has to be made of the proper remuneration for technology and services. For this purpose, technology payment made in other cases may be referred. Various alternative payments can be considered such as lump sum, a running royalty rate or a combination of the two. For most technical services, the cost of comparable services can be obtained.

5. CIVIL WORKS

The feasibility study should provide plans and estimates for the civil works related to the project. This should covers site preparation and development, factory and other buildings, civil engineering works relating to utilities, transport, emissions and effluent discharge, internal roads, fencing and security, and other facilities and requirements of the plant.

Civil engineering works are fairly project-specific and have to be related to a particular plant site and the facilities that may be required. While plans and estimates for the principal buildings required for a specific type of plant follow a fairly uniform pattern, there may be major variations in estimates because of site conditions and for other civil engineering works because of local conditions.

The plans and estimates for civil engineering works should be detailed for cost estimates and implementation scheduling. The estimates for buildings and other constructions should be based on unit costs such as building costs per square meter in the plant surroundings. The final costs will depend on the bids and quotations that are received.

6. ORGANIZATION AND MANAGEMENT

Organization

Organization is the means by which the operational functions and activities of the enterprise are structured and assigned to organizational units. The Organizational units are functioned by managerial staff, supervisors and workforce, with the objective of coordinating and controlling the performance of the enterprise and the achievement of its business targets.

A division of the company into organizational units, in line with the marketing, supply, production and administrative functions is necessary for efficient management of operations and designing proper organizational structure in accordance with the corporate strategies and policies.

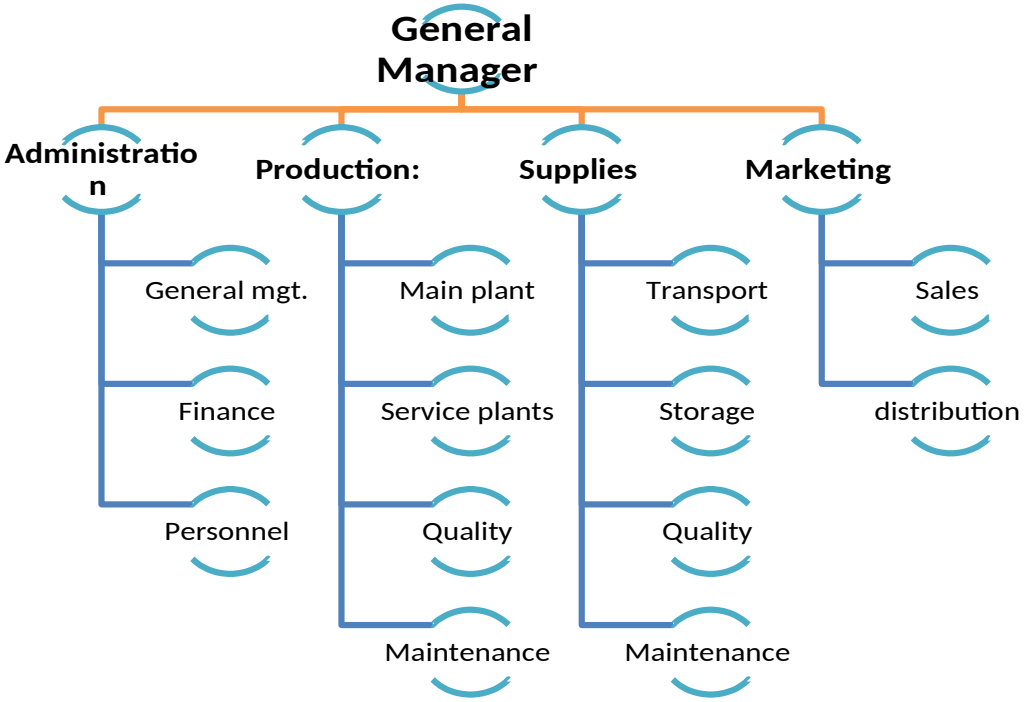
The recommended organization will depend on the social environment as well as techno-economic necessities. The organizational set up depends to a large extent on the size and type of industrial enterprise, strategies, policies and values of those in a position of power in the organization. Organizations develop along with the projects [pre-investment, investment and start-up and operation phases].

Organizational functions: The Organizational functions are the building blocks of the company. The figure XXV11 Shows that they may be grouped into the following organizational units in line with the specific requirements of the individual company:

- General management
- Finance, financial control and accounting
- Personnel administration
- Marketing, sales and distribution
- Supplies, transport, storage
- Production [main plant, service plants, quality assurance and maintenance and repair].

General Manager

Figure. Example of an organization chart for an industrial enterprise



The organizational design for both the construction and operating phase depends on internal and external project requirements and conditions and is prepare for the following reasons:

- To aim at the optimal coordination and control of the project inputs, which make it possible to implement the strategies economically;
- To structure the investment costs and to determine the costs [generally overhead costs] linked with the corresponding organizational units.

The design of the organization usually includes the following steps:

- Statement of goals and objectives of the business;
- Identification of necessary functions and its group;
- Design of organizational framework or structure;
- Analyzing of all key jobs, design and description;
- Preparation of recruitment and training program.

The organizational planner then will have to consider some of the fundamental aspects of optimal organization. These may include:

- Span of control [number of employees reporting to a supervisor]
- Number of organizational levels

- Subdivision of activities by function, process, equipment, location, product or class of customers
- Distribution of responsibilities and authority.

Once the project is approved, all information applicable to the organization will be collected in an organization manual, which may include:

- Overall description and identification of the strategic objectives and policies of the company
- A description of the various functional units, sections or divisions specifying the main tasks to be performed by the individual unit
- Job description of all key personnel
- Administrative procedures to be carried out both internally and externally, covering all functions and all levels of the company.

General Management

Depending on the type and size of an enterprise, the general manager is responsible for entrepreneurial functions; otherwise called management functions and this may not be delegated. In case of medium-size industrial plants, the general manger is also in charge of general administrative function such as personnel and finance. For administration of technical and technological aspects, the production manager could be in charge of the enterprise.

The feasibility study should determine the stuffing requirement of office of the general manger in order to allow estimates of personnel and other overhead costs. Cultural and social aspects should be considered in this regard.

Administration and finance: The [general] management requires financial and accounting information for the efficient and economic operation of the enterprise. As such an administrative unit or department for Accounting and finance [including costing] and has to be created.

For the purpose of cost planning and control, the project should be divided into various cost centers. Productions cost centers are those areas of activity where all major industrial operations are performed with in the context of manufacturing establishment. Service cost centers are those areas of activity that render the supplementary services necessary smooth running of the plant. Administrative and financial cost centers related to managerial planning, control and performance evaluation.

Personnel: The personnel unit deals with all subjects relate to human resources, such as recruitment and training of personnel and updating and developing skills and knowledge, health protection and safety measures. If the staff and workforce are relatively simple, in that case the personnel matters may be placed as a staff function or could be incorporated in the administrative department. A special personnel department would be required, if human resource management is considered as significant.

Production: The organization of production plant is designed in accordance with the production process and in line with the availability of human resources. Production department cause indirect costs, such as costs of plant management, general supplies and services [covered under overheads]

Quality assurance: The quality assurance department is responsible for the total quality of a product from its inception to its delivery to the end-user. The department may be part of production department or be subordinated to the purchasing department. If the company depends on imported raw materials, intermediate products or factory supplies, quality control and inspections on the premises of the suppliers may be necessary. Inputs required for the activities of a quality assurance department also vary in accordance with the responsibilities of the department; a fully integrated department will need almost all technical documentation form functional specifications to the final production and works specifications.

Maintenance: The maintenance function is often placed with the production department. The structure of the maintenance unit also depends on the maintenance policy of the company. In a highly industrialized environment where maintenance contractors can be easily found, the unit may only have to deal with preventive maintenance and emergency repairs. If a maintenance unit is wholly dependent on its own resources it will be responsible for both preventive and corrective maintenance of all plant equipment, auxiliary equipment and buildings.

Supplies: The supply system includes the provision of inputs of materials and services, shipping of the goods, storage and inventory control. Some companies may have a central purchasing department and stores attached to the production units. The purchasing department may be an independent or placed under the supervision of production unit.

In some large companies the entire supply system is entrusted to a purchasing or supplies department. It is the responsibility of the purchasing department to contribute to the overall profit generation of the company by

obtaining the best possible prices, while avoiding the storage of larger quantities of input materials than are required for safeguarding the production requirements.

Typical tasks of the purchasing department include:

- Selection and evaluation of suppliers
- Arranging for bids
- Ordering and dispatch
- Shipping and clearing, quality control of incoming goods
- Warehousing
- Invoice control and payment of suppliers.

Storage: stock control must aim at keeping stocks of materials and products low to avoid unnecessarily high net working capital requirements, while maintaining the minimum stock required for safe and interrupted operation. Often the control of the entire material and product flow, including storage, remains within the production department. In this case, the production program and stocks would be planned jointly with the marketing department and supplies would be ordered through the purchasing department.

Marketing

The marketing department is the organizational unit carrying out the marketing functions. Usually it has an independent line function. The structure of the unit varies according to type of customer, nature of the product, its geographical distribution and the sales and distribution pattern. Establishing a marketing organization for a new product or project requires careful determination of both the marketing objectives and means required and available. Sales and distribution of a product in a country where the infrastructure and the means of communication are limited may also require a more costly marketing organization.

Organization Structure

The organization structure of an enterprise indicates the delegation of responsibilities to the various functional units of the company and is shown in diagram, referred to as an organigram. The organization is designed primarily in line with the different functions in the enterprise, such as finance, marketing, purchasing and manufacturing. It is also possible to base organizational structures on products or production lines [for instance, profit or cost centers], or on geographical areas or markets.

The organizational structure of the company can take a number of shapes, like pyramid shape, which has the following three organizational levels:

- Top management-dealing with long-term strategic planning, budgeting, coordination and control
- Middle management- entrusted with planning and control functions such as sales, production, purchasing and finance
- Supervisory management- that plans and controls the day-to-day operations and activities under its supervision.

Human Resources

This chapter deals with human resource planning. Once the production program, plant capacity, technological processes have been determined; the human resource requirements at various levels and at different stages must be defined and also the availability and costs. The successful implementation of the project needs different categories of human resources--management, staff and workers-with different skills and experience.

The financial analysis of the project should deal with availability of personnel and training needs, the cost estimates for wages, salaries, and other personnel-related expenses.

Human resource requirements will obviously depend on the management structure, organizational layout, operating plan and other factors related to the financial and commercial features of the project. The number of shifts and production lines also influences the requirements.

Categories and functions: The feasibility study for the project need to define Human resources by categories such as management and supervision personnel and skilled and unskilled workers, and by functions, such as general management, production management and supervision, administration [accounting, purchase etc.], production control, machine operation and transport. The numbers, skills and experience required depend on the type of industry, the technology used, plant size, the cultural and socio-economic environment and the proposed enterprise.

Managerial and supervisory staff: The provision of qualified and experienced managers is a basic prerequisite for successful project implementation and operation. The timely provision of qualified staff to manage all the functions of the plant is most important. For a successful project implementation, suitably experienced supervisory personnel should be appointed well in advance. The feasibility study should define the

requirements at department level and state the qualifications and experience necessary. Before approving a new project, the source and cost of managerial and supervisory staff should be determined.

Skilled and unskilled workers: The timely provision of skilled and unskilled workers is of equal importance to the availability of managerial and supervisory staff. A definition of the kinds of professional staff, skilled labor and unskilled workers needed should be provided in order to specify the minimum training and professional experience required in order to qualify for the different posts identified.

Socio-economic and cultural environment

Human resource requirements are determined by both techno-economic, and financial factors and also by social and socio-economic conditions in the country and location of the project.

Labor conditions, standards and health care:

Labor terms are regulated by the legislation or trade union contracts or to be based on common practice. The prevailing rules on national holidays, shift work, working hours, annual sick leave etc. determines the number of effective working hours and days in a year.

Regarding the adoption of labor norms and the resulting effective machine hours and productivity, realistic estimates should be made on the basis of experience of industrial projects in the country.

A feasibility study should also assess the relevant existing regulations on occupational safety, including future trends, and analyze their impact on investment and production costs.

The project analyst should also identify and consider necessary plant components regarding arrangements for health care and social security for the human resources to be employed. The cost of such components will have to be estimated and included in the cost tables of the study. ILO publication on occupational safety, health and working conditions may be good reference for the project promoter.

Project – related requirements

Identification: Staff and labor requirements have to be planned for the implementation of various phases of a project. Attention should be paid to special professional skills and experience of employees and workers, as in the areas of enterprise management [entrepreneurial and management

functions], marketing, raw materials and factory supplies, production processes, environmental, location aspects, organization and personnel and construction management.

The identification of these significant requirements at the stage of feasibility study will provide substantial benefits:

- Delays and additional costs can be avoided on account of identifying the experienced and committed personnel for the project implementation.
- The right timing of recruitment will lead to optimum utilization of production capacity.
- Adequate maintenance and supply of raw materials and utilities may lead to planned and reduced production costs.
- Sales volumes and revenues can be kept pace with production due to appointment of experienced sales persons, sales managers and right timing of marketing
- Identification of skilled drivers may avoid transport delays, damage and losses and deterioration in quality of the products.

Timing: The labor should be recruited in advance during the pre-production phase like the managerial staff, supervisors, foremen, and machine operators in order to facilitate to start at the operational phase. Foreign expertise and their numbers required together with costs and periods of service could in each case be indicated.

In case of estimating labor requirements for the operational phase, the functions and skill levels needed should be determined by departments and aggregated for the project. The number of shifts should be considered.

Manning tables: Labor planning should start at the departmental level, defining the labor and staff requirements by functions and categories. [Workers-skilled, semi-skilled and unskilled; staff-managerial, supervisory, administrative and sales]. The departmental table can be set up according to schedule V111-1. The manning table of the entire project can be obtained by simply aggregating the departmental manning tables in schedule V111-2 for labor and staff. The manning tables will also be used to analyze availability and recruitment of human resources and to estimate operating costs related to these resources.

Availability and recruitment

The feasibility study should analyze and assess the general availability of human resources required and describe the background situation, focusing on employment, economic development, industrialization and urbanization etc. Attention should be paid to availability [supply and demand] of various personnel.

The feasibility study should describe and assess the employment situation in the region apart from the national outlook.

The following factors should be considered when analyzing the employment of human resources:

- Availability of human resource categories in the country and the project region
- The supply and demand situation
- Recruitment policy and methods
- Training policy and program.

The study should analyze the ability of the project to attract the human resources required which is influenced by the wages and salaries offered. Recruitment policy and methods should also be included in the study. A feasibility study should indicate the qualifications and experience required by key managerial personnel. Foreign personnel can be employed when there is a lack of experience in local managerial talent.

Training plan

Extensive training programs should be designed and carried out for the inexperienced and skilled personnel. The training should be organized during the pre-production stage at the plant site. The requirements of training for various levels of plant personnel, the duration of such training for each category and the location of and arrangements for training should be defined.

Personnel at various levels should undergone training before the production starts, during pre-production and construction stages. In the case of managerial and key non-technical personnel, the training would cover aspects of management and procedure. The training of supervisory and production personnel would cover production processes to facilitate to train others in the same fields.

A training program can be prepared through the following steps:

- Analysis of personnel characteristics, socio-cultural characteristics conditions and experience should be considered.
- Analysis of training requirements.[job analysis]
- Formal training can be carried out for management and supervisory personnel either in the country or at abroad.
- On the job training can be carried out for individuals or for groups.
- Updating during future plant operations may be required for management and administrative staff as well as labor.

Cost estimates

The feasibility study should present the estimated labor costs for each department and function. The manning tables prepared for each department can be used for estimating labor costs. The costs are to be divided into foreign and local currency components. When estimating the total wage and salary costs, provision should be made for social security, fringe benefits, welfare costs, subsistence payments and pension funds, costs of training and pay roll taxes.

7. FINANCIAL AND ECONOMIC ANALYSIS

Financial Analysis

Given the conditions for investment appraisal, project preparation should be geared towards the requirements of financial and economic analysis. Basically, financial analysis should accompany the design of the project from the very beginning. From a financial and economic point of view, investments can be defined as a long-term commitment of economic resources made with the objective of producing and obtaining net gains in the future. The main aspect of this commitment is the transformation of financial resources into productive assets, represented by fixed investment and net working capital.

Important aspects of financial analysis covers such as criteria for investment decisions, pricing of project inputs and outputs, the planning horizon and project life, as well as risks and uncertainty. Then the detailed consideration will be given to cost analysis, basic accounting principles, methods of investment appraisal, financing, financial efficiency and ratios and project evaluation in conditions of uncertainty.

Objectives of financial analysis: The financial analysis and financial project appraisal involves the assessment, analysis and evaluation of the required project inputs, the outputs to be produced and the future net

benefits, expressed in financial terms. The scope and objectives of financial analysis are to analyze and interpret all the financial consequences of an investment that may be relevant to and significant for the investment and financing decisions. The analysis should ensure that the objectives determined by the decision makers and within the scope of the feasibility study and also fulfill the following conditions:

- The most attractive choice in project selection under the conditions of uncertainty.
- The critical variables and possible strategies for managing or controlling risks are identified.
- The flow of financial resources require during the project cycle is determined and the lowest cost of financial resources are identified.

Principal aspects of financial analysis: The analysis should also accompany the various alternatives and design of the project strategies that basically determine the marketing strategies, project scope, resources, location, production capacities and technology. The orientation of financial analysis towards the needs of decision makers and their investment and financing criteria, as well as the principal conceptual aspects are discussed below.

Interest of parties Involved: The parties participating in a project expects benefits differently and values them accordingly. Basically, two groups of financial resources comprise the equity provided by the investors and the loans of financial institutions. The conditions under which the project may obtain funds reflect the interests of the financiers, in particular their opportunity cost of capital and the margin added for the various risks expected and evaluated by each party individually.

Public interest: To be successful, investments also have to serve the needs and development objectives of the socio-economic system. Since it is in the public interest that investments make efficient use of scarce resources and contribute to the national development.

Basic criteria for investment decisions: The investment is defined not only as a benefit-oriented long-term commitment of resources, but also as the transformation of liquidity into productive assets. The decision on industrial investments should be based on the following criteria relating to the overall feasibility of investment projects:

- Possible conflicts at present and in the long run between the basic project objective and the development objectives valid for the socio-economic environment
- Suitability of the proposed strategy, various alternatives and the reasons for the selection
- The matching of project design, marketing concept, production capacity and technology and location with that of project strategy and availability of resources.
- Efficiency in utilizing the economic resources
- The total investment costs and production and marketing costs fall in line with acceptable confidence level.
- Sufficiency of the total investment costs
- The structure of cash flows [in and out] and corresponding net returns met the requirements of investors and financiers
- The availability of local money and foreign exchange meets the requirements
- Identification of critical variables
- The financial consequences of the risks
- The likely projected scenario for a minimum condition for the investment to be appraised by investors, and by financing institutions etc.

Methods of Financial analysis and investment appraisal:

Financial analysis relies on a systematic presentation and processing of relevant business data on assets and liabilities, costs and income, and the related flow of goods, services and financial resources.

Accounting systems always cover the financial status of the firm in terms of the wealth [assets] and obligations [liabilities] recorded in the balance sheet; the costs accounted and corresponding income shown in the income statement. A cost accounting system is needed in order to determine production and marketing costs, which is necessary not only for the net income statement, but also for efficient financial planning, product pricing and cost control. For liquidity planning the cash flow statement is used.

Cost accounting is intended to provide a measurement of budgeted material costs, wages and salaries, and other expenses involved in producing and marketing the goods and services generated by the project. These costs are examined in an effort to establish the relationship between them and the level of business activity of the project. Standard cost representing a

predetermined cost may be calculated in advance of operations for latter comparison with actual costs.

The classification of costs is necessary in order to facilitate cost planning [budgeting] and to permit the determination of cost items that could be critical for the feasibility of a project.

Pricing of project inputs and outputs:

The purpose of feasibility study prices should reflect the real economic values of project inputs and outputs for the entire planning horizon of the decision makers. Prices may be defined in various ways, depending on the following:

- Market [explicit] or shadow [imputed] prices
- Absolute or relative prices
- Current or constant prices

Market or explicit prices are those present in the market, whether it is determined by the supply and demand or by the government. They are the prices at which the firm will buy the inputs and sell the outputs. In financial analysis market prices are applied. Later at the stage of economic cost-benefit analysis, the shadow or imputed prices will have to be introduced when the market prices are distorted.

Absolute prices reflect the value of a single product in terms of money, while relative prices express the value of one product in terms of another. [One ton of coal may be 100 monetary units and the equivalent quantity of oil may be 300 monetary units. In relative price of coal in terms of oil would be 0.33]. Absolute prices may change over the life time of the project due to inflation but relative prices remain unchanged despite variations in absolute prices.

Current or constant prices differ over time as a result of inflation. Whenever relative input and output prices remain stable, it is sufficient to compute the profitability of an investment at constant prices. If inflation has a significant impact on project input costs and output prices, such an impact must be dealt with in the financial analysis.

Inflation may have to be considered in financial planning, even when the relative prices stable, because additional equity, loan financing and working capital may be needed.

Planning horizon and project life:

The project planning horizon of a decision maker may be defined as the period of time over which he decided to control and manage his project-related business activities, or for which he formulates his investment or business development plan. When determining the economic life span of the project various factors [following] have to be discussed:

- Duration of demand [position in the product life cycle]
- Duration of the raw material deposits and supply, building and equipment
- Rate of technical progress
- Life cycle of the industry
- Opportunities for alternative investment
- Administrative constraints [urban planning horizon]

It is evident that the economic life of a project can never be longer than its technical life or its legal life. Considering that the accumulated net cash flows of an investment project, the planning horizon may have a considerable impact on the results of the financial analysis. The relationship between the planning horizon and project life should therefore be considered when appraising an investment project

Risk and uncertainty:

Investment projects are by definition related to the future, which a project analyst cannot forecast with certainty, thus financial analysis and evaluation have to be carried out under conditions of risk and uncertainty. Risk is present when the probabilities associated with various outcomes may be estimated on the basis of historical data. Uncertainty exists when the probabilities of outcomes have to be assigned subjectively, since there are no historical data.

Analysis of cost estimates:

Since reliable cost estimates are fundamental to the appraisal of an investment project, it is necessary to check carefully all cost items that could have a significant impact on financial feasibility. The preparation of cost estimates comprises the pre-investment, project implementation [investment] and operational phases. It covers the corresponding costs of initial investment, production, marketing and distribution, plant and equipment replacement, working capital requirements and decommissioning at the end of the project life.

Total investment costs:

Initial investment costs: These costs are sum of fixed assets [fixed investment costs plus pre-production expenditures] and net working capital. The amount of total investment cost [smaller than total assets] is composed of fixed assets and net working capital.

Investment required during plant operation

In order to keep a plant in operation, each item must therefore be replaced at the appropriate time, and the replacement costs must be included in the feasibility study. Other types of investment are rationalization, modernization and plant expansion.

Pre-production expenditures

In every industrial project certain expenditures due, for example, to the acquisition or generation of assets are incurred prior to commercial production. These expenditures have to be capitalized.

Preliminary capital-issue expenditures: These are expenditures incurred during the registration and formation of the company, including legal fees for preparation of memorandum and articles of association and for capital issues. The capital-issue expenditure includes prospectus, advertising, underwriting, and brokerage.

Expenditures for preparatory studies:

- Expenditures for pre-investment studies- opportunity, pre-feasibility, feasibility and support or functional studies
- Consultant fees for preparing studies, engineering, and supervision of erecting and construction
- Other expenses for planning the project.

Other pre-production expenditures: salaries, fringe benefit and social security contributions, travel expenses, preparatory installations, pre-production marketing costs [promotion, sales networks], training costs, know-how and patent fees, insurance costs and interest on loans.

Trial runs, start-up and commissioning of expenditures: This includes supervision, wage, salaries, fringe benefits, and social security contributions.

End- of- life costs: The costs associated with the decommissioning of fixed assets at the end of the project life, minus revenues from the sale of the

assets, are end- of- life costs. Major items are the costs of dismantling, disposal and land reclamation.

Fixed assets: It comprises fixed investment costs and pre-production expenditures. Fixed investment costs comprise land & improvements, building and civil works, plant, machinery, equipment and payment for know-how and patents.

Net working capital: It is the difference between current assets [inventories, marketable securities, prepaid items, A/R and cash] and current liabilities [accounts payable].

Accounts receivable [debtors]: A/R is trade credits extended to product buyers as a condition of sale.

$$\text{Debtors} = \frac{\text{Credit terms [in months]}}{12} \times \text{[value of annual gross sales]}$$

Inventories: Working capital requirements are considerably affected by the amount of capital immobilized in the form of inventories. Every attempt should be made to reduce inventories to low a level as justifiable.

Production materials: In computing inventories of production materials, consideration should be given to the sources and modes of supplies of raw materials and factory supplies.

Work-in-progress: To assess capital requirements for covering work-in-progress, a comprehensive analysis should be performed of the production process and of the degree of processing already reached. The valuation is based on the factory costs of work-in-progress.

Finished products: The inventory of finished products depends on a number of factors such as nature of the product and trade usage. The valuation is based on factory costs plus administrative overheads.

Cash- in- hand and cash- in- bank: At the end of a six month period the surplus of receipts over payments do not fully cover the interest payments, additional sort-term finance would be required. It may be prudent to provide for a certain amount of cash-in-hand. This could be done by including a contingency reserve on working capital.

Calculation of net working capital requirements:

When calculating the working capital requirements, the minimum coverage of days for current assets and liabilities has to be determined first. Annual

factory costs, operating costs, and costs of products should then be computed. The next step is to determine the coefficient of turn over for the components of current assets and liabilities by dividing 360 days by the number of days of minimum coverage. Subsequently the cost data provided from each item of the current assets and liabilities are divided by the respective coefficients of turnover. Finally, the net working capital requirements for the different production stages are obtained by deducting the current liabilities from the sum of current assets.

The calculation of working capital requirements at the stage of the feasibility study is of particular importance since it forces the project promoter, investors and financing institutions to think about the funds needed to finance the operation of the project as compared with invested funds, such as pre-production expenditures and fixed investment costs.

Production costs: It is essential to make realistic forecasts of production or manufacturing costs for a project proposal in order to determine the future viability of the product. Production costs should be calculated as total annual costs and preferably also as cost per unit produced. Production costs must be determined for the different levels of capacity utilization, and for an operational period corresponding to the planning horizon of the investors and financing institutions interested in the project. Production costs comprises into four major categories: factory costs; administrative overhead costs; depreciation costs; and costs of financing [interest].

Marketing costs: It comprises the costs for all marketing activities and may be divided into direct marketing costs for each product such as packaging and storage, sales costs [sales persons, commissions discounts, royalties, advertisements], transport, interim storage, and distribution costs, indirect marketing costs, such as overhead costs of the marketing department [personnel, materials, and communications].

Basic accounting statements: The accounting statements are also important for the analysis of the structure of project financing and for the computation of the costs of a company. There are basically two categories of accounting statements: the net income statement or profit and loss account which is linked to the balance sheet; and the cash flow table for financial planning.

Income statement: The net income statement is used to compute the net income or deficit of the project arising each year. The projections are required for the entire duration of the planning period chosen for the project.

Balance sheet: A balance sheet is a statement showing an accumulated asset- the wealth –of a company and how this wealth is financed. The sources of finance are treated as the aggregate liabilities of the company which shows investors, creditors, banks, and debenture holders. The projected balance sheet in the feasibility study should consist of estimates of key items, such as cash and other current assets, fixed assets as well as equity and loan capital and current liabilities that are required for the smooth performance of the enterprise.

Source and application of funds [cash flow statement]: The timing of the inflow of funds [paid-in equity, loan disbursements, sales revenues, loans, O/Ds or creditors] must be synchronized with the various expenditures [cash flow] for investments as well as the plant operation. If this timing of financial flows is not properly done, the project may experience periods with accumulated financial surpluses not employed but costing interest, or face sudden shortages of funds and liquidity problems. The liquidity problems would lead to reduced supplies and under-utilization of installed production capacities.

Projection of Cash Flows

Steps in the capital budgeting process

Once a potential capital budgeting project has been identified, its evaluation involves the following steps:

1. First, the cost of the project must be determined.
2. Next, management estimates the expected cash flows from the project, including the salvage value of the asset at the end of its expected life.
3. Third, the riskiness of the projected cash flows must be estimated. This requires information about the probability distribution (uncertainty) of the cash flows.
4. Given the project's riskiness, management determines the cost of capital at which the cash flows should be discounted.
5. Next, the expected cash flows are put on a present value basis to obtain an estimate of the asset's value to the firm.
6. Finally, the present value of the expected cash inflows is compared with the required outlay, or cost. If the PV of the cash flows exceeds the cost, the project should be accepted. Otherwise, it should be rejected. (Alternatively, if the expected rate of return on the project exceeds its cost of capital, the project is accepted.)

Estimation of Cash Flows

The most important step in project analysis is estimating the cash flows, specifically only the incremental cash flows. It is the difference between the firm's cash flows if the project were undertaken and the firm's cash flows without the project.

Financing flows such as interest payments, principal payments, and cash dividends are excluded from cash flow analysis.

Cash flows should be determined on an after-tax basis. The initial investment outlay, as well as the appropriate discount rate, will be expressed in after-tax terms. Therefore, all forecasted flows need to be stated on an equivalent, after-tax basis.

Operating cash flows is a project's operating income plus depreciation.

Sunk costs are not incremental and therefore must be ignored. A sunk cost is an outlay that has already occurred or has been committed and it will not affect future cash flows of the project.

All relevant **opportunity costs** must be included in the analysis. For example, suppose classic video rentals already own a piece of land. If the firm were analyzing a project for that land, it must include the current market value of the land as an opportunity cost. Thus, in deriving cash flows we need to consider any appropriate opportunity costs.

When a capital investment contains a current asset component, this component is treated as part of the capital investment and not as a separate working capital decision.

In estimating cash flows, anticipated inflation must be taken into account.

Depreciation: Depreciation lowers taxable income. While depreciation itself is a noncash expense, it does affect the firm's cash flow by directly influencing the cash outflow of taxes paid.

When a depreciable asset is sold, the actual sales price (the realized salvage value) minus the then existing book value is multiplied by the tax rate to determine the applicable taxes. The net salvage value, salvage value minus the applicable taxes, is then added to after-tax operating income.

It is helpful to place project cash flows into three categories based on timing:

1. The initial cash flow (initial Investment).
2. Interim incremental net cash flow (operating cash flows).
3. The terminal cash flow.

1. The initial Cash flow

The initial investment is the net after- tax cash flows that occur at time zero.

- Cost of equipment, facilities and land purchased.
- All other costs related to investment (transportation, installation, additional personnel etc. net of taxes)
- Additional net working capital.
- Opportunity costs, net of taxes (Ex- land used for this project that could have been sold).

2. Interim Incremental Net cash Flows (Operating cash flows):

The second parts of the cash flow stream, operating cash flows, are the net cash flows that occur while the asset is in operation. They begin in year 1 and continue throughout the project's useful life. Operating cash flows are calculated by taking the difference in the cash inflows minus the cash outflows to provide the cash flow before tax attributable to the proposed project.

Basic format for determining interim incremental net cash flow (per period)

a) Net increase (decrease) in operating revenue less (plus) any net increase (decrease) in operating expenses, excluding depreciation.
b) - + Net increase (decrease) in tax depreciation charges
c) = Net changes in income before taxes.
d) - + Net increase (decrease) in taxes.
e) = Net changes in income after taxes.
f) + -Net increase (decrease) in tax depreciation charges.
g) = Incremental net cash flow for the period.

3. Terminal Cash flow:

Terminal Cash flows are the net after-tax cash flows other than the operating cash flows that occur in the last year of the project's life. These potential project wind up cash flows are: 1) the salvage value of any sold or disposable assets; 2) taxes (tax savings) related to the asset sale or disposal; and 3) any project-termination related change in working capital.

Terminal Year Incremental Cash Flows

a) Calculate the incremental net cash flow for the terminal Period.
b) + - Salvage value (disposal/reclamation costs) of any Sold or disposed assets.

c) - + Taxes (Tax savings) due to the asset sale or disposal of new assets.
d) + -Decreased (increased) level of networking capital.
e) = Terminal year incremental net cash flow

Example of an asset expansion project

> *Basket Wonders (BW) is considering the purchase of a new basket-weaving machine. The machine will cost $50,000 plus $20,000 for shipping and installation and falls under the 3-year MACRS class. NWC will rise by $5,000. Lisa Miller forecasts that revenues will increase by $110,000 for each of the next 4 years and the machine will then be sold (scrapped) for $10,000 at the end of the fourth year, when the project ends. Operating costs will rise by $70,000 for each of the next four years. BW is in the 40% tax bracket.*

Initial cash flow

Technology is knowledge of using tools and machines to do tasks efficiently. Technology allows people to make more and better products. Technology has helped develop more advanced economies.

Incremental cash flow

		Year 1	**Year 2**	**Year 3**	**Year 4**
a)		$40,000	$40,000	$40,000	$40,000
b)	-	23,331	31,115	10,367	5,187
c)	=	$16,669	$ 8,885	$29,633	$34,813
d)	-	6,668	3,554	11,853	13,925
e)	=	$10,001	$ 5,331	$17,780	$20,888
f)	+	23,331	31,115	10,367	5,187
g)	=	$33,332	$36,446	$28,147	$26,075

Terminal – year Incremental cash flows

a) $26,075 the incremental cash flow from year 4
B) + 10,000 Salvage Value.

c) - 4,000.40*($10,000 - 0) Note, the asset is Fully depreciated at the end of Year 4.
D) + 5,000 NWC - Project ends.
e) = $37,075 Terminal-year incremental cash flow.
Summary of project Net cash flows
Asset Expansion

Year 0	Year 1	Year 2	Year 3	Year 4
-$75,000*	$33,332	$36,446	$28,147	$37,075*

MACRS depreciation percentages

Recovery year	3-year	5-year	7-year	10-year
1	33.33%	20%	14.29%	10%
2	44.45	32	24.49	18
3	14.81	19.20	17.49	14.4
4	7.41	11.52	12.49	11.52
5		11.52	8.93	9.22
6		5.76	8.92	7.37
7			8.93	6.55
8			4.46	6.55
9				6.56
10				6.55
11				3.28
Total	100%			