Development Planning and Project Analysis

For MSc. Students in Economics Department

Debre Markos University

Course Code: DEC541

Credit Hours: 3

Classification: Core

Semester: Year 1, Semester II

Course outline

- **Chapter 1. Basic Concepts and Development Planning Issues**
  - ➢ Basic Concept of Development Planning
  - ➢ Links among Development Planning, Program and Project
  - ➢ Evolution of development planning in the history of economics
  - ➢ Objective of planning, Elements of Planning, Rationale of Planning
  - ➢ Types of Development Planning (In terms of time Horizon, Spatial horizon, level (macro, micro and sectoral planning) and others

- **Chapter 2. Techniques of Project Appraisal**
  - ➢ Concepts, Characteristics and Preparation of a Project
  - ➢ Project Initiation and Feasibility study
  - ➢ Project Planning and Scheduling
  - ➢ Technical appraisal
  - ➢ Social appraisal
  - ➢ Economic and financial appraisal
  - ➢ Choosing the discount rate, risks and uncertainties…
  - ➢ Measuring Project Worthiness

Course outline

- **Chapter 3. Models of Development Planning**
  - ❖ Harrod-Domar Model of development Planning
  - ❖ The Fel'dman Model of development Planning
  - ❖ The Mahalanobis Model of development Planning
  - ❖ The Leontief Input-Output Model of development Planning
  - ❖ The Linear Programming (Optimizing) Model of development Planning
  - ❖ Macro econometric Model of development Planning
- **Chapter 4. Development Project Analysis**
  - ❖ Valuing the environment
  - ❖ Contingent valuation method (CVM)
  - ❖ The environmental impact assessment
  - ❖ Multi-criteria analysis
- **Chapter 5. Project Implementation, Monitoring & Evaluation**
  - ❖ Project Implementation
  - ❖ Monitoring & Evaluation
  - ❖ Project Closing

Chapter 1
1. Basic Concepts and Development Planning Issues

1.1. Basic concept of development planning.

1.2. Links among development planning, program and project .

1.3. Evolution of development planning in the history of economics

1.4. Objective, elements and rationale of planning.

1.5. Types of development planning (In terms of time Horizon, Spatial horizon, level (macro, micro and sectoral planning) and others

Introduction

- **Developing a project** follows a logical process, with the first step being to understand and identify what the community wants to accomplish.

- Once that is established, you can move towards identifying the problem you want to solve and what resources and assets are already available to address the problem.

- You can then begin working through the project and figuring out how much the project will cost.

- This development process does not involve reviewing funding opportunity announcements to determine the type of project for the community, rather, the project idea must come from the community and match the community's long range goal.

1.1. Basic Concept of Development Planning

- **Development** means making **a better life** for everyone.
- **A better life** means, essentially meeting basic needs:
- ✓ sufficient food to maintain good health; a safe, healthy place in which to live;
- ✓ affordable services available to everyone;
- ✓ being treated with dignity and respect.

- Development is a founding belief of modernity.…

- It is changing the world for a better livelihood.

- It implies starting change at the **bottom** rather than the top.
- **Economic growth** means achieving a more massive economy.

- **It** is producing more goods and services.

- **It** may be a larger total income on the other.

- **It** can occur without touching problems like inequality or poverty if all increment snatched be few people.

1.1.1. Difference between Growth and Development

- There may be parallel increment in **income inequality** and **economic growth**.

- **Development planning** refers the **strategic measurable goals** that an **entity plans** to meet within a certain time.

- Usually **it** includes time-based **benchmarks.**

- It generally considers **criteria** that will be used to evaluate **whether** or **not the goals** were actually met.

- **Development planning** refers to all the various activities related to **fund raising**, **grant writing**, **donor relations**, **capital campaigns**, **annual fund drives** and **fund-raising events**.

1.2. Links among Development Planning, Program and Project

- Planning, in general, can best be **described as the process of selecting the enterprise objectives and establishing the policies, procedures, and programs** necessary for achieving them.

- Planning in a project environment may be **described as establishing a predetermined course of action within a forecasted environment.**

- **Development planning** is a process of defining and identifying **development goals** and **objectives**, **strategies**, **resources needed**, and determine the **levels of growth** of outputs/results and, **assessing risks** and assumptions.

- **Program**: is a group of **projects** that are closely linked, wherein managing them together provides shared benefit.

- **Projects**: are means of organising activities that are impossible to address within the normal operation of the organisation.

- A **project** is a singular effort of defined duration, whereas a **program** is comprised of a **collection of projects**.

- Actually, **program** is a bit more complex than **a project**.

- They do have different functions within an organization

- **They have several difference**, and **many commonalities**.

- Even project and program management are two different roles within an organization, as well, yet they share similar duties.

1.2.1. Difference Between Them

- **Structure**: **A project** is well-defined, with a *Project Charter* that spells out exactly the scope & objectives.
- **A program** tends to have greater levels of uncertainty.
- The **labor** (team) is also **bigger** for a program.
- The program team are supervising and coordinating the work on a number of projects.
- **Effort**: This is the most significant difference between **projects** and **programs**.
- **A project** represents a **single effort**.
- It is a group of people forming a team working towards for **a common goal**.
- **A program** is a collection of **projects**.
- All the projects together form a **cohesive package of work**.
- The different projects are complimentary that help a program to achieve its **overall objectives**.

1.3.1. Difference Between Them

- **Duration**: Some **projects** may go for **several years** but mostly they will work for a **shorter**.
- However, **programs** are definitely longer.
- **Programs** tend to be split into **tranches** or **phases**.
- All projects **may not last** long to be delivered in multiple phases.
- **Benefits**: A project is towards achieving **certain outputs**.
- The benefits of a **project** tend to be **tangible**: you get a 'thing' at the end of it.
- **A program** team works towards **delivering outcomes**, and outcomes can be **tangible** but are often not.
- Benefits of a **program** are sum of the benefits from **projects** and this could generate **policies**.

1.3.2. Similarities Between Projects and Programs

- They do have **some characteristics** in common.
- Here are **four traits** that **projects** and **programs** have in common.
- **They are temporary**: They are not long term endeavors.
- They exist for a while until the work is done, and then the **project** or **program structure** and the **team** are disbanded.
- **They have business cases**: This is similar to all the work that a company does. **Projects** and **programs** should only start when they have a **valid business case**.
- **Project** and **program** managers work on activities that will add **some real value** to make good business sense.
- There is no point in wasting time working on something that isn't going to benefit the company.

1.3.2. Similarities Between Projects and Programs

- **They are aligned to strategic objectives**: It should be easy to see how **projects** and **programs** work to achieve the company's strategic objectives.

- The work on the project or program directly contributes to the company's goals.

- **They deliver change**: Both of them deliver a change.

- You do a **project** or **program**, and at the end something is different.

- The change could be something **big** or **small**.

- Programs tend to have **larger goals** for changing the status quo and often include an element of cultural change but the concept is the same.

1.3. Evolution of development planning in the history of economics

- Planning is rooted in applied disciplines.

- Early planning theories emerged out of practice.

- Efforts to develop a coherent theory emerged in the 1950s and 60s.

Pre-Modern Planning: Focus on Urban Design and Street System

- The classical economic thought and development planning….

- The Keynesian thought and development planning..

- The Marxism and development planning..

- The recent thought and development planning …

1.4. Objective and aims of planning

- Planning **establishes the policies, procedures, and programs** necessary for achieving them.

- It aims to establish a predetermined course of action within a forecasted environment.

- **It** schedule and control to meet the completion date of tasks, reporting the progress against the schedule.

- It identifies activities and end products that will be performed; and describes how the activities will be accomplished.

- Thus the purpose of planning is to define each major task, estimate the time and resources required a framework for management review and control

Elements of planning

- A plan has the following elements:

1. Aim:- The aim should be clearly defined so that it can guide and direct the activities of the enterprise.

2. **Objectives:** - it may be described as the ends towards which the group activities are aimed.

 3. **Policies:-** A policy is a verbal, written or implied basic guide that provides direction to a manager for action.

 4. **Procedures:** it refers the actions to be taken out in practice to achieve the organizations objectives as stated in the policies. Procedures may be static or changed often.

5. Methods: they are work plans, which provide the manner and order, keeping the objectives, time and facilities available.

Cont'd

 6. **Rules:** they are different from procedures and policies. A rule requires a specific and definite action be taken or not taken with respect to a situation.

 7. **Budget:** it is essentially a plan expressed in quantitative terms.

 8. **Programs**: they show the way and lay down procedure for activities to take place within a time limit for accomplishing, the stated objectives.

 9. **Strategies:** it concerns the direction in which human and physical resources will be deployed to maximize the chance of achieving a selected objective.

1.5. Types of development planning

- The division will be based on (Time and Spatial horizon, level (macro, micro and sectoral planning) and others).

- "Planning is deciding in advance *what to do*, *when to do*, and *how to do*. It bridges the gap from where we are and where we want to be."

- Planning involves *systematic thinking about ways* and *means for accomplishing long-term goals*.

- Thus, **it** could be different across different dimension

- Business planning, Strategic planning, Tactical Planning, Product planning, Marketing Planning , Operations Planning, Project Planning, Budgeting planning..

1.5. Types of development planning

(With Spatial horizon)

- Spatial planning is to provide for the fair, orderly, economic and sustainable use of land…..

- National Spatial Plan ….

- Regional Spatial Plan …

- Local Spatial Plans …..

- The plans shall be prepared on the basis of a complete study of the planning area and its surrounding context..

Types of development planning

(With time Horizon)

- Each plan shall establish the estimated length of time to be completely implemented (time horizon) and the needs for periodic review.

- The time coverage of plans purely depend on the objective to be addressed and the inputs

- Each plan should be time bounded …..to be measurable ….and achievable….

Macro and Microeconomic planning

- It aims and prepared to solve macroeconomic problems..

- Economic growth

- Unemployment reduction

- Inflation reduction

- Balance of payment stabilization

- **GTP I &II**

❖ **Microeconomic planning**

- It aims to solve microeconomic problems

- Regional level

- Specific to a sector

- Specific to part of a society

Sectoral Planning

- The different sectors of the economic system have their own growth and development plan.

- The **sectoral plan** of a nation depends on the economic dependency….

- Agrarian economy……

- Industry based economy…..

- Service based economy……..

- All the above do have different plans….

Chapter 2
Techniques of Project Appraisal

"*Great ideas are born within one hour, but killed in a second*"

2.1. Concepts, Characteristics and Preparation of a Project

- **Program**: is a group of projects that are closely linked, to the point where managing them together provides some shared benefit.

- **Projects**: are means of organising activities that are impossible to address within the normal operational limits of the organisation.

- **Definition of Projects**:- A unique set of coordinated activities, with definite starting and finishing points, undertaken by an individual or organization to meet specific objectives within defined schedule, cost and performance parameters.

- **Project** planning, scheduling, and control is the art of preparing a plan that meets the completion date, scheduling the individual tasks.

- A project planning defines the project activities and end products that will be performed; and describes how the activities will be accomplished.

- Thus, the purpose of project planning is to define each major task, estimate the time and resources required a framework for management review and control.

- Project may be initiated by some stakeholder driven by a need.

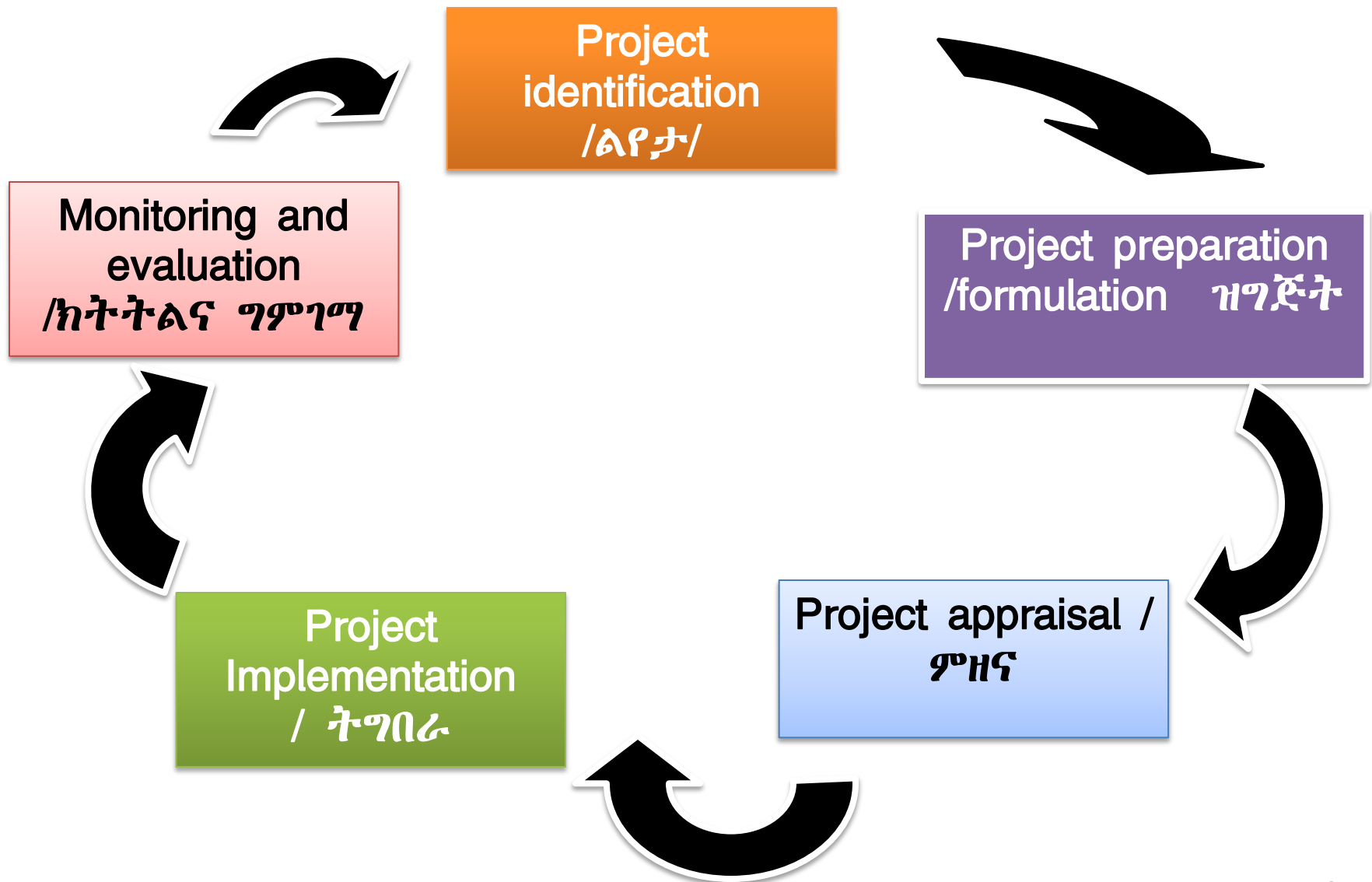The project planning activities and goals include defining:-

  - The specific work to be performed and goals that define and bind the project estimates to be documented for planning.

  - Commitments that are planned, documented and agreed by the affected groups

  - Project alternatives, assumptions, and constraints

Cont'd

Project Identification

- It is the second step in the realms of project management.

- Project ideas may originate from various circumstances.

- A project may designed to solve a problem, to satisfy a need, or to use available resources.

- Many projects are conceived , just because there is a ready market.

- In a poverty stricken community, a project may be identified to cater for the needs of the poor.

- Projects can be designed to use available labor and raw materials.

- A project is identified from the constraints of existing environment in an activity, a business, a sector, a community or a country.

- Such environment may characterized by unsatisfied strong needs like shortage of water in a village, or inadequately utilized resources like fruits rotting in markets because of lack of fruit processing factory.

Cont'd…. Project cycle /ዑደት/

- Project identification /ልየታ/
- Project preparation /formulation ዝግጅት
- Project appraisal / ምዘና
- Project Implementation / ትግበራ
- Monitoring and evaluation /ክትትልና ግምገማ

Cont'd…… Why a Project?

- A project is generally called upon to provide a solution to a problem or to take advantage of an opportunity. These needs might have to do with:-
    - Reducing costs
    - Increasing revenues
    - Eliminating waste
    - Increasing productivity and efficiency
    - Solving a business or functional problem
    - Taking advantage of market opportunities
    - Filling social needs; improving service to customers or clients
    - Responding to the activities of competitors
    - Responding to external changes (e.g development of new technology)
    - Responding to government initiatives or new laws or political consideration
    - Resource availability–opportunity to make profitable use of available resource
    - Natural calamity–hedging against the adverse effects of natural events as drought or floods

Cont'd ….. Defining a Project?

- Projects have four essential elements: a specified timeframe, a coordinated approach to co-dependent events, a desired outcome, and unique characteristics.

1. **Temporary.** Projects always have a start and a finishing date.

2. **A project is an exception/unique.** Unlike routines, projects involve investigation, compilation, arrangement, and reporting of findings that provides value.

3. **Progressively Elaborated**

- Projects are developed in steps.

- The project scope will be broadly described early and becomes more explicit and detailed when the team develops better and more complete understanding of the objectives and deliverables.

- We learn more and more about the project as it goes on.

- When we start, we have goals and a plan.

Cont'd......Defining a Project?...

4. Project goals and deadlines are specific and the desired result is identified. A project is well defined only when a specific result is known.

5. Connected Activities/Interdependencies.

- It implies that there is a logical or technical relationship between pair of activities.

- There is an order to the sequence wherein activities that make up the project must be completed.

- They are considered connected because the output from one activity could be an input to the other.

- A project consists of a number of interrelated activities that are performed sequentially or in parallel.

6. Within Budget

- Projects also have **resource limits**, such as labor, money, or machines.

- These resources can be adjusted up or down by management.

Cont'd…..Defining a Project?...

7. **According to Specification**

- The customer, expects a certain level of functionality and quality from the project.

- Specification of the project completion date, or customer-specified.

- A number of factors can cause the specification to change.

- It is unrealistic to expect the specification to remain fixed through project's life.

High level of uncertainty & risk

- As a result of its uniqueness, dependency on other agencies and its relatively long-term nature; a project is faced with a lot of uncertainty and risk

Teamwork/multi-skill

– Projects require a team of people with different skills to get the job done

- A project can create:-

  ✓ A product that can be either a component of another item, an enhancement of an item, or an end item in itself;

  ✓ A service or a capability to perform a service (e.g., a business function that supports production or distribution);

  ✓ An improvement in the existing product or service lines (e.g., A Six Sigma project undertaken to reduce defects)

2.2. Project Initiation and Feasibility study

Project Initiation

- It is the first phase within the project management life cycle, as it involves starting up a new project.

- In this phase, the business problem or opportunity is identified, a solution is defined, a project is formed, and a project team is appointed to build and deliver the solution to the customer.

- The business case includes:

- A detailed description of the Introduction, Business Objectives, Problem/Opportunity Statement, Assumptions, and Constraints.

- A list of alternative solutions available.

- An analysis of the business benefits, costs, risks, and issues.

- A description of the preferred solution.

- Main project requirements.

- A summarized plan for implementation that includes a schedule and financial analysis.

- The project sponsor and the required funding is allocated to proceed with a feasibility study.

2.2. Project Initiation and Feasibility study

Project Initiation

- The feasibility study may also show that the project is not worth pursuing and the project is terminated; thus the next phase never begins.
- The success of your project depends on the clarity and accuracy of your business case and whether people believe they can achieve it.
- Whenever you consider experiences, your business could be more realistic.
- Whenever you involve other people in the business case's development, you encourage their commitment to achieving it.
- Projects are filled with misunderstandings between customers and project staff.
- What the customer ordered is often not what they get.
- The need for establishing clear project objectives cannot be overstated.
- An objective or goal lacks clarity if, when shown to five people, it is interpreted in multiple ways.
- Ideally, if an objective is clear, you can show it to five people who, after reviewing it, hold a single view about its meaning.
- The best way to make an objective clear is to state it in such a way that it can be verified.
- It is important to provide quantifiable definitions to qualitative terms.

2.2. Project Initiation and Feasibility study

Contents of Project Identification Report

- **Status & background of the project**: present the origins & historic background of the project.

- **Project objectives**: describe the major objectives in short paragraph.

- **Project rationale**: explain alternative strategies to attain project objectives & shows the reasons for the selection of the selected alternative.

- **Type of product & service**: show a list of detailed goods or services to be delivered by the project.

- **Project components**: show the project items on which project funds will be spent.

- **Markets**: assess the supply demand gap for the products or services to be delivered & shows the market outlets and the marketing strategy to sell the project output.

- **Sources** - of raw materials, equipment, & labor.

Contents of Project Identification Report

- **Magnitude of project costs:** show preliminary estimate of the cost of investment & operations including overheads.

- **Sources of finance**: draw a list of potential project donors along with the reasons of their selection.

- **Project benefits**: present a forecast of project outputs, revenues, foreign exchange, employment, technologies…

- **External benefits of the project**: describe secondary costs & benefits expected in the special environment of the project & the projects effect that have a marginal impact on the economy as a whole.

- **Implementing agency**: describe the type of organization which will be responsible for project execution.

- **Critical assumptions of the project**: presents a brief analysis of conditions of success of a project & shows possible policy or institutional changes which can bring about success of project implementation.

2.4. Contents of Feasibility Study

1. Executive summary
2. Background and history
3. Market and plant capacity
4. Material inputs
5. Location and site
6. Plant organization and overhead costs
7. Man power
8. Project implementation
9. Financial and economic evaluation

Project Feasibility Study

- A feasibility study is part of the process of project identification, preparation and selection.

- This process involves appraising of projects and then choosing to implement some of them.

- This process is very important for projects that are implemented by governments and big organizations.

- In developing countries, it is common to find a situation where only a few projects are sufficiently prepared and carefully selected.

- This happens because of several reasons:-

  (1) there are no enough skilled people to perform this task;

  (2) there is some unwillingness to spend money on this process.

- It is believed that this process is wasteful if many projects are appraised but eventually abandoned.

Feasibility Study

- Proper feasibility studies of projects imply choice of investment projects.

- Proper choice of projects is crucial to the long run economic development of a country.

- If a firm implements projects, then proper choice is crucial to its long run survival.

- It is true that many projects are implemented without any extensive feasibility studies.

- This happens mainly because of using non-numeric project selection models.

- However, the application of these models to project selection may be limited to projects, which do not involve huge investment resources.

- For those projects which involve huge resources feasibility studies must be usually carried out before a project is selected for implementation.

- A feasibility study should provide all data necessary for an investment decision.

- The market, technical, financial, economic and environmental prerequisites for a project should be defined and critically examined with alternative solutions.

Preparation of Feasibility Report

- A feasibility report of a project provides information which will be required by the decision-makers for project appraisal.

- Project appraisal usually builds on the project plan, but it may also involve new information if data or assumptions in the feasibility study are questionable.

- The appraisal done is meant to show whether or not the project plan as contained in the feasibility study, is sound and it is worth investing in.

- Project appraisal a feasibility report should contain the following:-
  - ❖ Market Analysis
  - ❖ Technical Analysis
  - ❖ Organizational analysis
  - ❖ Financial analysis
  - ❖ Economic analysis
  - ❖ Social analysis
  - ❖ Environmental analysis

Market Analysis

- It is the demand and supply aspect of the project.

- It needs to ensure existence of effective demand at remunerative price.

- It also assesses how much output the market will absorb without affecting the output price and if price inevitably be affected, we would have to assess its magnitude.

- Similar arrangements need to be done on the input side too.

- Market analysis is basically concerned with two questions:
  - What would be the aggregate demand of the proposed product/service in the future?
  - What would be the market share of the project under study?

- To answer those questions the project analyst requires a wide variety of information and need to use appropriate forecasting methods.

Market/Demand Analysis

- This step aims to estimate the potential size of the market for the product proposed to be manufactured and to get an idea about the market share that is likely to be captured.

- Hence, the two broad issues raised are:
  - What is the likely aggregate demand for the product/ service?
  - What will be the share of the market for the proposed product/service?

Answers to those questions call for an in-depth study of various factors like:

- patterns of consumption growth,

- income and price elasticity of demand,

- composition of the market, nature of competition,

- availability of substitutes,

- reach of distribution channels, etc.

The objectives of market/demand analysis

- It has objectives of addressing the following questions:

- Who are the buyers?

- What is the total current demand for the product?

- How is demand distributed geographically?

- What is the demand for the product segmented in different sizes?

- What price will the customers be willing to pay for the new/improved product?

- How can potential customers be convinced about the superiority of the new product?

- What price and warranty will ensure its acceptance?

- What channels of distribution are most suited for the product?

- What trade margins will induce distributors to carry it?

Technical Feasibility

- It may include the works of qualified individuals in the project preparation.

- It is concerned with the projects inputs (supplies) and outputs of real goods and services and the technology of production and processing.

- It is the analysis of the technical aspects of a project to be done continuously when a project is formulated.

- Technical analysis seeks to determine whether the prerequisites for the successful commissioning of the project have been considered.

- Is there a reasonably good choices with respect to location, size, process, etc.

- It is from this aspect analysis that all physical quantity of inputs and outputs will be determined for the estimation of costs and benefits.

Technical Analysis

- Analysis of technical and engineering aspects is done continually when a project is being examined and formulated.

- The technical analysis is made to identify and evaluate:
  - availability of technology
  - availability of technical experts
  - appropriateness of technology
  - affordability of technology

- **Technical analysis is concerned primarily with:-**
  - Material inputs and utilities
  - Manufacturing process/ technology
  - Product mix
  - Plant capacity
  - Location and site
  - Machineries and equipments
  - Structures and civil works
  - Work schedule

Technical Feasibility

- Poor technical analysis will result in under or over estimation of quantities related to inputs required by and outputs of the project.

- Further analysis based on these estimates would eventually lead to spurious cost and benefit estimates.

- Care must also be taken in assessing alternative designs and techniques.

- The project's expected life time must also be determined carefully for it has greater implication on its overall analysis and preparation.

- All these require creative, committed and competent specialists from different fields.

- It also requires coordination among these specialists, as every technical aspect is interrelated and interacting.

Technical Feasibility

- In general the technical analysis is primarily concerned with
  - ❖ Work schedule
  - ❖ Location and site
  - ❖ Project charts and layouts
  - ❖ Structure and civil works
  - ❖ Machines and equipment
  - ❖ Plant capacity
  - ❖ Manufacturing process and technology
  - ❖ Material inputs and utilities
  - ❖ Product mix

Technical Feasibility

- Is the proposed technology or solution practical?

- Do we currently possess the necessary technology?

- Do we possess the necessary technical expertise, and is the schedule reasonable?

  – Is relevant technology mature enough to be easily applied to our problem?

- What kinds of technology will we need?

- Some organizations like to use state-of-the-art technology

  – …but most prefer to use mature and proven technology.

- A mature technology has a larger customer base for obtaining advice concerning problems and improvements.

Technical Feasibility

- Is the required technology available in the information systems shop?
  - If the technology is available:
    - …does it have the capacity to handle the solution?
  - If the technology is not available:
    - …can it be acquired?
  - Project appraisal is an exercise dealing with working out the value, quality and condition of the project

Main Features of Technical Feasibility:

  - Time:- different processes take different time to complete
  - Relationship:- the inputs being processed bear a definite relation to each other and with also the resulting outputs, factor-factor and factor-output relationships, respectively
  - Economies and diseconomies of scale: former:- when output increases with an increased scale of a proces, saving of inputs occurs. The latter refers to a situation where scale is increased beyond a point. E.g Irrigation wells.
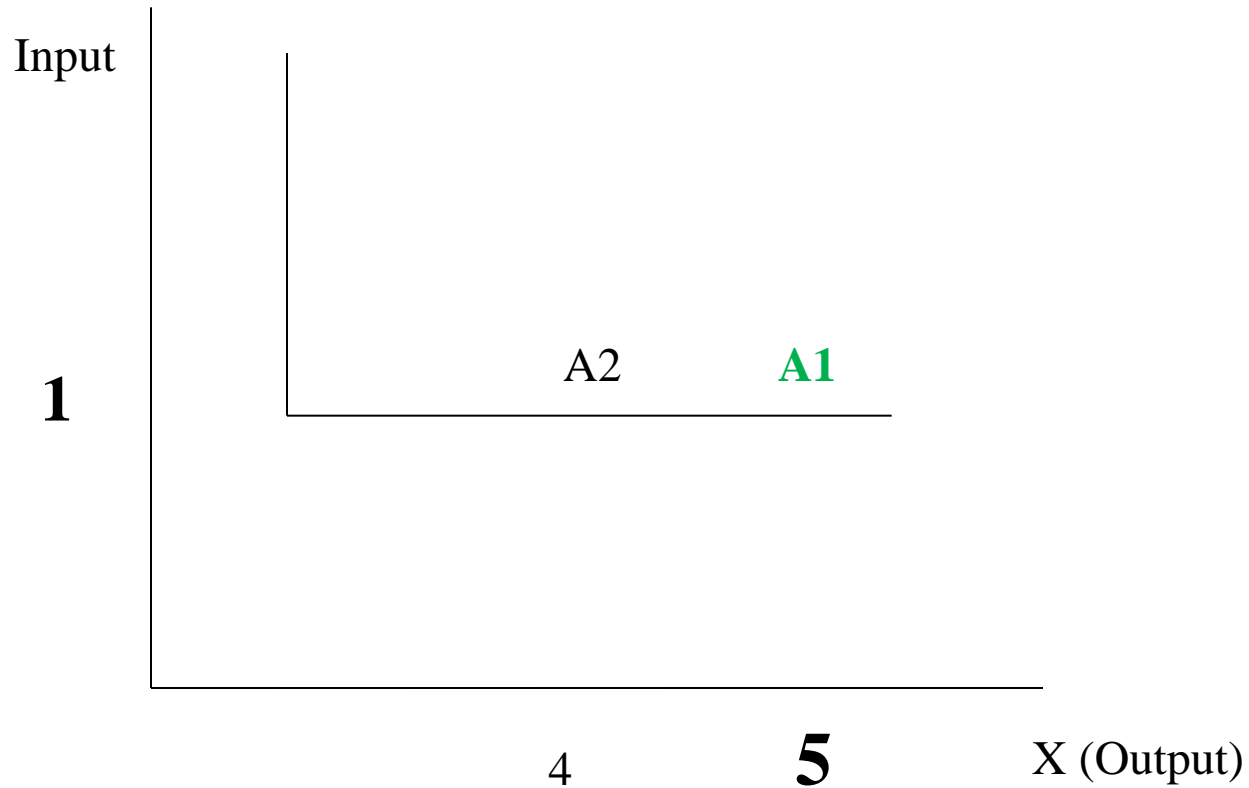
Technical Feasibility...

- **Choice of processes**:-input usage: a) same inputs or b) different inputs
- **Technical efficiency**: producing X outputs using less of inputs

Inputs	Project Variants				Input Prices	
	A1	A2	A3	A4	(A)	(B)
1	5	4	4	3	2	2
2	2	3	2	1	4	-
3	3	2	2	1	3	3
4	0	0	0	2	6	6
Output	X	X	X	X		

Which project to choose? Why?

Technical Feasibility...

Input

A2   **A1**

1

4   **5**   X (Output)

Exploring Operational Feasibility

- The "**PIECES**" framework useful for identifying operational problems to be solved, and their urgency.

  ❖ **Performance**:- Does current system provide adequate response time?

  ❖ **Information**:-Does current system provide end users and managers with timely, pertinent, accurate and usefully formatted information?

  ❖ **Economy**:- Does current system provide cost-effective information services to the business? Could there be a reduction in costs and/or an increase in benefits?

  ❖ **Control**:- Does current system offer effective controls to protect against fraud and to guarantee accuracy and security of data and information?

  ❖ **Efficiency**:- Does current system make maximum use of available resources, including people, time, flow of forms,...?

  ❖ **Services**:- Does current system provide reliable service? Is it flexible and expandable?

Financial Feasibility

- The following aspects should be considered in financial appraisal:-
    - ❖ Investment outlay and costs of the project
    - ❖ Means of financing; source of finance, credit terms, interest rates, etc
    - ❖ Projected profitability
    - ❖ Projected financial position
    - ❖ Cash flows of the project
    - ❖ Break-even point
    - ❖ Investment worthiness judged in terms of various criteria of merit
    - ❖ Level of financial risk
- It must generate future financial statements such as income statement, balance sheet and uses-and-source-of-fund statement.
- After these statements are produced, analysts can undertake different financial ratio analysis so as to ascertain financial feasibility.
- The analysis must show fund flows in each period in the project life.

Financial Feasibility

- **Objectives of Financial Analysis**

1. Assessment of financial impact

- The most important objective of financial analysis is to assess the financial effects the project will have on participants (farmer, firms, government, etc). This assessment is based on the comparison of each participant's current and future financial status with the project against the projection of his future financial performance as the project is implemented.

2. Judgment of efficient resource use

- For management especially, overall return is important because managers must work within the market price framework they face. Investment analysis & financial ratio analysis provide the tool for this review.

3. Assessment of Incentives

- The financial analysis is of critical importance in assessing the incentives for different participants of the project.

- Will participants have an incremental income large enough to compensate them for the additional effort and risk they will incur?

Financial Feasibility

- Will private sector firms earn a sufficient return on their equity investment & borrowed resources to justify making the investment the project requires?

- For semi-public enterprises, will the return be sufficient for the enterprises to maintain a self-financing capability and to meet the financial objectives set out by the society?

4. Provision of sound financial plan

- The financial plan provides a basis for determining the amount and timing of investment, debt repayment capacity, and also helps to coordinate financial contributions.

- Assessment of financial management competence especially for large projects, financial analysis will enable the analyst to judge the complexity of the financial management & the capability of managers so that he can judge what changes in organization and management may be necessary.

Financial Feasibility

- For project management purposes, there are three fundamental financial statements that can be used to determine the financial status of a project

1. The trading and profit and loss account: indicates the relative efficiency of the project operations represented in terms of income over expenditure in a given period of time

2. The cash flow: indicates the physical flow of money through the project over a given period of time, i.e, month-by-month, yearly basis. It indicates the liquidity of the project (its ability to meet cash requirements)

3. The balance sheet: indicates the net worth and nature of the project in financial terms at a specified point of time. Indicators are: value of assets. The balance sheet indicates how these assets are funded (like from shares, loans, retained profits from previous periods of operation).

- An analysis of the profitability of a project is undertaken from the determination of the profit and loss account. It has three main purposes:
  - ➢ To derive indicators of relative efficiency
  - ➢ To determine the net profit to be incorporated in the balance sheet
  - ➢ To determine the tax liability of the project

Economic Analysis

- The economic aspect of project preparation is primarily concerned with the determination of the likelihood of the proposed project, and hence the committing of scares resources, by justifying the significance of the project from **the whole economy** point of view (the society as a whole).

- In such evaluation the focus is on the social costs and benefits of a project, which may often be different from its monetary or financial costs, and benefits.

- The financial analysis views the project from the participants (or owners) point of view, while the economic analysis form the society's point of view.

- Decision makers here are concerned about the investment of scarce capital and other resources that will best further national objectives. This is true whether the resources committed are being invested by government directly or by individuals within the economy.

Economic & Social……….

- The aim is to measure the loss and gains in economic welfare of the society in which a project is implemented.

- Issues to be considered include:

a. The price of inputs and outputs

b. The valuation of the outputs of certain services

c. The evaluation of indirect effects-externalities

▪ It is difficult to compare costs & benefits directly because the prices used are distorted by inflation, foreign exchange and reducing all the costs & benefits to a common denominator is so difficult that we use **adjusted price, shadow price, or accounting price.**

- While financial analysis uses projected market prices to value inputs and outputs, economic analysis uses 'economic prices' or 'shadow prices' or 'efficiency prices' to better approximate the opportunity costs of an input.

- Similarly, economic analysis uses the marginal value of a given output to approximate the real value.

- Thus, economic analysis require adjustment of market prices, which may not reflect the real value of resources and outputs, into economic prices.

- It also require determination of economic prices of those goods that might not have market prices but that involve commitment of real resources.

Economic Analysis

- **Purpose of Economic Analysis**

- Economic analysis is an assessment of a project's costs and benefits from the national point of view and is therefore concerned with the impact of a proposed project on the national economy.

- It can be distinguished from financial analysis in that attention is not confined to the costs and benefits affecting a single group, the focus of economic analysis is on the net return to society.

- In economic analysis the most important question is whether or not the project under study is beneficial to the national economy.

- Economic analysis is, therefore, conducted to identify costs and benefits where there is a significant divergence between market prices and economic costs or values.

- Economic analysis can be useful for private-sector projects since it will assist government agencies to make decisions if they have to give loan guarantees.

- The aims of economic analysis in the context of project preparation are:
  - To ensure that public investment funds are used only for economically viable projects.
  - To ensure that a convincing economic case can be made for PIP or PEP projects to benefit from external funding.

Economic Analysis

- **Economic analysis** is less likely to be needed when:
  - The project is small (unless it is a pilot project likely to be replicated),
  - The project is financially viable and although to producing primary products for the local market,
  - Involves no significant negative externalities and no significant use of under valued local resources,
  - The project is financially viable and producing mainly for export with no significant negative externalities and no significant use of under valued local resources, and
  - The project is in a sector where valuation of the benefits is not practical and where there are no issues of cost effectiveness in determining the project design.

- **Stages of economic Analysis**

- 1. A statement on a year by year basis of costs and benefits at constant market prices.

- 2. The identification of linkages and externalities.

- 3. The adjustment of prices of goods and services taking into account their relative scarcity or estimation of economic or 'shadow' prices.

- 4. Comparing economic costs with economic benefits to determine which among alternative project proposals have acceptable returns.

Economic Analysis

- The costs and benefits of a proposed project must, therefore, be identified. Furthermore, once costs and benefits are known, they must be priced, and their economic values determined.

- In economic analysis, anything that reduces national income (or a wider definition of public welfare) is a cost and anything that increases national income/welfare is a benefit.

- Once financial prices for costs and benefits have been determined and entered in the project accounts, the formulators must estimate the economic value of a proposed project to the nation as a whole.

- Financial prices are, therefore, the starting point for economic analysis; they are adjusted as needed to reflect the value to the society as a whole of both project inputs and outputs.

- The principle of opportunity cost underlies all estimation of values in economic efficiency analysis.

- This principle states that the economic value of a resource is determined by its next best alternative use.

- The idea that the value of a project is determined by the difference between the assumed situations 'with' and 'without' project is an application of the opportunity cost principle.

- An example of the use of the opportunity cost principle in economic analysis is provided by the case of opportunity

- The opportunity cost of land can be investigated by asking what the alternative use of the land might be.

- Urban land can be used for houses, offices, shops, factories, and the like. cost of land.

Social appraisal

- The process of development is inherently social, dealing as it does with the improvement of social conditions and working through social structures to achieve these objectives.
- It is, therefore, crucial to integrate comprehensive social assessment into the project formulation process.
- The precise role of social assessment can be defined as ensuring that people, their capacities, values and needs are put at the centre of the development process.
- Project planners must make careful consideration of social factors when formulating projects.
- Experience has shown that ignorance of these factors can lead to project failure.
- Project formulators who have designed projects by applying expert knowledge without stakeholder consultation have often failed to achieve positive results.
- If social assessment is primarily concerned with ensuring that projects, and consequently the development process, are 'people- centered' then the following points must be taken into account in any project formulation exercises.
- These are:
  - ❖ Identifying of stakeholders and target groups.
  - ❖ Participation issues.
  - ❖ Social impact assessment (SIA)
- Assessing of mitigation measures, strategies and costs of SIA.
- Once the various stakeholders have been identified it is then necessary to consider their interests. These interests should be entered in the second column of the stakeholder table.
- When identifying stakeholder interests it is important to keep the following points in mind:
- Relate the stakeholders' concerns to the project objectives.
- Identify direct or indirect benefits which they are likely to receive from the project.
- Consider the costs they are liable to incur directly or indirectly as a result of the project.

Social appraisal

- The aim of participation is to produce a situation where stakeholders are willing to contribute to the successful implementation of the intended project and its future sustainability.

- Participatory approaches, which create an awareness amongst stakeholders of their own situation, of the socio-economic environment they live within, and of measures they can take to begin changing their environment, should be considered during project formulation.

- When dealing with participation as an element of project formulation it is important to think in terms of both quality and quantity that should be related to project objectives.

- This is because the level of participation necessarily varies from project to project and, while participation is important in all projects, some projects may even have participation as an objective in its own right.

- A useful place to begin when analyzing the level of participation expected and actually present in project formulation is with the construction of a participation matrix.

- Social impact assessment (SIA) is a term used to classify the process of assessing how the benefits (and Costs) of a project are distributed amongst various stakeholders over time.

- SIA is often used in evaluating the 'winners' and 'losers' of proposed policy reforms but its techniques can also be applied to project analysis.

- SIA is essentially concerned with three distinct areas:

- Impact of the project on its stakeholders.

- Impact of the stakeholders in terms of achieving the project objectives.

- People's response to the opportunities created by the achievement of the project objectives.

Social appraisal

- SIA is inextricably linked with stakeholder analysis; indeed stakeholder identification is the first of five distinct stages which together comprise Social Impact Assessment:

- **Stage 1, Scoping**: This involves stakeholder identification with environmental scoping. If scoping of social impact, determines no significant negative effects then there will be no need to carry out further SIA.

- **Stage 2, Baseline and impact identification**: This involves a consultative process of information-gathering regarding community baseline data like that undertaken in PRA and a consultative process in terms of identifying the potential social impacts of the project. This process is liable to utilize a variety of techniques such as:

  - Quantitative surveys
  - PRA
  - Qualitative questionnaires
  - Community discussions
  - Ethnographic field research

- Stage 3, Development of mitigation measures: Once the potential impacts have been identified the 'next stage is to formulate measures to minimize those negative impacts whilst maximizing the positive impacts.

- Stage 4, Production of draft SIA: Once the impacts have been identified and mitigation measures formulated the next stage is to produce a draft of the social impact assessment document which contains this information

Social appraisal

- Stage 5, Production of final SIA and social impact management plan- The final document will consist of a social impact assessment report and a management plan containing details of the mitigation measures and strategies to be undertaken together with their associated costs.

- The time required to undertake SIA can vary greatly dependent on the scale of research and size of sample areas.

- Due to overlapping data requirements and the need to minimize resource duplication, it is recommended that SIA be carried out simultaneously with stakeholder analysis and institutional Aspect.

- **Assessment of mitigation measures, strategies and costs**

- The success of this stage of the social assessment process is largely dependent on the quality of stakeholder analysis and social impact assessment carried out previously.

- The assessment of mitigation measures, strategies and costs will form the social impact management plan produced along with the SIA report.

- The analytical work carried out in previous stages of social assessment (stakeholder analysis, participation and gender analysis etc.) is likely to have identified potential options to limit the negative impact on stakeholders.

- These options now need to be studied in more detail in order to develop a comprehensive strategy to mitigate negative impacts.

- Stakeholder consultation is essential in order to suggest both feasible and desirable mitigation measures.

- Both costs and benefits of mitigation strategies should be calculated.

Environmental Analysis

- Environmental analysis is a field of growing importance in project preparation.

- Underestimation of the environment has resulted in negative outcomes such as poor human health, social disruption, reduced productivity and, ultimately, the undermining of development. When considering environmental aspects into project formulation exercises there are a number of issues that should be taken into considerations, these include:
  - A clear understanding of the meaning of Sustainability
  - Assessment of the potential environmental impact of the project: landfill, forest, soil, biodiversity, water, fishery
  - To suggest ways in which that impact could be reduced at a reasonable cost.
  - To formulate mitigation strategies and a plan of action.

- **Environmental sustainability of a development project**

- The World Commission on Environment and Development (WCED) defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

- This proposition raises the problem of defining the economic value of a capital stock. To help resolve the problem and also to provide guidance for the formulators a distinction needs to be clear among the following:
  - ❖ Man made capital, which is potentially expandable.
  - ❖ Critical natural capital, which is priceless.
  - ❖ Other natural capital, which may be nonrenewable and renewable.

Environmental Analysis

- The implications of the above classifications of capital stock are that the project formulators must seek to:
  - ❖ Maintain, if possible increase, the value of man made capital.
  - ❖ Avoid damage to critical natural capital at all costs.
  - ❖ Limit exploitation of renewable natural capital to sustainable level.
  - ❖ Internalize the cost of depleting non-renewable resources through some form of compensation measures.
- **Stages of environmental assessment**

1. Environmental screening

- Not all projects will require a full-scale environmental study.
- Nonetheless, it is important to be aware of the potential environmental effects of a project.
- The purpose of this screening process is to assess the type and complexity of environmental analysis techniques, which are likely to be necessary.
- The process aims to assess the project against simple criteria, to determine whether more detailed analysis are needed.
- Criteria used in environmental screening may include:
  - ❖ **Location**- projects that are being implemented in environmentally sensitive areas need further assessment.
  - ❖ **Type of project-** projects such as mines and dams are liable to cause a more damage than social projects.
  - ❖ **Size-** larger projects are more likely to require further or more detailed assessment

Environmental Analysis

- **Complexity-** a project with a number of disparate components is liable to have a wider range of environmental impacts, which need careful consideration.

- Data used in the screening process may take the form of general estimations or information already gathered from any similar projects.

- There are two possible results of environmental screening:
  - ❖ The project can continue as planned with no further EIA.
  - ❖ There is a need to prepare a more detailed preliminary assessment.

2. **Preliminary assessment**

- The preliminary assessment involves conducting a process of research and utilizing expert advice in order to achieve three objectives:
  - To **identify the key impacts of the project** on the environment
  - To **predict and describe the impacts** identified above
  - To assess the **potential importance of these impacts to decision makers**.

- The information from this preliminary assessment will help the formulators in deciding whether a project is cleared, rejected on environmental grounds or submitted to EIA.

- There are a number of useful checklists produced by different organizations, including the Ethiopian Environment Authority (EPA) that can help to assessment.

- The formulators are advised to refer to the appropriate guidelines or concerned authority.

Environmental Analysis

3. The meaning of environmental impact assessment (EIA)

- EIA is concerned with the identification, prediction and evaluation of the impacts of proposed project alternatives and measures aimed at eliminating or minimizing impacts and optimizing benefits.

- It is now widely accepted that those projects which incorporate EIA when necessary are more effective and often less costly.

- Not all projects require EIA to the same degree and intensity.

- Thus, classification of projects to determine the level of assessment is very useful for project formulation.

- Many donors/lenders and countries, including Ethiopia have developed four categories of EIA procedures. These are, named as **category A, B, C and D**.

- **Category "A"** projects are those that have diverse and significant environmental impacts. These types of projects require full environmental impact assessment. Dams and reservoirs, mineral development, resettlement and urban development.

- **Category "B"** projects are those that have **specific environmental impacts**. As the impact is specific limited environmental analysis is appropriate. E.G. rural water supply and sanitation, renewable energy and small scale projects.

Environmental Analysis

- **Category "C" projects** are those projects that normally with no significant environmental impact. These projects do not require environmental assessment. Technical assistance, consultancy, training and workshops are good examples.

- **Category "D" projects** are environmental projects. These are projects with a major environmental focus whose objective can be waste disposal, desalination or wildlife protection etc. They do not require EIA.

- In identifying significant EIA, project formulators must consider the following criteria:
  - ❖ Length of time and geographical coverage over which the effects will be felt.
  - ❖ Urgency that refers to how quickly a natural system might deteriorate and how long it takes to stabilize.
  - ❖ Degree of irreversible damage to the environment, natural resources and life supporting systems.

- In conducting EIA there are clearly defined stages or procedures which should be taken into consideration. These are:
  - ❖ Identifying of the various potential impacts of the project on the environment.
  - ❖ Predicting of the extent of the environmental changes.
  - ❖ Assessing of whether or not the identified and predicted changes are of any environmental significance.
  - ❖ Planning of mitigation measures or alternatives that could reduce the project's environmental impacts.

- EIA will lead to an eventual decision to **accept**, **reject** or **modify** a project.

- If a project have a serious environmental impact then it is necessary to prepare an environmental management plan (EMP) with the required financial expenditure.

Environmental Analysis

- **Assessment of mitigation measures, strategies and costs**

- Where potentially negative environmental impacts have been identified, it is necessary to consider ways in which these impacts can be overcome.

- This involves suggesting various measures and strategies to avoid, reduce or overcome these impacts.

- These various measures and strategies can be defined as forms of mitigation.

- A general overview of the various types of measures, include to:

  – Avoid negative impacts- redesign the project to avoid those areas with the potential to cause significant environmental impact.

  – Abandon the project altogether because the potential impacts are too serious.

  – Other avoidance strategies may include: changing the project's location; establishing buffer zones around sensitive ecosystems; avoiding transport routes with the potential to disrupt local populations and related activities; and deciding to exclude a certain project component because of its potential impact.

  – Reduce negative impacts- this involves introducing mitigation measures to reduce the impact of existing activities.

  – Reduction activities could include: treatment plants to reduce pollution; landscaping and using local materials to reduce the visual impact of new structures; scheduling project activities during the dry season to reduce.

  – Compensate for negative impacts- in some instances it will not be possible to avoid or reduce environmental impacts entirely. If this is the case then it will be necessary to include compensation for victim society.

Environmental Analysis

- Compensation could be financial or in the form of a compensatory project which aims to produce benefits for affected people.

- It is essential that mitigation measures be planned in integrated manner to ensure the effectiveness in combination and do not transfer the negative impact to another area.

- In projects where serious environmental impacts have been identified it will be necessary to collate these mitigation strategies in the form of an environmental management plan (EMP).

Environmental valuation techniques

- Valuation of environmental effects includes the measurement of environmental costs and benefits. There are various methods of estimating environmental costs and benefits. These methods can be categorized as:

- **Objective Valuation** (OV) methods that are based on physical relationships describing cause and effect to value the physical effect.

- **Subjective Valuation** (SV) methods are based on subjective assessment derived from real or hypothetical market behavior.

- Valuation techniques can also be divided between those that attempt to:
  - ❖ Value both costs and benefits that can be included in an overall cost and benefit calculation.
  - ❖ Concentrate on the cost side and might be used in either in cost effectiveness analysis or in some other form of analysis.

Environmental Analysis

- The various approaches to the valuation of environmental effects are described below:
- Those that attempt to **based on "OV"** include:
  - ✓ Effect on production or changes in productivity approach involves estimation of the effect of an environmental change on production in the affected project area. It is mainly applicable in projects affecting natural resources such as forests, fish and soil. **Determining the physical effects** of a project on the environment and estimating the values of the effects are a straightforward approach to estimate the costs of environmental mitigation.
  - ✓ Lose of **Earnings Approach** includes the valuation of human life and cost of illness approaches. This applies particularly to air and water pollution. The methodology involves calculating the loss of earnings through sicknesses or premature deaths.
  - ✓ **Replacement cost** and **compensation approach**, which take into account environmental damage by compensating or replacing/restoring the damaged asset. These techniques are applicable if cost of restoration/compensation is less than the value of the resources destroyed.

  The SV methods include:
  - ❖ **Hedonic Pricing methods** attempt to value a particular environmental state based on surrogate markets.
  - ❖ These markets use '**property value approach**' (e.g. housing) and 'wage differential approach' (e.g. labor).
  - ❖ In **property value approach**, environmental impacts are derived from changes in values.
  - ❖ The **wage differential** is used to estimate the costs associated with the risk of ill health or death at work.
- These methods are applicable where **market efficiencies are strong** to justify the assumptions, which will be **unlikely for developing countries.**

Environmental Analysis

❖ **Contingent valuation techniques** which are used to establish 'willingness to pay' for environmental improvement or 'willingness to accept' environmental damage.

- It is not possible to provide exhaustive lists/methods of valuation techniques. It is up to the formulators to select those techniques applicable to a project under consideration.

- Whatever strategy is chosen, it will be necessary to consider the associated costs and who has the responsibility to provide funds to cover these costs.

Environment Management Plan (EMP)

- The EMP sets out the various mitigation measures and related monitoring and institutional arrangements to be carried out to reduce the environmental impact of a project.

- An EMP is not required for all projects, but if serious potential impacts were identified during EIA.

- Relating this to the project categorization for EIA mentioned above an EMP should be prepared for:
  - All Category 'A' projects.
  - Some Category 'B' projects.

- A project's EMP should consist of the following components:

  ❖ **Mitigation**: potential mitigation strategies are identified from the categories described in EIA as mentioned above.

  ❖ **Monitoring**: the EMP must set out arrangements for monitoring of potential impacts and mitigation measures throughout the implementation and operational phases of the project cycle.

  ❖ **Institutional Arrangements**: this may relate to the establishment of environmental units with the specific task of implementing the EMP.

Environmental Analysis

Implementation Schedule and Costs.

- The EMP must provide:

  - ✓ A project implementation schedule for all aspects of mitigation, monitoring and institutional arrangements.

  - ✓ A detailed breakdown of the costs related to the implementation of mitigation, monitoring and institutional arrangements.

- These costs should be integrated into **total project costs** tables.

- The environmental management plan should be integrated into the overall implementation plan, budget and project analysis.

- It should not be seen as a separate, external component, but rather as an integral part of the project as a whole.

The 8 Step EA Process & Its Associated Outputs

1. Identify the Project: Identify the purpose and need of the proposed action.

• Develop a goal to provide a framework for EA.

2. Scoping, identify the issues, opportunities, and effects of implementing

• The proposed action

3. Collect and Interpret Data

• Identify probable effects of project implementation.

4. Design of the Alternatives Consider a reasonable range of alternatives.

• Usually at least three alternatives are considered.

• Include a No-Action Alternative.

• Consider the mitigation of negative impacts.

5. Evaluate Effects, Predict and describe the physical, biological, economic, and social effects of implementing each alternative.

• Address the three types of effects --Direct, Indirect, and Cumulative.

6. Compare Alternatives, Measure the predicted effects of each alternative against evaluation criteria.

7. Decision Notice Select preferred alternative and Public Review Allow for review and comment by the affected and interested public.

8. Implementation, Record results and Monitoring, Implement selected alternative.

• Develop a monitoring plan.

• Insure that EA mitigations are being followed.

The generally accepted method includes the following

- **Define Objectives:** define what you have to achieve to be successful and establishes a basis for dealing with risk and future decisions.
- **Identify Risk:** identify areas of risk which may limit or prevent achievement of objectives.
- **Quantify Risk:** evaluate and prioritize the level of risk and quantify frequency of occurrence and impact.
- **Develop Response:** define how we are going to respond to the identified risks; eliminate, mitigate, deflect or accept.
- **Document:** the risk management plan documents how we propose to tackle risk on the project.
- **Risk Control:** the risk control function implements the risk management plan.
- This may involve training and communication.
- And as the risks and work environment are continually changing, it is essential to continually **monitor** and **review** the risk level and your ability to effectively respond.

Techniques for identifying risk include:

- Analyzing historical records
- Structured questionnaires
- Structured interviews
- Brainstorming
- Structured checklists
- Flow charts
- Judgment based on knowledge and experience
- System analysis
- Scenario analysis (what-if)

Risk Assessment
Political Risk Assessment

- Political economy
- Political stability/predictability
- Political commitment of the authorities to the public
- Incentives
- Subsidies
- Company's success is achieved by pursuing opportunities to gain a competitive advantage, and projects have typically been setup to take advantage of these opportunities:-
  - to make something new, or
  - change an existing facility.
- Risk has always been an intrinsic part of project management.
- Risk management is gaining significance and importance due to:
  - increasing market competition,
  - increasing technology and
  - an increasing rate of change,
- Risks are generally deemed acceptable if the possible gains exceed the possible losses.
- A project risk may be defined as any event that prevents or limits the achievement of project objectives as defined at the outset of the project, and these objectives may be revised and changed as the project progresses through the project life-cycle.

Why Do Project Plans fail?

No matter how hard we try, planning is not perfect, and sometimes it may fail. Typical reasons include:

- Aggregate goals are not understood at the micro level.
- Plans encompass too much in too little time.
- Financial estimates are poor.
- Plans are based on insufficient data.
- No attempt is being made to systematize the planning process.
- Planning is performed by a planning group.
- Planners may not know the ultimate objective, the staffing requirements, and the major milestone dates.
- Project estimates are best guesses, and are not based on standards or history.
- Not enough time has been given for proper estimating.
- No one has bothered to see if there will be personnel available with the necessary skills.
- Individuals may not work towards the same specifications.
- Individuals are consistently shuffled in and out of the project with little regard for schedule.

Major criterion for Sustainable Project

- Low investment cost
- Adaptability to local skills
- Use of local raw materials
- Out put to meet the needs of the local people
- Import substitution & foreign exchange savings
- Creation of employment
- Profit generation
- Environmental harmony
- Continuity of production
- Supportive institutions
- Gender balance

Sensitivity Analysis

- Project planning starts by establishing assumptions & conditions on which the project is based

- They are generally based on inputs, outputs, costs, prices, and revenues

- Since the planner cannot make assumptions that will hold true with certainty, it is usual to check what will happen if this base changes.

- This study of assumption under varied assumptions is called sensitivity analysis

- What will happen to our project if all costs are increased by 10%?

- What will be the profitability of the project if the price of one unit of output drops by 20%?

- What will be the net income of a farming project if the output drops by 10% as an effect of bad rains?

- N.B. All these changes will affect the revenues, the costs, and the financial results of the project directly or indirectly through other means.

2.7.Measures of Project Worthiness

Project Selection....

- The selection of the right project for future investment is a crucial decision for the long-term survival of the company.

- The selection of the wrong project may well precipitate project failure leading to company bankruptcy .

- The execution of a project will tie up company resources, and as an opportunity cost the selection of one project may preclude the company from pursuing another project.

- We live in a world of finite resources and therefore cannot carry out all the projects we may want or need.

- Therefore a process is required to select and rank projects on the basis of beneficial change to the company.

2.7.Measures of Project Worthiness

- Project selection is the process of evaluating proposed projects, and then choosing to implement the best to achieve objectives of the organization.

- Each project will have different costs, benefits, and risks, which are known with certainty rarely.

- In the face of such differences, the selection of one project out of a set is a difficult task.

- Choosing a number of different projects, a *portfolio, is even more complex.*

- Project selection is only one of many decisions associated with project management.

- To deal with all of these problems, we use methods that can abstract relevant issues about a problem from the detail in which the problem is embedded-reality is far too complex to deal with in its entirety.

- The methods allows us to strip away almost all the reality from a problem, leaving only the relevant aspects of the "real" situation for us to deal with.

2.7.Measures of Project Worthiness

- A numeric methods is usually financially focused and quantifies the project in terms of either time to repay the investment *(payback) or return on investment. While non-numeric methods look at a much wider view of the project considering items from market share to environmental issues.*

- ❖ The main purpose of these models is to aid decision-making leading to project selection.

- When choosing a selection method the points to consider are; realism, capability, ease of use, flexibility and low cost.

- ❖ Most importantly the method must evaluate projects by how well they meet a company's strategic goals and corporate mission.

- ❖ The following sub-headings indicate the type of questions to ask:

- Will the project maximize profits?

- Will the project maximize the utilization of the workforce?

- Will the project increase market share or consolidate market position?

- Will the project enable the company to enter new markets?

- Will the project satisfy the needs of the stakeholders aspirations?

- Is the project's risk and uncertainty acceptable?

Numeric Methods

- The numeric selection methods presented here may be sub-divided into **financial** and **scoring methods**. The financial ones are:
  payback period

  return on investment (ROI)

  net present value (NPV)

  internal rate of return (IRR)

- Companies tend to prefer financial ones and often select solely on profitability. This may not be as drastic as it sounds because subconsciously the managers will consider a wider scope of selection criteria.

- In an investment appraisal only the incremental income and expenses attributed directly to the project under consideration should be included.

- Costs that have already been incurred (sunk costs) should be ignored as they are irrelevant to decisions effecting future projects.

Scoring Methods

- The numeric methods discussed so far all have a common limitation; they only look at the financial element of the project.

- In an attempt to broaden the selection criteria a scoring method called the factor method which uses multiple criteria to evaluate the project.

- The factor method simply lists a number of desirable factors on a project selection performance along with columns for selected and not selected.

- A weighted column can be added to increase the score of important factors while reducing the scoring of the less important.

- The weighted column is calculated by first scoring each factor, and then dividing each factor by the total score.

- The total weighted column should always add up to one.

- The factors can be weighted simply 1 to 5 to indicate; 1 "very poor", 2 "poor", 3 "fair", 4 "good" and 5 "very good".

2.7.Measures of Project Worthiness

- When costs and benefits have been identified, quantified and priced (valued), the analyst is trying to determine which one, among various projects, to accept and which to reject.

- There are two methods for measuring the worthiness of projects: undiscounted & discounted methods.

- The arithmetic of these discounted methods, and the way we interpret the measures and their limitations, is exactly the same whether we are using them for financial analysis or for economic analysis.

- Before embarking on the methods, it is important to note two critical points. First, there is no one best technique for estimating project worth; each has its own strength & weakness.

- Second, these financial and economic measures of investment worth are only tools of decision-making, i.e., they are necessary conditions & are not sufficient condition for final decision.

- There are many other non-quantitative and non-economic criteria for making final decision of whether to accept or reject a project.

2.7.Measures of Project Worthiness

1. **Non-Discounted Measures of Project Worth**

- Use the cash flow as obtained through the project period without taking into account the present value of future cash flows
- There are 3 most commonly used NDM of project worth are:
 a. Ranking by inspection
 b. Payback period
 c. Return on Investment

2. **Discounted Measures of Project Worth**

- DM takes into account the difference between the value of money today, & the same value tomorrow-timing value of money.
- This measure is based on the concept that "to receive some today is better than to receive more tomorrow"
- Three major techniques in DM project worth computation:
a. Net Present Value (NPV)
b. Benefit - Cost Ratio (BCR)
c. Internal Rate of Return (IRR)

2.7. Measures of Project Worthiness

The Non-Discounted Measures (NDM)

- Use the cash flow as obtained through the project period without taking into account the present value of future cash flows.

- There are three most commonly used NDM of project worth:-

a. **Ranking by inspection**

b. **Payback period**

c. **Return on Investment**

a. Ranking by Inspection (RI)

- Given alternative investments which one should exclusive investments
- There may be an alternative as to build a hotel or a factory on the same site.
- The investor might choose to start one with limited resources he/she has.
- RI consists of choosing the best investment by comparing the net proceeds of alternative investments.
- The project having more cash proceeds will be preferred though are some peculiarities on inspections be implemented and which one should be discarded in a mutually.
- Comparing the net proceeds of A & B projects, we can find out which project has shorter life period
- Compare the net proceeds of the short lived project with long lived one
- If the two have the same initial investment & proceeds throughout the period of investment; & if the long lived investment continues to earn income after the end of the short lived one, then the long lived one is more desirable as the second project continues to earn proceeds while the first one has ended.

Net Cash Flow of 4 Hypothetical Projects with identical initial investment outlays & life periods

Project	Initial Cost	Net Cash Proceeds in Years		
		1	2	Total
A	20,000	20,000	-	20,000
B	20,000	20,000	2000	22,000
C	20,000	14,625	9825	24,450
D	20,000	**16325**	8125	24,000

- Then, which one is more desirable-taking into account the net proceeds?

- Although the total net proceeds of C & D are identical, D earns more income earlier than C.

- Thus, D is more desirable than C

- Project B is more desirable than A

b. Payback Period (PP)

- PP is dealing with the question of how long will it take to earn an amount of proceeds equal to the initial cost of investment?
- It involves with the calculation of the length of the period that is required for the stream of the earned cash proceeds to equal the initial cost of investment
- If the net annual proceeds are constant, the payback period in years is found by dividing the total initial outlay by the amount of expected annual cash proceeds
- If the total initial cost of investment was $500, & if the net amount proceeds is $100, for 10yrs, the PP would be $500/$100= 5yrs
- The implication is the investment cost would be covered in 5 yrs period.
- If the annual proceeds are not constant, the payback period will be obtained by finding out after how many years the total net proceeds will equal the original outlay.
- This is done by adding up the net proceeds year to year, until the amount of the initial investment cost is reached.

The PP period on the basis of the Previous Table

Project	Payback period (Yrs)	Ranking
A	1	1
B	1	1
C	1.5	4
D	1.4	3

- Both projects A & B have the same payback period, investment B is preferable, b/s it earns more proceeds than investment A.
- Both investment C & D have identical 2years PP, but looking at the proceeds earned, investment D will have earned $1,700 more than investment C only in the first year.
- Therefore, although investments C & D have the same PP, investment D is preferable than C. because it earns more than investment C in the earlier period.

Weakness of PPM of Project Worth

- It fails to take into account the proceeds earned after the PP
- It does not account for the timing of proceeds earned prior to the PP date

Payback Period

- The payback period is the length of time from the beginning of the project until the sum of net incremental benefits of the project equal to total capital investment. It is the length of time that the project requires to recover the **investment cost**.

- The method is very simple, and it is a good measure when the project has problem of liquidity.

- The pay-back period is also a common, rough means of choosing among projects in business enterprise, especially when the choice entails high degree of risk.

- Since risk generally increases with futurity, the criterion seems to favor projects that are *prima facie* less risky. This method has two important weaknesses: First, it fails to consider the time & amount of net benefits after the payback period. Second, it does not adequately take into account the time value of money even in the payable periods.

- **Payback Analysis**: how long will it take (usually, in years) to pay back the project, and accrued costs: It indicates the number of years the project will take to repay its investment cost

- It is the length of time between the starting time of the project and the time when the initial investment is recovered in the form of yearly benefits

Measures of Project Worth

Alternative projects	Year	Investment cost	Net incremental benefits	Cumulative net incremental benefits
I	1	20000	-	
	2		2000	31,000
	3		8000	
	4		12000	
	5		9000	
II	1	20000	-	
	2		2000	34,000
	3		12000	
	4		8000	
	5		12000	
III	1	20000	-	
	2		1000	37,000
	3		5000	
	4		6000	
	5		8000	
	6		10000	
	7		5000	
	8		2000	

Measures of Project Worth

- Project I & II have a payback period of 4 year.

- But project III has a payback period of 5 years.

- Thus, based on this criterion, project I & II have equal higher rank than project III.

- Therefore, the method fails to consider the time & amount of net incremental benefit after the payback period- project III.

- In addition, the method results equal rank for both project I and II.

- Yet we know by inspection that we would choose project II over project I because more of the returns to project II are realized earlier.

- This method is a measure of cash recovery, not profitability.

c. Return on Investment (RI)

- Also called average income on cost.
- The simplest way to ascertain whether the investment in a project is viable is to calculate the return on investment (ROI).
- If a project investment is Birr 100,000, and gives a return of 20,000 per year over 10 years, the average return/year = (10 × 20,000) −100,000 = 1,000 X10 , in terms of percentage, it is 1%.
- Calculated by dividing the average income by the cost of investment.
- Some planner prefer to take the ratio of the average income to the book value (cost of investment after depreciation).
- Project C & D are preferred than A or B, but B is preferred than A.
- Weakness of RI: It doesn't take into account the timing of the cash flow.

Investment	Cost ($)	Average income	Average income on cost (%)	Ranking
A	20,000	0	0	4
B	20,000	660	3.3	3
C	20,000	800	4	1
D	20,000	800	4	1

Discounted Measures (DM) of Project Worth

- DM takes into account the d/c between the value of money today, & the same value tomorrow-timing value of money.

- This measure is based on the concept that "to receive some today is better than to receive more tomorrow"

- Three major techniques in DM project worth computation:

   Net Present Value (NPV)

   Benefit - Cost Ratio (BCR)

   Internal Rate of Return (IRR)

a. Net Present Value (NPV)

- The philosophy is "better today than tomorrow"- principle of the wise.

- One dollar today is worth more than one dollar tomorrow- the concept of NPV is based on this wisdom

- E.g the present value of $100 payable after 3 years from now can be defined as "that amount of dollars necessary to invest today at compound interest in order to obtain $100 in 3 years"

- The amount to invest today/the present value will depend on the rate of interest at which the money will grow & the frequency at which the rate of interest will be compounded.

- The NPV represents the net benefit over and above the compensation for time and risk.

- Hence, the decision rule associated with the net present value criterion is: accept the project if the NPV is positive and reject it if NPV is negative.

a. Net Present Value (NPV)

- **Properties of NPV**:-

- **NPVs are additive:-** The NPV of a package of projects is simply the sum of the net present values of individual projects included in the package.

- **Intermediate Cash Flows are Invested at Cost of Capital:-** The NPV rule assumes that the intermediate cash flows of a project-that is, cash flows that occur between the initiation and the termination of the project-are reinvested at a rate of return equal to the cost of capital

- **NPV calculation permits time-varying discount rates:-** when the discount rate changes over time

a. Net Present Value (NPV)

- **Net Present Value**

- The Net Present Value (NPV) of a project is the sum of the project values of all the cash flows-positive as well as negative-that are expected to occur over the life of the project.

- The general formula for NPV is:-

$$NPV = \sum_{t=1}^{n} \frac{c_t}{(1+r)^t} - I$$

- *C_t = cash flow at the end of year t*
- *n= life of the project*
- *r = discount rate*

Examples and Implications of NPV

Periods/Years	Investment	Interest	Total Earnings
1	1	0.10	1.10
2	1.10	0.11	1.121
3	1.121	0.121	1.331

- If $1.00 is invested at the beginning of the first year at 10% compound interest, the total return at the end of the 3rd year will be $1.331.
- It is possible to find the present value of a $100 future earning at 10% interest of by dividing $ 100 with 1.331 = 75.13, which implies that the sum of $75.13 that earns 10% compound annually will be $100 at the end of the 3rd year.
- This implies that an offer of $ 100 in 3yrs time is as attractive as an offer of $ 75.13 now-this is the justification for discounting, which enables flows of different yrs to be compared with the present flows.

$$PV = 100/ (1-0.1)^3 = 75$$

a. Net Present Value (NPV)
Cash flow analysis (Cost benefit Analysis)

Description	Year							
	1	2	3	4	5	6	7	8
Cost/Expenditure	100	150	200	200	250	300	400	500
Benefit/Income	150	200	250	300	350	420	500	650
Profit	50	50	50	100	100	120	100	150
Discount Factor (%)	0.91	0.83	0.75	0.68	0.62	0.56	0.51	0.47
NPV	46	41	38	68	62	68	51	70
Total NPV								444

a. Net Present Value (NPV)

- Financial tables give the appropriate conversion factor for various rates of interest.

When doing NPV, consider the ff:

- Choose an appropriate rate of discount

- Compute the present value of the cash proceeds revenues expected from the investments

- Compute the present value of the cash outlays/costs

- The present value of the revenues minus the present value of the costs is the net present value of the investment

- For any enterprise carrying out a financial analysis, the discount rate used is normally the interest rate at which bank loans are available

- When the enterprise funds are used, the rate which the bank would pay for the deposited of these funds are used. This is the "Opportunity Cost"

- The formula of the NPV of a project is generally the sum of the flows obtained as follows:-

Let x be the cash flow:

t =the particular year from initial year (0) to the last (n)

r=the discount rate of the investment

a. Net Present Value (NPV)

- The NPV of a project then is the sum of the flows (x_t) discounted:-

    $x_{0/} (1+r)^0 + x_{1/} (1+r)^1 + x_{2/} (1+r)^{2}\cdots\cdots x_{n/} (1+r)^n$ or

$$NPV = \sum_{t=0}^{n} \frac{x_t}{(1+r)^t} - I$$

- In order to make the present value net, we need to go further to the benefit and cost computation:- let B & C respectively be the total benefits & costs of a project duly discounted. The selection criterion for the project is then that the discounted benefits should exceed the discounted costs:-

$$V = \sum_{t=0}^{n} \frac{B_t}{(1+r)^t} > \sum_{t=0}^{n} \frac{C_t}{(1+r)^t}$$

a. Net Present Value (NPV)

Year	Cash flow
0	Birr (1,000,000)
1	200,000
2	200,000
3	300,000
4	300,000
5	350,000

If the cost of capital (discount rate) is 10%, then NPV is calculated as follows

$$NPV = \frac{200,000}{(1.10)^1} + \frac{200,000}{(1.10)^2} + \frac{300,000}{(1.10)^3} +$$

$$\frac{300,000}{(1.10)^4} + \frac{350,000}{(1.10)^5} - 1,000,000 = -5,273$$

NPV/I = Profitability Index

a. Net Present Value (NPV)

- The NPV represents the net benefit over and above the compensation for time and risk. Hence, the decision rule associated with the net present value criterion is: accept the project if the NPV is positive and reject it if NPV is negative.

- Properties of NPV:

- NPVs are additive:- The NPV of a package of projects is simply the sum of the net present values of individual projects included in the package.

- Intermediate Cash Flows are Invested at Cost of Capital: The NPV rule assumes that the intermediate cash flows of a project-that is, cash flows that occur between the initiation and the termination of the project-are reinvested at a rate of return equal to the cost of capital

- NPV calculation permits time-varying discount rates: when the discount rate changes over time, we use a different formula like the one shown below:

Measures of Project Worth

Interest rate	14%	15%	16%	18%	20%
Investment 12000					
Cash flow	4,000	5,000	7,000	6,000	5,000

$$PV_{C_1} = 4{,}000/1.14 = 3509$$

$$PV_{C_2} = 5{,}000/(1.14 \times 1.15) = 3814$$

$$PV_{C_3} = 7{,}000/(1.14 \times 1.15 \times 1.16) = 4603$$

$$PV_{C_4} = 6{,}000/(1.14 \times 1.15 \times 1.16 \times 1.18) = 3344$$

$$PV_{C_5} = 5{,}000/(1.14 \times 1.15 \times 1.16 \times 1.18 \times 1.20) = 2322$$

NPV of Project = 3509 + 3814 + 4603 + 3344 + 2322 - 12000 = 5592

NPV Computation….

Period	(1) Cash Flow ($)	(2) Present Value Factor	(3) Present value (Col. 1* Col. 2)
0	2227.80	1.000	2227.80
1	12356.60	0.690	8526.00
2	24116.60	0.476	11479.50
3	23766.60	0.328	7795.40
4	24116.60	0.226	5450.30
5	24358.60	0.156	3799.90
6	12974.50	0.108	1401.20
7	14576.60	0.074	1078.70
8	20268.60	0.051	1033.70
9	20686.60	0.035	724.00
10	31036.60	0.024	744.90
NPV			44261.40

NPV Cont'd…

- We computed the present value of the investment in the previous slide table using 0.45 as the discount rate.

- The present value of $1 due 0 periods from now discounted at any interest rate is 1.00.

- The present value of $1 due 1 periods from now discounted at 0.45 is 0.690.

- The present value of $1 due 2 periods from now discounted at 0.45 is 0.476.

- By the same analogy we found the value of $ 1 due 10 periods from now discounted at 0.45.

- The NPV of the investment is the algebraic sum of the 11 present values.

- The NPV is +ve indicating the project is acceptable.

- Any investment with NPV ≥ 0 is acceptable using this single criterion.

- NPV≥ 0, the investor could pay an amount in excess of costs of $ 44261.40 & could still break-even economically by undertaking an investment.

B. Benefit-Cost Ratio (BCR) Computation

- The ratio of the present worth of Gross benefits to the present worth of Gross Costs.

- BCR = $\dfrac{\text{Present worth of Gross Benefits}}{\text{Present Worth of Gross Costs}}$

    Or Present value benefits/Investment

- If the ratio is greater than 1, the implication is the investor will recover the investment.

- If the bank interest rate is as equal as or les than the discount rate used for the computation that gives 1, it is better to invest the money in the project than save in the bank.

- It is usual to compare the present worth of the net benefits with the present worth of the investment cost plus operating costs.

- Thus, **Net Benefits =Gross Benefit –Production Costs**

- **BCR is used in economic analysis – in the evaluation of economic benefits vis-à-vis the entire economy.**

- For private investment, Internal rate of Return is widely used.

B. Benefit-Cost Ratio (BCR) Computation

- **Benefit-Cost Ratio**: There are two ways of defining the relationship between benefits and costs:

(1) $$BCR = \frac{PVB}{I}$$

(2) $$NBCR = \frac{PVB - I}{I} = BCR - 1$$

PVB = present value of benefits, **I** = initial investment, **NBCR**= Net Befit Cost Ratio

- Example:

		100,000
Benefits	Year 1	25000
	Year 2	40000
	Year 3	40000
	Year 4	50000

$$BCR = \frac{\dfrac{25{,}000}{(1.12)} + \dfrac{40{,}000}{(1.12)^2} + \dfrac{40{,}000}{(1.12)^3} + \dfrac{50{,}000}{(1.12)^4}}{100{,}000} = 1.145$$

NBCR = BCR-1= 0.145

This discount factor is 12%

When BCR > 1 or NBCR > 0 accept
When BCR < 1 or NBCR < 0 reject the project

C. Internal Rate of Return (IRR)

- It is the rate of discount at which the total discounted cash proceeds/benefits expected from the project equals the total discounted cash outlays/costs required by the investments.

- The IRR is defined as the rate of discount, which brings about equality between the present value of future net benefits & initial investment.

- **IRR = Discount Rate, which makes the NPV zero**

- It is the value of r in the following equation.

$$I = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}$$

- I – investment cost

- C_t – Net benefit for year t

- r - IRR

- n - Life of the project

- IRR can be found by trial and error

Measures of Project Worth

Year	0	1	2	3	4
Cash flow	(100,000)	30,000	30,000	40,000	45,000

IRR is the value of r which satisfies the following equation:

$$100{,}000 = \frac{30{,}000}{(1+r)^1} + \frac{30{,}000}{(1+r)^2} + \frac{40{,}000}{(1+r)^3} + \frac{45{,}000}{(1+r)^4}$$

- The calculation of *r* involves a process of trial and error.
- Try different values of "r" till you find that the **right-hand side of the above equation is equal to 100,000**.
- Let us try to use 15%. This makes the right-hand side to be:

$$100{,}000 = \frac{30{,}000}{(1.15)} + \frac{30{,}000}{(1.15)^2} + \frac{40{,}000}{(1.15)^3} + \frac{45{,}000}{(1.15)^4} = 100{,}802$$

Since the value is slightly higher than our target value, which is 100,000, we increase the value to 16%.

$$100{,}000 = \frac{30{,}000}{(1.16)} + \frac{30{,}000}{(1.16)^2} + \frac{40{,}000}{(1.16)^3} + \frac{45{,}000}{(1.16)^4} = 98{,}641$$

Measures of Project Worth

- Since this value is now less than 100,000, then the value of r lies between 15 and 16%.

- For most of the purposes, this indication suffices.

- If a more refined estimate of r is needed, we use the following procedure:

1. Determine the NPV of the two closest rates of return.

   (NPV/15%) = **802**

   (NPV/16%) = **1,359**

2. Find the sum of the absolute values of the NPVs obtained in Step 1

   802+1,359 = **2,161**

3. Calculate the ratio of the NPV of the **smaller discount rate**, identified in Step 1, to the sum obtained in Step 2

   802/2,161 = **0.37**

4. Add the number obtained in Step 3 to the smallest discount rate

   15+0.37 = **15.37**

C. Internal Rate of Return (IRR)

- Since this value is now less than 100,000, we conclude that the value of r lies between 15% and 16%.

- For most of the purposes, this indication suffices.

- If a more refined estimate of r is needed, we use the following procedure:

1. Determine the NPV of the two closest rates of return

   $(NPV/15\%) = 802$

   $(NPV/16\%) = 1,359$

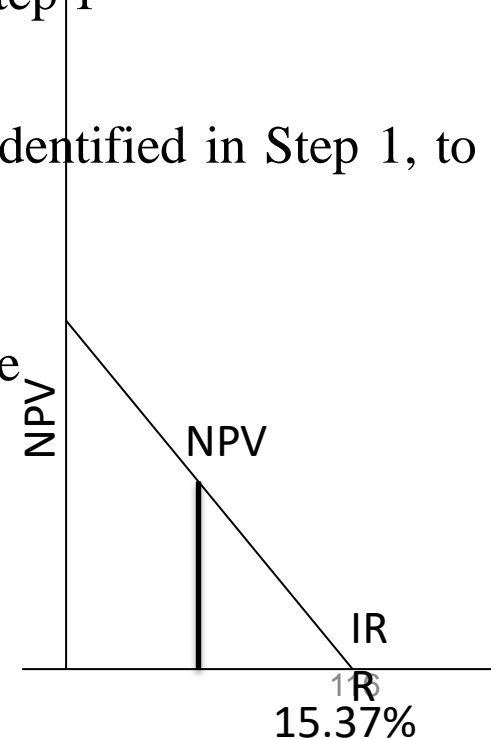2. Find the sum of the absolute values of the NPVs obtained in Step 1

   $802 + 1,359 = 2,161$

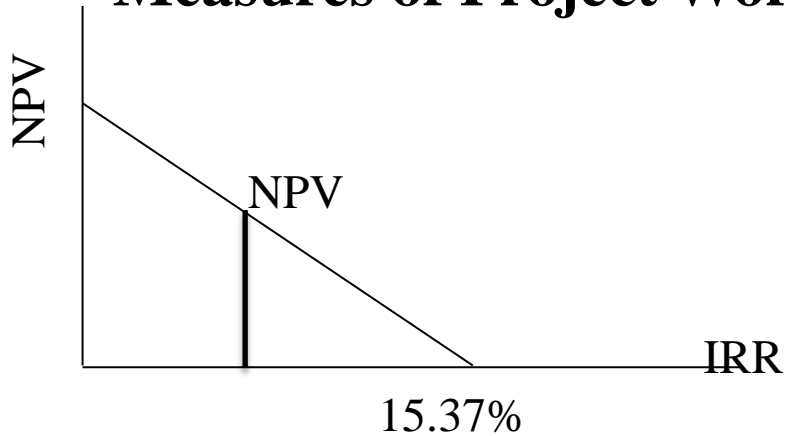3. Calculate the ratio of the NPV of the smaller discount rate, identified in Step 1, to the sum obtained in Step 2

   $802/2,161 = 0.37$

4. Add the number obtained in Step 3 to the smallest discount rate

   $15 + 0.37 = 15.37$

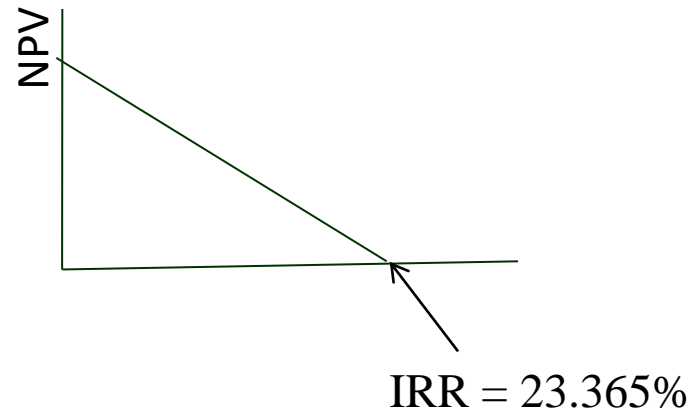## Measures of Project Worth

If two discounting rates are given, we can use this formula to find IRR

Lower discounting rate + (NPV at lower rate/difference b/n NPVs) x difference in rates)

For example, lower discount rate : 20% and higher 24%

The cash flow is: Year 1, Year 2 and Year 3 having 60,000 each.

Find IRR. It should be 23.365% .

IRR = 23.365%

IRR…

- Can be described as the rate of growth of an investment

- Can be interpreted as the highest rate of interest an investor could afford to pay, with out losing money, if all the funds to finance the investment are borrowed, and if the debt services (loan and accrued interests) was repaid by use of cash proceeds from the investment.

- When using IRR, the investment criterion is that the IRR should be greater than the discounted rate

IRR r/n ship with other methods

- When the NPV (the discounted benefits are excess of the discounted costs) is positive, then the IRR is greater than the rate of discount

- When the NPV is 0, then the IRR is equal to the rate of discount and the discounted benefits are equal to the discounted costs

- When the NPV is negative, then the IRR is smaller than the discount rate and the discounted benefits are smaller than the discounted costs

Accounting Rate of Return (ARR)

- ARR differs from the payback period in using **accounting profits** rather than cash flows

- It is calculated by taking the average annual profits expected from a project as a percentage of the capital invested

ARR = Average annual profit x100/outlay,

Cash Flows	A	B	C
Outlay	120,000	120,000	120,000
After deducting depreciation			
Year 1	30,000	20,000	10,000
Year 2	30,000	20,000	70,000
Year 3	30,000	20,000	80,000
Average Annual Profit	30,000	20,000	53,000

ARR of A = 30,000 x100/120,000 = 25%,
ARR of B = 20,000 x 100/120,000 = 16.7%,
ARR of C = 53,333 x 100/120,000 = 44.44%

Chapter 3
Models of Development Planning

- Harrod-Domar Model of development Planning

- The Fel'dman Model of development Planning

- The Mahalanobis Model of development Planning

- The Leontief Input-Output Model of development Planning

- The Linear Programming (Optimizing) Model of development Planning

- Macro econometric Model of development Planning

Introduction

- Planning models can be classified in several different categories: aggregate, main sector, multi-sectoral, regional and project specific models (Chowdhury and Kirkpatrick, 1994).

- They may be simulation models or more traditional econometric models.

- The former use informal calibration procedures, while the latter are calibrated more formally, using statistical theory which is in turn based on the assumption of time-phased structural stability.

- The simulation approach was developed in response to the self-evident observation that structural stability is precisely what the process economic development is designed to undermine.

- Planning models are useful for several reasons.

- The most obvious is that they allow policymakers to form quantitative estimates of the various trade-offs in preparing development policies.

- Planning models reflect the accounting regularities and conventions of national income and product accounts, balance of payments and income and expenditure balances of the public sector (Taylor, 1979).

Introduction

- Analytical models combine behavioral equations with accounting identities from these sources.

- As a result, the planner becomes aware of limitations imposed by the adding-up principle implicit in the underlying accounts and limitations on the degrees of freedom of the parameters that determine behavior.

- Planning models also serve as a means of communication with outside aid agencies, signaling donors that donated resources will be used wisely and in ways consistent with the broad development objectives.

- They communicate the thinking about how the resources will be best employed and the explicit assumptions (behavioral parameters, elasticities and the like) underlying the model can be reviewed and evaluated by outsiders.

- Inappropriate assumptions can be identified and removed.

- In contrast, planning models with sufficient structural detail also can be used to counterbalance any undue influence of generic, one-size-fits all models in discussions of multilateral agencies.

Introduction

- Aggregate growth models which may involve either optimization or balance are due to Solow, Ramsey and Mahalanobis, Chenery and monetary models for financial programming at the International Monetary Fund and the World Bank (Chowdhury and Kirkpatrick, 1994).

- They can serve as guide to the formulation of lower-level models, providing control totals for more disaggregated approaches.

- Aggregate planning models are indicative of the potential growth path of the economy and can be used to generate various scenarios ranging from pessimistic to optimistic.

- The can also be used to determined optimal accumulation paths far into the future.

- One of the most well-known models in economics employs the calculus of variations to find the optimal savings rate, the one that maximizes the discounted value of future consumption.

- In the 1960s, a by-product of the space program emerged in the form of optimal control models, a dynamic analogue to static Lagrangian nonlinear programming models.

Introduction

- The models were more flexible than the classical calculus of variations models of Ramsey and his followers, admitting piecewise continuous and inequality constraints.

- Planning models is a term applied to several disciplines, each using certain techniques to achieve the planning objectives.

- For example, in construction industry "Fast Track," Program Evaluation and Review Technique, PERT; Critical Path Method, CPM; and "CPM/Cost," are various planning tools devised for systematic and accelerated project implementation.

- However, development economists have concentrated most of their efforts on the analysis of the conditions currently facing various countries, the requisites for economic development, and the consequences and the experience of various countries in their development efforts.

- There is an absence of extensive economic development models in the literature. A number of theories on economic development have been

Introduction

- Beyond Leontief's and Kooros' models, (although the latter provide an optimum planning strategy, and the former does not), other so-called economic development models are descriptive or normative.

- Both Rostow, (1990) and Kooros, (1996) have described the "stages of economic development." and conditions that would lend to such an aspiration.

- Contrary to North (1993) the growth and development of industrialized economies was not merely the result of democratic institutions, but due to many other conditions including technology, resources, productivity, and economic policies.

- The Leontief's Input-output analysis accounts for general equilibrium phenomenon in the empirical analysis of inter-industry production.

- It forecasts the dynamics in both the final and intermediate goods.

- Accordingly, demand plays no role in this theory, unless demand for a product increases, which will impact the derived demand for other factors of production, and intermediate products.

- Even with its simplicity of assumptions, the input-output model will need massive amount of data on the economy's production interdependence.

- This model is particularly useful in predicating future production requirements given the availability of demand information.

Introduction

- "Several assumptions restrict the use of the model, among which are: homogeneity of the product by each industry and the fixity of proportions of input used in the production of any good. The second assumption momentarily dispels the idea of technological progress" (Henderson 1971).

- This latter assumption is addressed later on in the conclusion section.
  The input-output model consists of n simultaneous linear equations, with n variables to be determined. However, the ingenuity of Leontief to provide an eloquent predictive system pertaining to the real-world behavior through the formulation of this mathematical model that won him the Noble prize. Whereas to many it was initially considered pure abstraction, it is now a well-recognized model.
  To illustrate the model, the following simple example shows the structure of this general equilibrium for a three-industry structure, (steel, coal, and railroad), where each industry utilizes the input from others:

- Almost all-economic planning models deal with causal forecasting or economic growth determination, including Harrod-Domar Model.

- These models include: a simple Keynesian macroeconomic growth model, Leontief's Input/Output model, the social accounting matrix, general equilibrium models, and cost benefit analysis approach, [Gills, et. Al 1996].

- For example Horrod-Domor Model simply states the following:-

Introduction

- As stated in the introduction, the Markov-Chain model determines the consequence of changes in consumer preferences affecting a firm within an industry, or the consumers' behavioral changes or their economic performance, (with or without any growth in the total market).

- Leontief's Model estimates the impact of growth or dynamic change of one industry on the entire economy, whether such growth is uniform or skewed due to technology, differential capital injection, productivity, etc; and Kooros' model determines the need for resources, and prescribes the manner by which these resources should be allocated to each economic sector or programs so that the overall economic development objective (social welfare function) is maximized.

- After briefly describing each model in some details, Table VIII in the conclusion section shows the comparative structure, input and output of these models.

- Planning failed largely because of the lack of political power or will to enforce command and control measures in the absence of appropriate incentives.

- When targets were missed, little could be done other than revise the targets.

Introduction

Models of Development Planning:-

- **Economic development** occurs when all segments of the society benefit from the **fruits** of **economic growth** through **economic efficiency** and **equity**.

- It transforms a traditional **dual-system society** into a productive framework wherein every **one contributes** and receive benefits **accordingly**.

- "Economic development is a process by which an economy is transformed from one that is dominantly **rural** and **agricultural** to one that is dominantly urban, industrial, and service in composition" (Manley, 1987).

- It brings higher standard of living and welfare to a nation, while attempting the **Parato Optimality**, or a "win-win strategy" without negative externalities.

- **Planning models** is a term applied to several disciplines, each using certain techniques to achieve the planning objectives.

Cont'd

- A number of theories on economic development have been posed by economists dating back to Adam Smith, (1776), David Richrado, (1830), Karl Marx, (1880), W.W Rostow (1953), Leontief (1965), and others.

- However, none of these theories, except Leontief's, provide a viable **functioning structure** for a development model.

- Almost all-economic planning models deal with causal forecasting or economic growth determination, including Harrod-Domar Model….

- These models include: a simple Keynesian macroeconomic growth model, Leontief's Input /Output model, the social accounting matrix, general equilibrium models, and cost benefit analysis approach (Gills *et al*., 1996).

-

- **Economic growth** is defined as a sustainable rise in real GDP.
- Growth in strict sense does not refer to expansion of output for a brief period of time rather growth has to be understood in the long-run.
- Growth rate of GDP at a given time (year or quarter) can be calculated as:

- $g = \left(\dfrac{Y_t - Y_{t-1}}{Y_{t-1}}\right).100$

- where Y_t = GDP at time t.

Measuring Growth

- Given the formal definition for growth, it is required to determine the growth rate for a longer period.

- Given the annual growth rates of real GDP, g_i, the average growth rate over T period is given by:

- $g_{av} = \dfrac{\sum_{i=1}^{T} g_i}{T}$

- Under this approach, there is an implicit assumption that the variable at hand (GDP) is compounded annually. That is,

- $Y_1 = Y_0 + gY_0 = Y_0(1+g)$

- $Y_2 = Y_1 + gY_1 = Y_1(1+g)$
- $Y_2 = Y_0 + gY_0 + g(Y_0 + gY_0) = Y_0(1+g)2$
- $Y_2 = Y_0(1+g +g+g^2) = Y_0(1+2g +g^2)$
- $. = \ldots\ldots\ldots\ldots\ldots\ldots = \ldots$
- $Y_t = Y_0(1 + g)^t$

- Thus, growth $= \dfrac{Y_t - Y_{t-1}}{Y_{t-1}} = \dfrac{Y_0(1+g)^t - Y_0(1+g)^{t-1}}{Y_0(1+g)^{t-1}}$

- $= \dfrac{Y_0(1+g)^t}{Y_0(1+g)^{t-1}} - \dfrac{Y_0(1+g)^{t-1}}{Y_0(1+g)^{t-1}}$

- $Y_0(1+g)^t \Big/ \dfrac{Y_0(1+g)^t}{(1+g)} - 1 = 1+g-1=g$

Harrod-Domar Model of development Planning

- For example Horrod-Domor model simply states the following .

- Economic growth can be thought of as result of abstention from current consumption.

- If a farmer wants to increase output more than he used to produce, all he needs to do is increase the amount of seed by foregoing current consumption.

- The act of increasing the stock of seed is investment while the total accumulated level of seed is capital stock.

- Thus, capital stock is the machinery, equipment and the like which is used to produce output, and investment is the flow of output to increase or maintain capital stock.

- Current output (Y_t) is the sum of what is consumed (C_t) and saved (S_t).
- $Y_t = C_t + S_t$
- Assuming that what is saved is invested (I_t),
- $I_t = S_t$
- Let a capital stock have a path:
- $K_{t+1} = K_t - D_t + I_t = K_t - \delta K_t + I_t$
- where D_t is depreciation and δ is depreciation rate.
- Define a saving rate as $s = S_t/Y_t$ and capital-output ratio $\theta = K_t/Y_t$
- Combining the above three relations, a simple algebra gives the relation: $s/\theta = g + \delta$ where g is growth rate of GDP.

- That determines the resource gap (S_t -I_t)for a targeted level of g. That determines the financial requirement from abroad in the form of aid, loan, and foreign direct investment (FDI).

- The Harrod-Domar model can be extended to account for population growth:

- $\frac{s}{g} = g^* + n + ng^* + \delta \cong g^* + n + \delta$

- where g^* and n are growth in per capita GDP and population, respectively.

- The Harrod-Domar equation relates growth of an economy to two fundamental variables:
- the ability of the $s/\theta = g + \delta$ economy to answer the two fundamental variables:
- the ability of the economy to save (s) and the capacity (efficiency) of capital to produce (θ).
- To foster growth just increase s and/or increase efficiency of capital (decrease θ).
- For a given θ, given the domestic saving, one can see the resource gap ($S_t - I_t$) for a targeted level of g.

The Fel'dman Model of development Planning

- It is a Neo-Marxian model of economic development, created independently by a Soviet economist Grigory Fel'dman in 1928.

- It was amended by an Indian statistician Prasanta Chandra Mahalanobis in 1953.

- Essence of the model is a shift in the pattern of industrial investment towards building up a domestic consumption goods sector.

- The **model** argued that to reach a high standard in **consumption**, **investment** on **capital goods** is firstly needed.

- A high enough **capital goods** in the long-run expands the capacity of **producing consumer goods**.

- It is therefore continuing to follow "***heavy-industry-first***" policies.

Fel'dman Model Cont'd

- It recognizes the **significance of a number of factors**, viz:

- (a) the pattern of **income distribution……..** **Marxian thought**

- (b) increase in the **effective utilization** of the existing capital stock

- (c) distinction between degrees of **effective utilization** of the old and the new capital stocks.

- (d) consideration of the **rate of growth** in terms of **capital capacity** as well as in terms of the **absorption of a growing labor supply**.

Fel'dman Model Cont'd

- The model assumed that:-

  - there is no **government expenditure,** only **household consumption** and **firm investment**,

  - **Production** is independent of **consumption**, there is **no lags** in the growth process.

  - **Capital** is the **only limiting factor**, among others.

- It follows the **Marxian division** of the **total output** of an economy (**W**) into **capital goods** for both producer and consumer goods, and all **consumer goods** including **raw materials** for them.

- **Production** is the sum of **constant capital** ,C, **variable capital** (wages), V, and **surplus value**, S.

- $$CaW_1 = C_1 + V_1 + S_1$$

- $$+ CoW_2 = C_2 + V_2 + S_2$$

- $$W = C + V + S$$

Fel'dman Model Cont'd

- The **fraction of total investment** allocated to **Capital Goods** is the **key variable** in the model.

- The **rate of investment** is purely determined by the **coefficient** and **stock of capital**.

- Fel'dman (1928) employed the following notations to demonstrate the **two-sector model**:-

- ❖ The fraction of **total investment** allocated on **capital goods**;

  I = annual rate of **net investment** allocated to the respective categories, so that; $I = I_1 + I_2$;

- The investment measured in years, t,

  V = the **marginal capital coefficient** for the whole economy; as V_1 and V_2 represent for the respective category.

Fel'dman Model Cont'd

- C = the annual output of **consumer goods**;
- Y = the **annual net output/income** of the whole economy;
- α = the **marginal propensity to consume**;
- $\acute{\alpha}$ = the **marginal propensity to save**;
- t_0, C_0, and Y_0 = the respective initial magnitudes of t, C, and Y; and
- $I_1 = \gamma I$ = the **annual net investment** allocated to **capital**
- Thus, since only I_1 increases the capacity of producing **capital goods**, then it follows that
- $$\frac{dI}{dt} = \frac{I_1}{V_1} = \frac{\gamma I}{V_1}$$ [since $I_1 = \gamma I$]; $\mathbf{v_i}$ is the **accelerators**.
- In time t, **total investment** will **grow** at **an exponential rate**..

$$I = e^{\gamma t / V_1}$$

- In other words, **total investment** will grow at a **constant exponential rate** of γ/V_1. It could be certain proportion…

Fel'dman Model Cont'd

- Similarly, the annual rate of net investment allocated to category 2 (**consumer goods**) is given by $I_2 = (1-\gamma)I$.

- I_2 being the source of increased capacity in **consumer goods**,

- $$\frac{dC}{dt} = \frac{I_2}{V_2} = \frac{(1-\gamma)}{V_2} e^{\gamma t/V_1} \quad \text{since} \quad [\text{since } I = e^{\gamma t/V_1}]$$

- The annual rate of output of **consumer goods** is given by

$$C = C_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} \ (e^{\gamma t/V_1} - 1)$$

- The elements which determine the national income and the growth rate of the economy are given by

- $$Y = I + C$$

- By substituting the values of I and C in the above equation, it gives

$$Y = e^{\gamma t/V_1} + C_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} \ (e^{\gamma t/V_1} - 1)$$

Fel'dman Model Cont'd

- $Y = e^{\gamma t/V_1} - 1 + 1 + C_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} (e^{\gamma t/V_1} - 1)$

- $Y = (e^{\gamma t/V_1} - 1) + 1 + C_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} (e^{\gamma t/V_1} - 1)$

- $Y = [1 + C_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} + 1] \ (e^{\gamma t/V_1} - 1)$
- Assuming that $I_0 = 1$, the equation becomes.

- $Y = I_0 + C_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} + 1] \ (e^{\gamma t/V_1} - 1)$

- $Y = Y_0 + \left(\frac{1-\gamma}{\gamma}\right)\frac{V_1}{V_2} + 1] \ (e^{\gamma t/V_1} - 1)$ [Since $Y_0 = I_0 + C_0$]

- The fundamental equation shows that C and Y each represent a sum of a **constant** and an **exponential** in t.

- Their rates of growth will differ from γ/V_1.

- The values of C and Y will be greater than the value of I.

- With the going of time, the exponential $e^{\gamma t/V_1}$ will dominate the scenario and the rates of growth of C and Y will gradually approach γ/V_1.

- But this may take quite a long time, but the following happens:

Fel'dman Model Cont'd

- $C_0 = \dfrac{(1-\gamma)}{\gamma}\dfrac{V_1}{V_2}$

- The C and Y will grow at the rate of γ/V_1 from the **very beginning**.

- If the purpose of **economic development** is the maximization of **investment** or **national income** at a point of time.

- This is always true for investment and nearly always for income, and this will happen when V_1 greatly exceeds V_2 and even then for a short period of time.

- A high γ does not imply, however, any reduction in **consumption.**

- With capital assets assumed to be permanent, even $\gamma = 1$ would merely **freeze consumption** as its original level.

- If assets were subject to wear and tear, consumption would be slowly *reduced by failure to replace them*.

Critics on Fel'dman

- It is generally valid in a long term growth model to ignore some short-run issues,

- It is not valid to assume that long term growth does not alter the environment of the model.

- Fel'dman model ignores the impact of technological change on the rate of growth.

- It has no place in a long run theory, where the available techniques of production cannot be realistically "held constant".

- The irreversibility assumption 'capital goods are used by both sectors but, once investment is made, they cannot be transferred from one sector to the other'.

- Surplus labor assumption…

The Mahalanobis Model of development Planning

- The Mahalanobis model holds true based on the following assumptions:

- A closed economy.

- The economy consists of two sectors:- **consumption goods** (C) and **capital goods** (K).

- Capital goods are ***non-transferable*** once installed in any of the sector

- **Full capacity production**.

- Investment is determined by **capital goods supply**.

- **Constant prices**.

- **Capital** is the only **scarce factor**.

- Production of **capital goods** is independent of **consumer goods** production.

Mahalanobis Model cont'd

- Mahalanobis, (1953 & 1955) developed a **single-sector**, **two-sector**, and **a four-sector model** that fit into development planning of the Indian economy.

- In the **two-sector model** the entire **net output** of the economy could be produced in the **investment** and **consumer goods** sector.

- Based on the above assumptions, **net investment of the economy** is divided into capital goods sector (with a proportion λ_k) and consumer goods sector with a proportion (λ_c).

- Thus,

$$\lambda_c + \lambda_k = 1$$

- At any point of time (t), **net investment** (I) is divided into the **two** sectors:-

  $\lambda_k I_k$ = for improving capacity of the **capital goods sector**, and

  $\lambda_c I_c$ = for the **consumer goods** sector.

  In the form that $I_t = \lambda_c I_t + \lambda_k I_t$

Mahalanobis Model cont'd

- Take β as the **total productivity coefficient** when β_k and β_c are the capital-output ratio of the capital goods and consumer goods sector, then it can be shown that,

$$\beta = \frac{\beta_k I_k + \beta_c I_c}{\lambda_k + \lambda_c}$$

- The income identity equation for the entire economy is

$$Y_t = I_t + C_t$$

- If the **national income** changes, **investment** and **consumption** also.

- The change in investment and consumption depends upon previous year's **investment** (I_{t-1}) and **consumption** (C_{t-1}). Hence, the increase in investment in period t, is

$$\Delta I_t = I_t - I_{t-1}$$

and increase in **consumption** is

$$\Delta C_t = C_t - C_{t-1}$$

Mahalanobis Model cont'd

- Essentially, improvement in the two sectors is related to productive **capacity of investment** and the **output-capital ratio**.

- Initially, the **investment growth path** is determined by the **productive capacity of investment** in the **capital goods sector** ($\lambda_k I_k$) and its **output-capital ratio** (β_k), such that

- $I_t - I_{t-1} = \lambda_k \beta_k I_{t-1}$ there could be reinvestment from the **capital goods**

- $I_t = I_{t-1} + \lambda_k \beta_k I_{t-1}$

- $\boldsymbol{I_t = (1 + \lambda_k \beta_k)I_{t-1}}$

- Substitute different values for t (t= 1, 2, 3, . . .,) the solutions to the above equation.

- $I_1 = (1 + \lambda_k \beta_k) I_0$

- $I_2 = (1 + \lambda_k \beta_k) I_1$

- $I_2 = (1 + \lambda_k \beta_k) (1 + \lambda_k \beta_k) I_0$

- $\boldsymbol{I_2 = (1 + \lambda_k \beta_k)^2 I_0}$

Mahalanobis Model cont'd

- Similarly, by putting the value of t in above equation, it gives…
- $I_t = I_0 (1 + \lambda_k \beta_k)^t$
- $I_t - I_0 = I_0 (1 + \lambda_k \beta_k)^t - I_0$
- **$I_t - I_0 = I_0 (1 + \lambda_k \beta_k)^t - 1$** --------------------------------(1)
- Also, substitute the value of t ($t = 1, 2, 3, \ldots,$) in the consumption growth path, as $C_t - C_0 = \lambda_c \beta_c I_0$

$$C_2 - C_1 = \lambda_c \beta_c I_1$$

$$C_t - C_0 = \lambda_c \beta_c (I_0 + I_1 + I_2 + \ldots + I_t)$$

- Substitute the values of $I_1, I_2, \ldots, I_t$ on **consumption**, then:-

$$C_t - C_0 = \lambda_c \beta_c [I_0 + (1 + \lambda_k \beta_k)I_0 + (1 + \lambda_k \beta_k)^2 I_0 + \ldots + (1 + \lambda_k \beta_k)^t I_0]$$

$$C_t - C_0 = \lambda_c \beta_c I_0 [1 + (1 + \lambda_k \beta_k) + (1 + \lambda_k \beta_k)^2 + \ldots + (1 + \lambda_k \beta_k)^t]$$

$$C_t - C_0 = \lambda_c \beta_c I_0 \left[\frac{(1 + \lambda_k \beta_k)^t - 1}{(1 + \lambda_k \beta_k) - 1} \right]$$

$$C_t - C_0 = \lambda_c \beta_c I_0 \left[\frac{(1 + \lambda_k \beta_k)^t - 1}{\lambda_k \beta_k} \right]$$ -------------------------------(2)

Mahalanobis Model cont'd

- As such, the growth path of income for the whole economy, given above equation is:-

$$\Delta Y_t = \Delta I_t + \Delta C_t$$

or $\quad Y_t - Y_0 = (I_t - I_0) + (C_t - C_0)$ $\qquad$ --------------------(3)

- By substituting the values of equations (1) and (2) in equation (3), it gives….

- $Y_t - Y_0 = [I_0 (1 + \lambda_k\beta_k)^t - 1] + \lambda_c\beta_c I_0 \left[\dfrac{(1 + \lambda_k\beta_k)^t - 1}{\lambda_k\beta_k}\right]$

- $Y_t - Y_0 = I_0[(1 + \lambda_k\beta_k)^t - 1] \left[1 + \dfrac{\lambda_c\beta_c}{\lambda_k\beta_k}\right]$

- $Y_t - Y_0 = I_0 [(1 + \lambda_k\beta_k)^t - 1] \left[\dfrac{\lambda_k\beta_k + \lambda_c\beta_c}{\lambda_k\beta_k}\right]$ $\qquad$ --------------------(4)

- Supposing that $I_0 = \alpha_0 Y_0$ and substituting it in equation (4) above, it gives

- $Y_t - Y_0 = \alpha_0 Y_0 [(1 + \lambda_k\beta_k)^t - 1] \left[\dfrac{\lambda_k\beta_k + \lambda_c\beta_c}{\lambda_k\beta_k}\right]$

Mahalanobis Model cont'd

- $Y_t = \alpha_0 Y_0 [(1 + \lambda_k \beta_k)^t \; 1] + Y_0$ ----------------------(5)

- Supposing that $I_0 = \alpha_0 Y_0$ and substituting it in equation (5), it gives.

$$Y_t - Y_0 = \alpha_0 Y_0 [(1 + \lambda_k \beta_k)^t - 1] \left[\frac{\lambda_k \beta_k + \lambda_c \beta_c}{\lambda_k \beta_k} \right]$$

$$Y_t = \alpha_0 Y_0 [(1 + \lambda_k \beta_k)^t - 1] \left[\frac{\lambda_k \beta_k + \lambda_c \beta_c}{\lambda_k \beta_k} \right] + Y_0$$

$$Y_t = Y_0 \left[1 + \alpha_0 \frac{\lambda_k \beta_k + \lambda_c \beta_c}{\lambda_k \beta_k} \right] (1 + \lambda_k \beta_k)^t - 1)$$

- Where α_0 is the rate of investment in the base year, Y_0 and Y_t are the gross national income on the base and at year t, respectively.

- The ratio $\dfrac{\lambda_k \beta_k + \lambda_c \beta_c}{\lambda_k \beta_k}$ is the overall capital coefficient.

- Assume that β_k and β_c are given, then income growth will depend on α_0 and λ_k.

- Assuming further that α_0 to be constant, income growth will depend on, λ_k (the policy instrument).

Mahalanobis Model cont'd

- If $\beta_c > \beta_k$, implies that larger percentage investment on consumer goods industries, the larger will be the income generated.

- The expression $(1 + \lambda_k \beta_k)^t$, shows that after a range of time, larger investment in capital goods industries, will generat larger income.

- Initially a high value of λ_k increases the magnitude $(1 + \lambda_k \beta_k)^{t.}$, and lower the overall capital coefficient $(\frac{\lambda_k \beta_k + \lambda_c \beta_c}{\lambda_k \beta_k})$.

- As time goes a higher value of λ_k would lead to higher income growth in the long run.

- On the other hand, if $\beta_c = \beta_k$, then the reciprocal of the overall capital coefficient, that is, $\frac{\lambda_k \beta_k}{\lambda_k \beta_k + \lambda_c \beta_c} = \lambda_k$ equals marginal rate of saving.

- The important policy implication of the model is that for a higher rate of investment (λ_k), marginal rate of saving could also be higher.

- A higher rate of investment on capital goods in the short run would avail a smaller volume of output for consumption.

- In the long run, it would lead to a higher consumption growth rate.

Leontief Input-Output Model of development Planning

- Sectoral planning models have their roots in the model described by the young Harvard graduate student W. Leontief just after the turn of the century (Blitzer *et al*., 1975).

- The inter-industry or input-output approach pioneered by Leontief and first implemented in the Soviet Union, served a means by which consistent inter-sectoral plans could be drawn up.

- Input-output models have their roots in Quesnay's Tableau Economique, a physiocratic device that was the first effectively to separate real from nominal resources flows.

- In the standard input-output model, there is no substitution of factors in the production functions and final demand is exogenously determined, or in a later refinement later by a set of Engel curves.

- A dynamic version of the input-output model accounted for the accumulation of capital stock but was computationally clumsy and its linearity led to either a balanced growth turnpike or explosive diversion there from.

Leontief Input-Output Model of development Planning

- The input-output model is used to analyze inter-industry relationship to understand the interdependencies and complexities of the economy

- It is also known as "**inter-industry analysis**."

- It shows conditions for maintaining equilibrium b/n supply & demand.

- The assumptions of the technique operates:

  - No substitution between inputs to produce a given unit of output

  - The *input coefficient are constant*

  - The linear input functions imply that the marginal input coefficients are equal to the average

  - Joint products are ruled out,*i.e*, each industry produces only one commodity and each commodity is produced by only one industry

  - External economies are ruled out

  - Production is in a constant returns to scale.

- If the total output of say X_i of the ith industry be divided into various number of industries, 1, 2, 3,…n, then it gives the balance equation (Leontief (1951 & 1986)):-

Leontief Input-Output Model Cont'd

- $X_i = x_{i1} + x_{i2} + x_{i3} + \ldots + x_{in} + D_i$ -------------- (1)

- If an amount Y_i absorbed by the *outside sector* is also considered, then the balance equation of the ith industry becomes:-

- $X_i = x_{i1} + x_{i2} + x_{i3} + \ldots + x_{in} + D_i + Y_i$ -------------- (2)

  or $\displaystyle\sum_{j=1}^{n} xij + Y_i = X_i$ -------------- (3)

- Where Y_i is the sum of product outflows from the ith industry, to consumption, investment and exports, net of imports.

- Equation (3) shows the conditions of equilibrium between demand and supply (X_i).

- It illustrates the flows of outputs and inputs to and from one industry to other industries and vice versa.

- In the analysis of input-output, the system of equations (1) and (2) presents the conditions of internal consistency of the plan.

- If these equations are not satisfied, there might be excess of some goods and deficiency of others.

Leontief Input-Output Model Cont'd

- As x_{i2} represents the amount absorbed by industry 2 of the ith industry it then follows that x_{ij} stands for the amount absorbed by the jth industry of ith industry.

- Thus, the *technical coefficient* or *input coefficient* of the ith industry is denoted by…..

- $a_{ij} = x_{ij}/X_j$ ⎯⎯⎯⎯⎯⎯ (4)

- where x_{ij} is the flow from industry i to industry j, X_j is the total output of industry j and a_{ij} is constant which is called *technical coefficient* in the ith industry.

- it shows the number of units of one industry's output that are required to produce one unit of another industry's output.

- Cross-multiplying the terms in equation (4) gives……

- $a_{ij} \cdot X_j = x_{ij}$

- By substituting the value of x_{ij} in equation (3) and transposing the terms gives the basic input-output system of equations in the form.

Leontief Input-Output Model Cont'd

$$X_i - \sum_{j=1}^{n} a_{ij} x_j = Y_i$$

- n represents the number of sectors in the economy.
- If $n = 2$, that is, **two-sector economy**, then two linear equations could be stated symbolically in the form……

$$x_1 - a_{11}x_1 - a_{12}x_2 = Y_1$$

$$x_2 - a_{21}x_1 - a_{22}x_2 = Y_2$$

which can be represented in matrix notation as….

$$X - [A]X = Y$$

or $[I-A]X = Y$

- Where matrix $(I-A)$ is known as the Leontief Matrix and is further extended as…..

$$(I-A)^{-1} (I-A) X = (I-A)^{-1}Y$$

such that

$X = (I-A)^{-1}Y$ and I, is the identity matrix of the form,

Leontief Input-Output Model Cont'd

- $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

- Hence, $\begin{bmatrix} X_1 \\ X_2 \end{bmatrix} = \left\{ \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - [A] \right\}^{-1} \begin{bmatrix} Y_1 \\ Y_2 \end{bmatrix}$

- For analytical illustration purpose, there are only two sectors, agriculture (X_1) and textiles (X_2) in the economy.

- The Input-Output coefficient table depicts economic activity as:

	Agriculture	Textiles
Agriculture	0.6	0.2
Textiles	0.4	0.3

- Then, $A = \begin{pmatrix} 0.6 & 0.2 \\ 0.4 & 0.3 \end{pmatrix}$ and

- $I - A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} - \begin{pmatrix} 0.6 & 0.2 \\ 0.4 & 0.3 \end{pmatrix} = \begin{pmatrix} 0.4 & -0.2 \\ -0.4 & 0.7 \end{pmatrix}$

Leontief Input-Output Model Cont'd

- $[I - A]^{-1} = \begin{pmatrix} 0.7/0.2 & 0.2/0.2 \\ 0.4/0.2 & 0.4/0.2 \end{pmatrix} = \begin{pmatrix} 3.5 & 1 \\ 2 & 2 \end{pmatrix}$

- If the final demand is given by;

- $D = \begin{pmatrix} 10 \\ 5 \end{pmatrix}$

  such that, $x = [I - A]^{-1} D$

- Thus, given that $X = \begin{pmatrix} 3.5 & 1 \\ 2 & 2 \end{pmatrix} \begin{pmatrix} 10 \\ 5 \end{pmatrix} = \begin{pmatrix} 40 \\ 30 \end{pmatrix}$

- Implying that the two sectors agricultural (X_1) and textiles sector (X_2) would produce 40 and 30 units, respectively.

- The analysis can be extended to include many other sectors, like health, education, communication, transportation, manufacturing, banking, foreign trade and balance of payments, and so on, in the economy.

- The above presentation, however, is an open static model of Input-Output analysis.

Leontief Input-Output Model Cont'd

- In reality, most economic variables are dynamic

- Causes and effect, and action and reaction do not occur immediately after one and other:

- It takes some time for certain economic activities to happen as a result of some causes or actions.

- Thus, the analysis becomes dynamic when it is closed by the linking of investment part of the final goods to output.

- In the Leontief dynamic input-output model, the output of a given period is supposed to go into stocks (capital goods), which in turn are distributed among industries.

- The dynamic balance equation is of the form…..

- $X_i(t) = x_{i1}(t) + x_{i2}(t) + x_{i3}(t) + \ldots + x_{in}(t) + (S_{i1} + S_{i2} + S_{i3} + \ldots + S_{in}) + D_i(t) + Y_i(t)$

The Linear Programming Model of Development Planning

- The model is essentially an extension and generalization of input-output analysis, it can be interpreted as a **LP** problem.

- Thus, the LP model differs in several important respects from the standard input-output model on which it is based.

- In particular, production, imports and exports are variables whose level in each sector are to be determined by an optimizing solution.

- In addition, alternative activities and resource limitations are explicitly taken into account.

- The input-output model can be expressed in LP form.

- **LP** requires that all the mathematical functions in the model be linear functions.

LP Model

- It is well known that an input-output model provides, for each commodity- sector, balance equalities, which indicate that the total supply of and total demand for commodities are equal.

- Hence: Production + imports = inter-industry demand + export demand + consumption + other final demand.

- The LP version of the input-output model is then developed by formulating the following balance inequalities, for each commodity- sector:-

- Production ≥ inter-industry demand + export demand - imports + consumption + other final demand.

- To complete the LP format, an objective function - the maximization of the level of consumption – and resource constraints are added.

LP Model

- Max. $C = \sum \beta_i X_i$

Subject to: $(A-I) X_i + cX_i^c + eX_i^e - mX_i^m \leq -d_i$

$$a_{lj}X_i \qquad \leq L_0$$
$$a_{kj}X_i \qquad \leq K_0$$

and all $X_i \geq 0$

Where A = matrix of input coefficients
X_i = levels of production
X_i^c = level of consumption.
X_i^e = products produced for exports
X_i^m = products from imports
c = vector giving desired commodity composition of consumption,
D = other final Demand vector,
a_{lj} = labor input coefficients,
a_{kj} = capital input coefficients,
L_0 and K_0 initial stocks of labor and capital

The LP Model

- The LP version of the input-output model maximizes the linear function Z.

Let: Z = Objective function or linear function

$X_1, X_2, X_3, \ldots\ldots, X_n$ = decision variables

$$Z = c_1X_1 + c_2X_2 + c_3X_3 + \ldots\ldots + c_nX_n$$

subject to the following constraints:-

$$a_{11}x_1 + a_{12}x_2 + \cdots + a_{1n}x_n \leq b_1$$
$$a_{21}x_1 + a_{22}x_2 + \cdots + a_{2n}x_n \leq b_2$$
$$\vdots \qquad\qquad \vdots$$
$$a_{m1}x_1 + a_{m2}x_2 + \cdots + a_{mn}x_n \leq b_n$$
$$\text{all } x_j \geq 0$$

where a_{ij}, b_i, and c_j are given constants.

❖ **GAMS** can solve complex LP problems.

Macro econometric Model of development Planning

- The planning exercise and plan formulation of developing countries has found basis in macroeconometric models recently.

- Application of such models takes the form of a simple **Keynesian framework** of analysis; wherein, C_t = consumer expenditure, I_t = capital formation, Y_t = national income, r_t = interest rate, M_t = the exogenously supplied money, t = time.

- $C_t = \alpha_0 + \alpha_1 Y_t + \alpha_2 r_t + \mu_t$

- $I_t = b_0 + b_1 Y_t + b_2 r_t + v_t$

- $Y_t = C_t + I_t$

- $M_t = a_0 + a_1 Y_t + a_2 r_t + z_t$

$$\text{and}$$

- μ_t, v_t, z_t are error terms as in the equation below.

Macro econometric Model

- Such a model is not dynamic, it does not determine prices and it ignores **foreign trade**. Also, a change in **government taxes** and **spending** (public policy) is not assigned any role.

- Klein (1965) set out a **more sophisticated version of the model** which is presented as follow:-

- $C_t = \alpha_0 + \alpha_1 \dfrac{Y_t - T_t}{P_t} + \alpha_2 C_{t-1} + \mu_{1t}$

- $I_t = b_0 + b_1 \dfrac{Y_{t-1}}{P_{t-1}} + b_2 K_{t-1} - b_3 r_{t-1} + \mu_{2t}$

- $F_t = c_0 + c_1 \dfrac{Y_t - Y_{t-1}}{P_t} + c_2 F_{t-1} + c_3 \dfrac{P_{ft}}{P_t} + \mu_{3t}$

- $E_t = d_0 + d_1 T_{wt} + d_2 \dfrac{P_{et}}{P_t} + \mu_{4t}$

- $\dfrac{Y_t}{P_t} = C_t + I_t - F_t + E_t + G_t$

- $T_t = e_0 + e_1 Y_t + \mu_{5t}$

- $I_t = K_t - K_{t-1}$

Macro econometric Model

- $\dfrac{Y_t}{P_t} = g_0 + g_1 L_t + g_2 K_t + \mu_{6t}$

- $P_t = h_0 + h_1 \dfrac{w_t L_t}{Y_t P_t} + h_2 \dfrac{P_{ft}}{P_t} + \mu_{7t}$

- $\dfrac{W_t - W_{t-1}}{W_{t-1}} = j_0 + j_1 \dfrac{N_t - L_t}{N_t} + j_2 \dfrac{P_t - P_{t-1}}{P_{t-1}} + \mu_{8t}$

- $N_t = k_0 + k_1 (N_t - L_t) + k_2 w_t / P_t + \mu_{9t}$

- $\dfrac{M_t}{P_t} = l_0 + l_1 \dfrac{Y_t}{P_t} + l_2 r_t + \mu_{10t}$

- $P_e = m_0 + m_1 P + \mu_{11t}$

- In the above model; C=the real consumer expenditures, Y=national income in current prices, T=taxes less transfer payments, p=general price index, I=net real investment, K=real capital stock, r=interest rate, F=real imports, E=real export, L=employment, w=wage rate, and N=labour supply are the **endogenous variables** .

Macro econometric Model

- The exogenous variables are *p*, import prices, is volume of world trade, *G* is real government expenditures, and *M* is money supply.

- Practically, however, the planner will have to determine different types of the mentioned variables to render such a model applicable to the special problems of LDCs.

- The actual econometric techniques to be used depend upon initial specifications of the equations…

- Subjective judgement of the planner in the light of the actual state of information also determine the econometric model.

- See Agarwala (1970), Chenery *et al* (1971), Ghosh (1968), and Ghosh *et al* (1974).

Chapter 4.
Development Project Analysis

❖Valuing the environment

❖Contingent valuation method (CVM)

❖The environmental impact assessment

❖Multi-criteria analysis

Valuing The Environment

- Virtually all projects are planned and implemented in a social, economic, and **environmental** context, and have intended and unintended positive and/or negative impacts.

- A project should consider how it affects people and how people affect it.

- Therefore, it is very essential to consider projects in their cultural, social, international, religious, political, physical environmental and economic contexts.

- Thus, a project should consider:-

  – **Socio-cultural environment**: how it affects people and how people affect it.

  – **International and political environment**: applicable international, national, regional, and local laws and customs, and the political atmosphere.

  – **Physical environment**: how it affects physical surroundings including the local ecology.

Environmental Factors

- Environmental factors vary widely in type or nature of the enterprise. The factors include, but are not limited to:-
    - Organizational culture, structure, and governance;
    - Geographic distribution of facilities and resources;
    - Government or industry standards (e.g., regulatory agency regulations, quality and workmanship standards);
    - Infrastructure (e.g., existing facilities and capital equipment);
    - Company work authorization systems;
    - Marketplace conditions;
    - Stakeholder risk tolerances;
    - Political climate;
    - Existing human resources (e.g. skills, disciplines, and knowledge);
    - Personnel administration
    - Organization's established communications channels;
    - Commercial databases (e.g., standardized cost estimating data, industry risk study information, and risk databases); and
    - Project management information system.

Contingent Valuation Method (CVM)

- The **Contingent Valuation Method** (CVM) is an economic, non-market based valuation method especially used to infer individual's preferences for public goods, notably environmental quality.

- CVM is known in the literature by exploring the use of questionnaires and asking directly consumers.

- CVM is the most applied valuation method in recent years, and it has been developed mainly in the context of environmental valuation, over the last 30 years.

- The respondents could be asked for their **maximum willingness to pay** (**WTP**) for improving the environmental quality.

- CVM circumvents the absence of markets for public goods by presenting consumers with a market survey in which they have the opportunity to buy the good in question.

- Because the elicited WTP values are contingent upon the market described to the respondents, this approach came to be called the CVM.

- The CVM mean that the value of an environmental good is elicited directly, as answer to a question about WTP to have more of the good, or willingness to accept (WTA) to have less of it.

Contingent Valuation Method (CVM)

Basics of the CVM

- **It has 5 steps** in establishing the method as follows:-
- **Step 1: Construction of a hypothetical market**
- The main idea here is to construct a scenario that corresponds as closely as possible to a real-world situation.
- It is still usually hypothetical for the persons being interviewed.
- In most cases there may not be a direct link between the answers of the persons being interviewed in the CVM survey, and a possible decision to implement or not implement the environmental change to be valued.
- **a) Sets the reason for payment.**
- With standard market goods: We must pay to get more of a good.
- The improvement specified is **contingent** on payment actually being made.
- This scenario must be understood by respondent.
- **b) Must construct a so-called bid vehicle or method of payment.**
- It should fulfill conditions with respect to incentive compatibility, realism, and subjective justice among respondents.
- Relevant vehicles are:
  - Direct sum of money to be paid
  - Payment to a fund/contribution
  - Support of a particular tax
  - Payment in the form of higher price of goods to improve it (like electricity, water).

Contingent Valuation Method (CVM)

- c)Construct a provision rule. This is a mechanism by which the good is to be provided, as a function of the stated value.

- **Step 2: Obtaining the data**

- We select a limited sample of the underlying population, and let this sample go through an interview (or possibly a sequence of interview sessions). Interviews can be obtained in the following possible ways:

- a. Personal interview, person to person

- b. Personal interview session using an interactive medium (computer)

- c. Mail questionnaire (with follow-ups)

- d. Telephone interview Most research and recommendations about research departs from person-to-person interviews.

- These have advantages of face-to-face contact, increasing engagement and awareness by interviewee, reduces mis-understading, makes spontaneous questions possible (may be important).

- b can sometimes have advantages, in cases where a computer program may be better at choosing a (complex) path of questions when there are several alternatives.

Contingent Valuation Method (CVM)

- Valuation measure sought:-

- a. Maximum WTP for an improvement in environmental quality,

- b. Minimum WTA to abstain from an improvement in environmental quality

- c. WTP to avoid a worsening in environmental quality

- d. WTA to accept a worsening in environmental quality.

- **Possible bidding mechanisms**:

- a. "Bidding game": ask a sequence of questions until maximum is found.

- May suffer from lack of incentive compatibility and starting point bias, and fatigue effects.

- b. Payment card: Card indicates range of possible values, one of which is pointed out by interviewee. May have problems of starting point bias.

- c. Open-ended question: no anchor. Here high degree of individual impreciseness, and sometimes systematic bias, may be a problem.

- d. Closed-ended single-bounded referendum.

- e. Double-bounded referendum (same as d, but with an additional follow-up question of maximum WTP).

- The others provide more information, but this may be distorted.

Contingent Valuation Method (CVM)

- **Step 3: Estimating average WTP/WTA.**
- Straightforward with open-ended and bidding-game formats. More difficult with single-bounded referendum.
- Must estimated probability functions, requiring more data.
- **Step 4: Estimating bid curves**.
- Define bid curve for individual i as:-
- WTP(i) = f(Y(i), E(i), A(i), X(i), Q, U(i), e(i)),
    Where Y = income, E = education, A = age, Q = environmental quality, X = vector of other background variables we want to include, U = individual use of the environmental asset/object, e =random disturbance.
- Objective is to find a "best" fitting function of this sort, from the material collected.
- Since material is "experimental", simple estimation methods are usually sufficient (OLS or GLS with direct bid data, logit or probit with referendum-type data).
- Step 5: Aggregating the data
- Convert mean bids to population aggregates
- Utilize derived bids and bid functions for benefit transfer.

The Environmental Impact Assessment (EIA)

- It is a tool designed to identify and predict the impact of a project on the bio-geophysical environment and on health and well-being of the society.

- It is to communicate information about the impact, to analyze site and process alternatives and provide solutions to sift out or mitigate the negative consequences on the environment.

- The EIA is a means of avoiding environmental disturbances that are always much more expensive to correct after their occurrence.

- It is also important to underline that very few projects have been deemed not viable merely because of the cost of pollution control and that modern environmental control.

- Today, there is world-wide evidence that man cannot ignore the quality of the environment.

- Thus environmental issues must be addressed as soon as possible during project planning.

- There should not be any hesitation in abandoning a project at an early stage if it has very detrimental impact on the environment, like projects which are not economically or financially viable.

- In the same way as economic, financial, institutional, or technical analyses, EIA is an integral part of the project.

- Aware of this necessity, numerous countries have implemented EIA regulations.

- International agencies generally also lend their assistance to any industrial project of importance implementing an EIA, including pulp and paper industries.

Environmental Assessment (EA)

- Successful economic development depends on the rational use of natural resources and on reducing as far as possible the adverse environmental impacts of the projects.

- EA is a primary tool for achieving this objective, by inserting critical environmental information in to the process of project identification, preparation, and implementation.

- Economic analysis, by comparison, is employed to determine if the overall economic benefits of a proposed project exceed its costs, and to help design the project in a way that produces a solid economic rate of return.

- Adverse environmental impacts are part of the costs of a project, and positive environmental impacts are part of its benefits.

- Consideration of environmental impacts, therefore, should be integrated with the other aspects of the project in the economic analysis to the extent possible.

Environmental Analysis (EA)

- EA is a systematic, interdisciplinary process used to identify the purpose of a proposed action, develop practical alternatives to the proposed action, and predict potential environmental effects of the action.

- An EA identifies problems, conflicts, or resource constraints that may affect the natural environment or the viability of a project.

- It also examines how a proposed action might affect people, their communities, and their livelihoods.

- The analysis should be conducted by an Interdisciplinary Team consisting of personnel with a range of skills and disciplines relevant to the project.

- Team members should include a team leader and may include

- Engineers, geologists, biologists, archaeologists, and social workers.

- The EA process and findings are communicated to the various affected individuals and groups.

- At the same time, the interested public helps provide input and comment on the proposed project.

- The document produced as a result of the EA guides the decision maker toward a logical, rational, informed decision about the proposed action.

Cont'd....

- The EA process and interdisciplinary Team studies can reveal sound environmental, social, or economic reasons for improving a project.

- After predicting potential issues, the EA identifies measures to minimize problems and outlines ways to improve the project's feasibility.

- Environmental mitigations a designer can use to avoid potential impacts on wildlife like use of animal underpasses and culvert requirements for fish passage.

- The EA process can provide many benefits to the road builder, local agencies, and the communities who will be affected by road construction and maintenance activities.

- The process and resulting reports are tools that road managers to guide their decisions, produce better road designs and maintenance plans, identify and avoid problems, and gain public support for their activities.

- An EA document can be long and complex for major, potentially high impact projects, or it may only be a few pages long for a simple road project presents an **eight-step process** that is useful for doing Environmental Analysis. **SEE THE SECOND CHAPTER**

Multi-criteria analysis (MCA)

- MCA is a general framework for supporting complex decision-making situations with multiple and often conflicting objectives that stakeholders groups and/or decision-makers value differently.

- MCDA methods are **integrative evaluation methods** that combine information about performance of the alternatives with respect to the *relative* importance of the evaluation criteria.

- A MCA is when a project is evaluated by more than just monetary terms.

- It is a form of appraisal that measures variable like material costs, time savings and project sustainability as well as the social and environmental impacts that may be quantified but not so easily valued.

- MCA describes any structured approach used to determine overall preferences among alternative options, where the options accomplish several objectives.

- In MCA, desirable objectives are specified and corresponding attributes or indicators are identified.

- The actual measurement of indicators need not be in monetary terms, but are often based on quantitative analysis (through scoring, ranking and weighting) of a wide range of qualitative impact categories and criteria.

- Different environmental and social indicators may be developed side by side with economic costs and benefits.

- Explicit recognition is given to the fact that a variety of both monetary and nonmonetary objectives may influence policy decisions.

- MCA provides techniques for comparing and ranking different outcomes, even though a variety of indictors are used.

- MCA includes a range of related techniques, some of which follow this entry.

Multi-criteria analysis (MCA)

- MCA or **multi-objective decision making** is a tool that is particularly applicable to cases where a single-criterion approach (such as cost-benefit analysis) falls short, especially if significant environmental and social impacts cannot be assigned in monetary values.

- MCA allows decision makers to include a full range of social, environmental, technical, economic, and financial criteria.

- Analysis that is carried out in monetary terms does not usually, in practice, present the analysts with problems of choosing between the interests of different groups in society.

- A cost-effectiveness appraisal may be compare options with slightly different outputs, but these differences will should be weighted by decision makers at a later stage.

- The valuations used in cost-benefit analysis will include distributional judgments, but these will have been determined at an earlier stage.

- A broadly satisfactory criterion which appears to underlie many cost benefit analysis valuations is that they should reflect informed preferences of the people, to the extent that these preferences can be measured and averaged.

- The objectives included in any MCA analysis should sufficiently wide to encompass the main concerns of people as a whole.

Chapter 5
Project Implementation, Monitoring & Evaluation

1. **Project Implementation**

2. **Monitoring & Evaluation**

3. **Project Closing**

Plan execution

- At the beginning of the process, the core planning team should discuss the planning exercise and how it will be approached.

- The internal policies and procedures should consulted for information on the timelines, roles and responsibilities in the processes, and the internal quality assurance and approval arrangements.

- Information should be collected on the major global, regional, country or community challenges that need to be addressed.

- In the initiation phase, the team should put together a brief **issues note** and **draft work plan**.

- This would refine the planning process.

- The note should capture the available information on the critical challenges that need to be addressed.

- Inadequate stakeholder involvement is one of the most common reasons programs and projects fail.

- Thus, every effort should be made to encourage broad and active stakeholder engagement in the planning, monitoring and evaluation processes.

Cont'd

- Any given program, project or development plan is likely to have a number of important stakeholders.

- Effective planning is done with the participation of these stakeholders.

- The implemented development plan should be followed and kept checking at every stage to make it effective.

- The predefined objectives will be achieved if the implementation is as to the plan….

- In the absence of **effective monitoring** and **evaluation**, it would be difficult to know whether the intended results are as to the plan.

- What corrective action may be needed to ensure delivery of the intended results towards human development.

- Monitoring and evaluation always relate to pre-identified results in the development plan.

Project Executing/Implementing Stage

- It is the stage where we get things done. As project managers, we make sure that what we plan gets implemented.

- **Project Executing**: involves the actual implementation of the project activities to achieve the set targets and objectives.

- Project managers try to acquire, develop, manage staff, manage communication, communicate with stakeholders, conduct procurements, assure quality.

- During the **Implementation** phase, the project is mobilized and executed.

- This may require the tendering and award of contracts for technical assistance or works and supplies.

- During implementation, and in consultation with beneficiaries and stakeholders, project management assesses actual progress against planned progress to determine whether the project is on track towards achieving its objectives.

- If necessary the project is re-oriented to bring it back on track, or to modify some of its objectives in the light of any significant changes that may have occurred since its formulation.

Project Monitoring & Evaluation

- **Monitoring** and **evaluation** are tools that make it possible to identify and measure the results of projects, programs or policies
  - ❖ To evaluate and adjust **strategies** and **activities.**
  - ❖ To report on progress to interested parties.
  - ❖ To identify and share the best practices and lessons learned
  - ❖ To improve the programming of **new interventions** and **strategies**.
- Monitoring involves watching the progress of a project against time, resources and performance schedules during the execution of the project and identifying lagging areas requiring timely attention and action.
- Monitoring is defined as a management function to guide in the intended direction and to check performance against pre–determined plans.
- Monitoring means periodic checking of progress of works against the targets laid down in order to ensure timely completion of the project.
- Monitoring provides regular information on how things are working.
- It is a continuous **data collection** and **analysis process** is implemented to assess a project and compare it with the **expected performance.**
- **Evaluation** can only be done after a **certain time** and **requires more thorough investigations.**
- **Evaluation** is a **systematic** and **objective measurement of the results achieved by a project**, a program or a policy, in order to assess its **relevance**, its **coherence**, **efficiency** of its implementation, its **effectiveness** and its **impact**, as well as the **sustainability** .

Project Monitoring & Evaluation

- **Monitoring** assesses **progress in implementation** of ongoing projects.
- It should be an on-going activity during implementation.
- It can be carried out by beneficiaries, the managing staff, supervisory staff and the project management staff.
- **Evaluation** provides a **snapshot** against **some benchmarks** at a point in time of the project that may or may not be continuing.
- Monitoring
  - Holds implementers accountable for delivery of inputs
  - Provides basis for corrective action
  - Provides assessment of continued relevance
- Monitoring
  - ❖ Was delivery according to plan?
  - ❖ What were the deviations?
- Evaluation
  - ❖ Accountability - was money well spent?
  - ❖ Learning - what could we do better next time?
  - ❖ Focus on; Relevance, Appropriateness, Effectiveness/Success, Cost effectiveness, Lessons learned, Impact, Sustainability and Efficiency

Monitoring & Evaluation

Relationship Between M&E

- M & E are two different management tools that are closely related, interactive and *mutually supportive*.

- Through routine tracking of project progress, monitoring can provide quantitative and qualitative data useful for designing and implementing project evaluation exercises

- Through the results of periodic evaluations, monitoring tools and strategies can be refined and further developed.

- The aim should be to ensure that activities of the project are being undertaken on schedule to facilitate implementation as specified in the project design.
  - Are the right inputs being supplied/delivered at the right time?
  - Are the planned inputs producing the planned outputs?
  - Are the outputs leading to the achievement of the planned objectives?
  - Is the policy environment consistent with the design assumptions?
  - Are the project objectives still valid?

Monitoring and Evaluation

- Evaluation can be done internally or by external reviewers.
- The aim of evaluation is largely to determine the extent to which the objectives are being realized.
- It is about evaluation of success or failure of a project.
- Sometimes it could be done only at the end by sponsoring company, agency, etc.
  - Are or have objectives being/been met? If not, were the objectives realistic?
  - Was the technology proposed appropriate?
  - Were the institutional, management arrangements suited to the conditions?
  - Were the financial aspects carefully worked out?
  - Were the economic aspects carefully explored?
  - Did management quickly respond to changes?
  - Was its response carefully considered and appropriate?
  - How could the project's structure be changed to make it more flexible?

Monitoring and Evaluation - Timing

- Monitoring is an ongoing or periodic throughout the life of the program

- Evaluation:-Typically at mid-point in a funding cycle, a year before the end. It may be an **impact evaluation** between 3 to 5 years afterwards.

- **Monitoring** is the **systematic**, **regular collection** and **occasional analysis of information** to identify and **possibly measure changes** over a **period of time**.

- Evaluation is the analysis of the effectiveness and direction of an activity and involves making a judgment about progress and impact.

- The main differences between M&E are the **timing** and **frequency** of **observations** and **the types of questions** asked.

- However, when M&E are integrated as a project management tool, the line between the two becomes rather blurred.

Monitoring & Evaluation

- Participatory M&E is the joint effort or partnership of two or more stakeholders to M&E , systematically, one or more activities.

- Why to M&E ? In general, the purpose of M&E can be:
  - To assess project results:
  - To find out if and how objectives are being met and are resulting in desired changes.
  - **To ensure accountability**: to assess whether the project is effectively, appropriately, and efficiently executed to be accountable to the key agencies

- Projects even with a good planning, adequate organizational machinery and sufficient flow of resources cannot automatically achieve the desired result.

- There must be some warning mechanism, which can alert the organization about its possible success and failures, off and on.

- Constant watching not only saves wastage of scarce resources but also ensure speedy execution of the project.

- Thus, monitoring enables a continuing critique of the project implementation.

Monitoring & Evaluation

- **Efficiency** refers to the amount of time and resources put into the project relative to the outputs and outcomes.

- A project evaluation may be designed to find out if there was a less expensive, more appropriate, less time-consuming approach for reaching the same objectives.

- **Effectiveness** describes whether or not the research process was useful in reaching project goals and objectives, or resulted in positive outcomes.

- **Relevance** or appropriateness describes the usefulness, ethics, and flexibility of a project within the particular context.

- Combined, these criteria enable judgment about whether the outputs and outcomes of the project are worth the costs of the inputs.

- **Purpose of Monitoring**: Project monitoring helps to provide constructive suggestions like.

- Rescheduling the project (if the project run behind the schedule).

- Re-budgeting the project (appropriating funds from one head to another; avoiding expenses under unnecessary heading).

- Re-assigning the staff (shifting the staff from one area to other; recruiting temporary staff to meet the time schedule)

Monitoring & Evaluation

- **Steps in Monitoring**:
  - ❖ Identifying the different units involved in **planning** & implementation
  - ❖ Identifying items on which feedback is required.
  - ❖ Developing performance for reporting. Determining the periodicity of reporting. Fixing the responsibility of reporting at different levels.
  - ❖ Processing and analyzing the reports. Identifying the critical/unreliable areas in implementation.
  - ❖ Providing feedback to corrective measures.
- **Indicators for Monitoring**: Projects are usually monitored against. Whether the projects . Running on schedule. Running within the planned costs.
- **Meaning of Evaluation**. Evaluation has its origin in the Latin word "Valupure" which means the value of a particular thing, idea or action.
- Evaluation helps us to understand the worth, quality, significance amount, degree or condition of any intervention desired to tackle a social problem.
- Evaluation means finding out the value of something.
- Evaluation simply refers to the procedures of fact finding.
- Evaluation consists of assessments whether or not certain activities, treatment and interventions are in conformity with generally accepted professional standards.
- Any information obtained by any means on either the conduct or the outcome of interventions, treatment or of social change projects is considered to be evaluation.
- Evaluation is designated to provide systematic, reliable and valid information on the conduct, impact and effectiveness of the projects.
- Evaluation is essentially the study and review of past operating experience.

Monitoring & Evaluation

- **Purpose of Evaluation**. From an accountability perspective: The purpose of evaluation is to make the best possible use of funds by the program managers who are accountable for the worth of their programs.
- Measuring accomplishment in order to avoid weaknesses and future mistakes.
- Observing the efficiency of the techniques and skills employed.
- Scope for modification and improvement.
- Verifying whether the benefits reached the people for whom the program was meant.
- Form a knowledge perspective: The purpose of evaluation is to establish new knowledge about social problems and the effectiveness of policies and programs designed to alleviate them.
- Understanding people's participation & reasons for the same. Evaluation helps to make plans for future work.
- **Principles of Evaluation** .The following are some of the principles, which should be kept in view in evaluation. 1. Evaluation is a continuous process (continuity).
- 2. Evaluation should involve minimum possible costs (inexpensive).
- 3. Evaluation should be done without prejudice to day to day work (minimum hindrance to day to day work).
- 4. Evaluation must be done on a co-operative basis in which the entire staff and the board members should participate (total participation).
- 5. As far as possible, the agency should itself evaluate its program but occasionally outside evaluation machinery should also be made use of (external evaluation).
- 6. Total overall examination of the agency will reveal strength and weaknesses. (agency/program totality).
- 7. The result of evaluation should be shared with workers of the agency (sharing).
- **Stages in Evaluation**.1. Program Planning Stage. Pre – investment evaluation or Formative evaluation or Ex – ante evaluation or Early / Formulation Pre project evaluation or Exploratory evaluation or Need assessment.
- 2.Program Monitoring Stage. Monitoring Evaluation or Ongoing / interim. Concurrent evaluation.
- 3. Program completion Stage. Impact evaluation or Ex- post evaluation or (Summative / Terminal / Final) Final evaluation.

Monitoring & Evaluation

Types of Evaluation. Evaluation can be categorized under different headings.

- A) **By timing** (when to evaluate).
  - **Formative Evaluation**. Done during the program -development stages. (**Process Evaluation**, **ex-ante evaluation**, **project appraisals**).
  - **Summative Evaluation**. Taken up when the program achieves a stable of operation or when it is terminated (Outcome evaluation, ex post evaluation etc.)
- B) **By Agency.** Who is evaluating? **Internal Evaluation** Vs **External Evaluation**.
  - **Internal Evaluation** is a progress/impact, unbiased, objective detailed monitoring by the management itself
  - **External Evaluation is** assessment by an outsider (Ongoing / concurrent evaluation)
- C) **By Stages**:- **On going** = During the implementation
  - **Terminal** =After a time lag of a project or immediately from completion
  - **Ex–post** =after the completion of a project
- **Internal/External Evaluation: Internal Evaluation**: (Enterprise Self Audit) (concurrent evaluation) is a continuous process which is done at various points and in respect of various aspects of the working of an agency by the agency staff itself i.e. staff board members and beneficiaries.
- **External/Outside Evaluation**: (by outsiders /Certified Management Audit) how the program is implemented experienced and qualified evaluators (inspectors) may assess the work.
- **Inter agency evaluation.** In this type two agencies mutually agree to evaluate their program by the other agency. Inter agency tours.

Monitoring & Evaluation

- **Methods of Evaluation**: (Tools/techniques) a variety of the methodologies have been evolved by academicians, practitioners and professionals for evaluating any program/project.

- Some of the **commonly used practices** are given below.

- **First hand Information** : One of the simplest and easiest methods of evaluation by getting **first hand information** about the progress, performance, problem areas etc,. of a project from a host of staff, line officers, field personnel, other specialists and public who directly associated with the project.

- **Direct observation** & **hearing** about the performance and pitfalls further facilitate the chances of an effective evaluation.

- **Formal/Informal Periodic Reports**. Evaluation is also carried out through formal and informal reports. Formal reports consists of **Project Status Report.**

- **Project Schedule chart** -Project financial status Report. Project Status Report: From this one can understand the current status, performance, schedule, cost and hold ups, deviations from the original schedule.

- This indicates the time schedule for implementation of the project. From this one can understand any delay, the cost of delay and the ultimate loss.

- **Project Financial Status Report**: It is through financial report, one can have a look at a glance whether the project is being implemented within the realistic budget and time.

Monitoring & Evaluation

- **Areas of evaluation**: Evaluation may be split into various aspects, so that each area of the work of the agency, or of its particular project is evaluated. These may be:-

- **1.Purpose**: The review objectives of the agency/project and how far these being fulfilled.

- **2.Programs**: Aspects like number of beneficiaries, nature of services rendered to them, their reaction to the services, effectiveness and adequacy of services etc. may be evaluated.

- **3.Staff**: The success of any program depends upon the type of staff it employs. Their attitude, qualifications, recruitment policy, pay and other benefits and organizational environment. These are the areas which help to understand the effectiveness of the project / agency.

- **4.Financial Administration**: The flow of resources and its consumption is a crucial factor in any project/agency. Whether the project money is rightly consumed over spending in some headings, appropriation and misappropriation.

- **5.General**: Factors like public relations strategies employed by the project / agency, the constitution of the agency board or project advisory committee and their contribution future plans of the agency are important to understand the success or failures of any project.

- Evaluation Analysis on how successful the project has been in transforming the means (i.e. the inputs allocated to the project) through project activities into concrete project results.

- Provides the stakeholders with information on inputs/costs per unit produced.

Monitoring & Evaluation

Criteria for Evaluating Development Assistance.

- **Relevance.** The extent to which the project is suited to the priorities and policies of the target group, partner country and donor. **Possible questions**: To what extent are the objectives of the program still valid? Are the activities and outputs of the program consistent with the overall goal and attainment of its objectives? Are the activities and outputs of the program consistent with the intended impacts and effects?

- **Efficiency** = It measures outputs' qualitative and quantitative in relation to the inputs. It is a term which signifies that the project uses the least costly resources in order to achieve the desired results. The issue here is comparing alternative approaches to achieving the same outputs, to see whether the most efficient process has been adopted.

- **Effectiveness** = A measure of the extent to which a project attains its objectives

- **Impact** = The positive and negative changes produced by the project, directly or indirectly, intended or unintended. Possible questions: What has happened as a result of the project? What real difference has the activity made to the beneficiaries? How many people have been affected?

- **Sustainability** = Sustainability is concerned with measuring whether the benefits of an activity are likely to continue after the project funding has been withdrawn.

- **Possible questions**: To what extent did the benefits of a program or project continue after it has been closeout? What were the major factors which influenced the achievement or non-achievement of sustainability of the project?

Participatory Monitoring and Evaluation

	Conventional M &E	Participatory M &E
Who?	External experts	Stakeholders, including communities and project staff; outsiders:- facilitate
What?	Predetermined indicators, to measure inputs and outputs	Indicators identified by stakeholders, to measure process as well as outputs or outcomes
How?	Questionnaire surveys, by outside "neutral" evaluators, distanced from project	Simple, qualitative or quantitative methods, by stakeholders themselves
Why?	To make project and staff accountable to funding agency	To empower stakeholders to take corrective action

Monitoring and evaluation…

- **Evaluation Criteria**

- A major issue that affects any evaluation is the choice of criteria. Mostly the following criteria are used:

- **Relevance - the appropriateness of project objectives to the** problems that it was supposed to address, and to the physical and policy environment within which it operated

  - **RELEVANCE-** does the project address needs?

- **Project preparation and design – the logic and completeness of** the project planning process, and the internal logic and coherence of the project design

- **Efficiency - the cost, speed and management efficiency with** which inputs and activities were converted into results, and the quality of the results achieved

  - **EFFICIENCY-** are we using the available resource wisely?

- **Effectiveness - an assessment of the contribution made by results** to achievement of the project purpose, and how assumptions have affected project achievements

  - **EFFECTIVENESS-** are the desired output being achieved?

- **Impact - the effect of the project on its wider environment, and** its contribution to the wider sectoral objectives summarized in the project's Overall Objectives

  - **IMPACT-** has the wider goal been achieved? What changes have occurred that help beneficiaries?

Comparison Between M&E

Item	Monitoring	Evaluation
Frequency	Regular, ongoing	Episodic
Main action	Keeping track/oversight	Assessment
Basic purpose	Improving efficiency Adjusting work plan	Improve effectiveness, impact, future programming
Focus	Inputs/outputs, process outcomes, work plans	Effectiveness, relevance, efficiency, impact, sustainability
Information sources	Routine systems, field visits, stakeholder meetings, output reports, rapid assessments	Same plus Surveys (pre-post project) Special studies
Undertaken by	Project/program managers Community workers Supervisors Community (beneficiaries) Funders Other Stakeholders	External evaluators Community (beneficiaries) Project/program managers Supervisors Funders

Differences between Monitoring and Evaluation

Item	Monitoring	Evaluation
Frequency	routine, regularly scheduled	episodic
Primary Objective	tracking / oversight	assessment
Purpose	improve efficiency mid-course corrections to workplan	improve effectiveness, impact, future programming
Focus	Conformity/fidelity to program guidelines, process indicators, quarterly and annual goals, workplans	effectiveness, impact, cost-effectiveness, relevance
Data Sources	routine surveillance systems, field observation, progress reports	same, plus surveys, special studies
Conducted by	TB Focal Person and TBCO	TBCO, BNTP supervisors, MOH, external evaluators
Reporting to	TBCO, District PHS, Matron, BNTP, MOH, community	District PHS, Matron, BNTP, funders (e.g., Global Fund), other policy-makers

Project Closing

- Close project

- Document lessons learnt

- Close contract/procurement

  - READ ON THOSE ISSUES

THANK

YOU

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