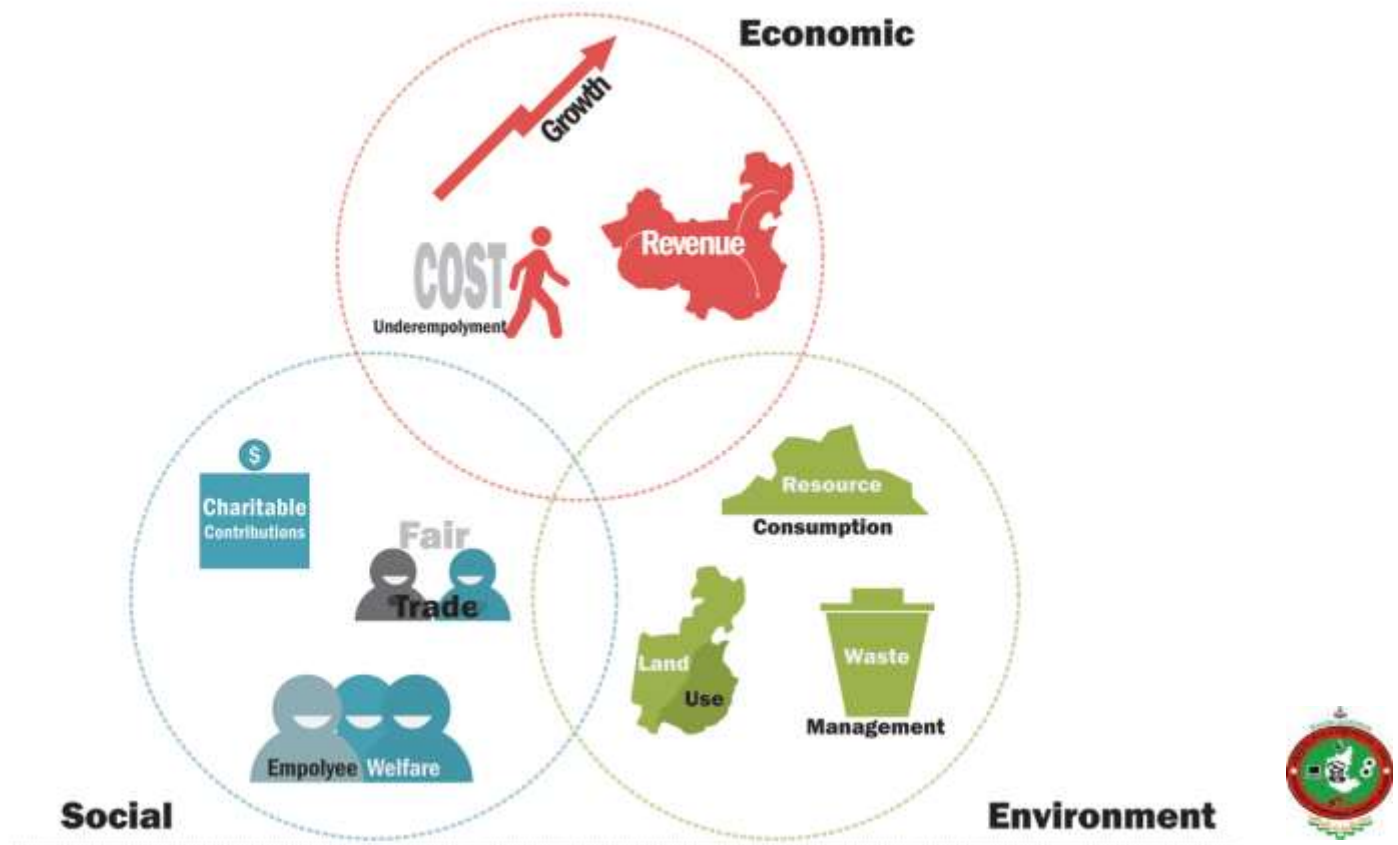


Social Cost Benefit Analysis



Commercial Cost Benefit Analysis (CBA)

Total cost of the
project

Expected future
benefit from the
project

- Benefit > Cost is desirable here.
- So it is nothing but a profitability analysis.
- But what will be the costs and/or the benefits that a society may have to bear and/or get from the proposed project are not considered here.



For example:

- Suppose, a manufacturer produces cigarettes and sell it tk.40 a packet, and another manufacturer produces soaps and sell it tk.20 a bar.

Now, if we think about the impact of soaps & cigarettes on the society, the questions may be –

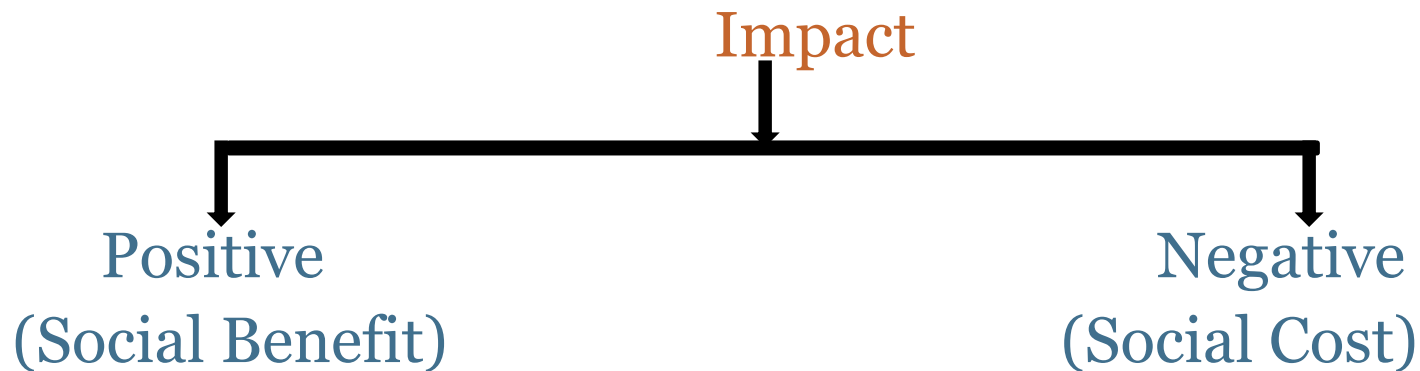
- Does the price of cigarettes take account of the smokers' higher probability of heart disease or cancer?
- Does the price of soap take note of the benefits from the use of soap, e.g., reduced risk of spread diseases?

Obviously, a commercial entrepreneur can't give well answer to these questions.



What is Social Cost Benefit Analysis ?

- So, to reflect the real value of a project to society, we must consider the impact of the project on society.



Thus ,when we evaluate a project from the view point of the society (or economy) as a whole, it is called Social Cost Benefit Analysis (SCBA)/Economic Analysis.



Core differences between CBA & SCBA

CBA	SCBA
<ul style="list-style-type: none">• Limited range of effects are considered as it measures the profitability of individuals who are only a part of the society.	<ul style="list-style-type: none">• The evaluator has to take a wider view as it tries to measure social values of the whole society.
<ul style="list-style-type: none">• It is quantitative in nature.	<ul style="list-style-type: none">• It can be quantitative or qualitative.



Scope of SCBA

- SCBA can be applied to both Public & private investments –

- Public Investment:

SCBA is important specially for the developing countries where govt. plays a significant role in the economic development.

- Private Investment:

Here, SCBA is also important as the private investments are to be approved by various governmental & quasi-governmental agencies.



Objectives of SCBA

The main focus of Social Cost Benefit Analysis is to determine:

1. Economic benefits of the project in terms of shadow prices;
- 2 The impact of the project on the level of savings and investments in the society;
3. The impact of the project on the distribution of income in the society;
4. The contribution of the project towards the fulfillment of certain merit wants (self- sufficiency, employment etc).



Significances of SCBA

- CBA is unable to reflect social values. Hence SCBA has been emerged with some interesting significances. These significances also make the SCBA different from the CBA.
 - Market Imperfections
 - Externalities
 - Taxes & Subsidies
 - Concern for Savings
 - Concern for Redistribution
 - Merit Wants



Significances of SCBA (Contd.)

- **Market Imperfections:**

Market prices, the basis for CBA, do not reflect the social values under imperfect market competition.

- **Externalities:**

A project may have beneficial or harmful external effects that are considered in SCBA, not in CBA.

- **Taxes & Subsidies:**

From the social point of view, taxes & subsidies are nothing but transfer payments. But in CBA, taxes & subsidies are treated as monetary costs and benefits respectively.



Significances of SCBA (Contd.)

- **Concern for Savings:**

In SCBA, the division between benefits & consumption is relevant wherein higher valuation is placed on savings.

But in CBA such division is irrelevant.

- **Concern for Redistribution:**

In SCBA, the distribution of benefits is very much concerning issue where commercial private firm does not bother about it.

- **Merit Wants:**

Merit wants are important from the social point of view and therefore, SCBA considers these wants.



Approaches to SCBA

- There are two principal approaches for Social Cost Benefit Analysis.
 - A. UNIDO Approach, and
 - B. L-M Approach.

A. UNIDO Approach:

This approach is mainly based on the publication of UNIDO (United Nation Industrial Development Organization) named *Guide to Practical Project Appraisal* in 1978.

B. L-M Approach:

I.M.D Little & J.A.Mirlees have developed this approach for analysis of Social Cost-Benefit in *Manual of Industrial Project Analysis in Developing Countries* and *Project Appraisal & Planning for Developing Countries*.



UNIDO Approach

The UNIDO approach of Social Cost Benefit Analysis involves five stages:

- Calculation of *financial profitability* of the project measured at market prices.
- Obtaining the *net benefit* of the project at *shadow (efficiency) prices*. (Objective of SCBA-1)
- Adjustment for the *impact of the project on Savings & Investment*. (Objective of SCBA-2)
- Adjustment for the *impact of the project on Income Distribution*. (Objective of SCBA-3)
- Adjustment for the *impact of the project on Merit and Demerit Goods* whose social values differ from their economic values. (Objective of SCBA-4)



UNIDO Approach (Contd.)

Stage-1: Calculation of financial profitability of the project

- ❑ A good technical and financial analysis must be done before a meaningful economic (social) evaluation can be made so as to determine financial profitability.
- ❑ Financial profitability is indicated by the Net Present Value (NPV) of the project, which is measured by taking into account inputs (costs) and outputs (benefits) at market price.



UNIDO Approach - Stage One (Contd.)

- Net Present value of a Project is calculated as:

$$NPV = \sum_{t=0}^T \left\{ \frac{V_t - C_t}{(1 + K)^t} \right\} - I_o$$

Here,

V_t = Value of outputs at market price at time t

C_t = Value of inputs at market price at time t

K = Discount Rate

T = Lifetime of the project

I_o = Initial cost at the start of the project.

- The project is viewed as financially feasible if $NPV > 0$.



UNIDO Approach (Contd.)

Stage-2: Obtaining the net benefit of the project at economic (shadow) prices

- ❑ The Commercial Profitability analysis (calculated in stage - 1) would be sufficient only if the Project is operated in perfect market. Because, only in a perfect market, market prices can reflect the social value.
- ❑ If the market is imperfect (most of the cases in reality), net benefit of the Project is determined by assigning shadow prices to inputs and outputs.
- ❑ Therefore, developing shadow prices is very much vital.



UNIDO Approach - Stage Two (Contd.)

- ❑ Shadow Prices reflect the real value of a resource (input or output) to society.
- ❑ Shadow Prices are also referred as economic prices, accounting prices, economic/accounting efficiency prices etc.
- ❑ Shadow Prices can be defined as the value of the contribution to the country's basic socio-economic objectives made by any marginal change in the availability of commodities (output) or factor of production (input).
- ❑ *Example: A project of power station may increase the production of electricity which contributes to one of the socio-economic objectives of the country.*



UNIDO Approach - Stage Two (Contd.)

General Principles of Shadow Pricing

Numeraire :

- ❑ A unit of account in which the values of inputs and outputs are to be expressed.

- ❑ Numeraire is determined at-
 - Domestic currency (BDT) rather than border price.
 - Present value rather than future value.
Because, *“a bird in the hand is worth two in the bush.”*
 - Constant price rather than current price.



UNIDO Approach - Stage Two (Contd.)

General Principles of Shadow Pricing (Contd.)

Tradability:

- ❑ Tradability refers to whether a good or service is tradable or non-tradable; if tradable whether is fully traded or non-traded.
- ❑ A good/service is tradable in the absence of or within limited trade barriers.
- ❑ A tradable good/service is actually traded when-
 - the import (export) supply is perfectly elastic over the relevant range of volume.
 - all additional demand (production) must be made (consumed) by import (export) due to the full capacity in the domestic industry (fulfillment of demand by domestic consumer).



UNIDO Approach - Stage Two (Contd.)

General Principles of Shadow Pricing (Contd.)

- the import (CIF) price is less or the export (FOB) price is more than the domestic cost of production.
- ❑ A good/service is non-tradable; if
 - its import (CIF) price is greater than its domestic cost of production, and/or
 - its export (FOB) price is less than its domestic cost of production.
- ❑ A tradable good/service that is not actually traded is called non-traded.



UNIDO Approach - Stage Two (Contd.)

General Principles of Shadow Pricing (Contd.)

Sources of Shadow Pricing:

- Depending on the impact of the project on national economy, there are three sources of shadow pricing:

Impact of the project on National Economy		Sources of Shadow Pricing
From production of output angle	From consumption of input angle	
Increase total consumption in the economy	Decrease consumption in the rest of the economy	Consumer's willingness to pay
Decrease production in other parts of the economy	Increase production within the economy	Cost of production
Decrease imports or increase exports	Increase imports or decrease exports	Foreign Exchange Value (Border Price)

UNIDO Approach - Stage Two (Contd.)

General Principles of Shadow Pricing (Contd.)

Taxes:

- If the project augments domestic production, taxes should be excluded;
- If the project consumes existing fixed supply of non-traded inputs, tax should be included;
- For fully traded goods, tax should be ignored.

Consumer Willingness to Pay (CWP):

- What a consumer wants to spend for a product or service.
- The difference between CWP and actual payment is called consumer surplus.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources

Tradable inputs & outputs:

Tradability	Type of Goods		Shadow Prices
	Input	Output	
Traded			Border Price
• Export	Export decreased	Export increased	Value of Export (FOB)
• Import	Import increased	Import decreased	Cost of Import (CIF)

- ❑ For a fully traded good, the shadow price is border price translated into the domestic currency at shadow foreign exchange.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

□ Assuming that a project uses two indigenous equipment's costing Tk. 5,00,000. These equipment's can be exported at \$10,000. The shadow foreign rate of \$ 1.00 is equivalent to Tk. 68.

Therefore, shadow price of these equipment's (inputs) are $(\$10,000 \times \text{Tk.}68) = \text{Tk. } 6,80,000$.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Non-Tradable Inputs & Outputs:

Tradability	Type of Goods		Shadow Prices
	Input	Output	
Non-Traded:			
Production	More from local producers	Less by other local producers	Cost of Production
Consumption	Less to other local users	More to local users	Consumer's willingness to pay



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

- Assuming that for a project, one-half of the required input is collected from additional domestic production which has a domestic cost of Tk. 2,00,000 and the rest one-half is collected from diversion from other consumers who are willing to pay Tk. 3,00,000.

Therefore, the shadow price of the inputs will be:

$$\begin{aligned} & (\text{cost of production} + \text{consumer's willingness to pay}) \\ &= \text{Tk. } (2,00,000 + 3,00,000) \\ &= \text{Tk. } 5,00,000 \end{aligned}$$



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Tradability	Type of Goods		Shadow Prices
	Input	Output	
Non-Traded:			
Production	More from local producers	Less by other local producers	Cost of Production
Consumption	Less to other local users	More to local users	Consumer's willingness to pay



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

- Assuming that a newly establishes power station having a total capacity of 100 million units of electricity, charges tariff at Tk. 1 for per unit electricity consumption. The consumers of that particular area are willing to pay Tk. 1.20 for per unit.

Therefore, the shadow price is

$(\text{Tk. } 1.20 \times 10 \text{ million}) = \text{Tk. } 120 \text{ million}$, instead of Tk. 100 million.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Externalities:

- An externality is an external effect (either beneficial or harmful) caused from a project which is –
 - not deliberately created by the project sponsors but is an incidental outcome.
 - beyond the control of the persons who are benefited or affected by it.
 - not traded in the market place



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Example of External Effects:

- ❑ Near about 100,000 people had lost lands 5,680 acres due to the project of Jamuna Bridge.
- ❑ People may be affected by erosion and flood conditions brought about by changes to the river which result from the construction activities of a bridge.
- ❑ Environmental pollution created by brick field.
- ❑ A project of planting trees for commercial purpose may give protection to the environment against the increasing global warmth.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Shadow Pricing of Externalities:

Although valuation of external effects is difficult as they are often intangible in nature and there is no market price, shadow pricing of externalities may be made indirect means such as :

- ❑ The harmful effect of the bridge may be measured by the consumer willingness to pay for the output of the people which has been reduced due to the bridge.
- ❑ The cost of pollution may be estimated in terms of the loss of earnings as a result of damage to health caused by it.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Labor:

Possible Impact	Shadow Price (Social Cost) of Labor
1. Taking labor away from other employments	Willingness to pay of other users for this labor
2. Stimulating the production of new workers	<ul style="list-style-type: none">• the value assigned by the worker on the leisure that he has forego.• the additional consumption of food• the cost of transport• negative impact on savings and investments due to the increased consumption by workers• the cost of training• the cost of urbanization
3. Importing workers	Flighting of foreign currency equivalent to the wages commanded by them along with a premium on account of the foreign exchange.

UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (contd.)

Capital:

- ❑ Investment of capital in a project causes to happen two things:
 - i. Financial resources are converted into physical assets
 - ii. Financial resources are withdrawn from national pool of savings. Thus alternative projects are foregone and there is an opportunity cost of it.
- ❑ The shadow price of physical assets is calculated in the same manner in which inputs and outputs are calculated.
- ❑ The opportunity cost of capital (shadow price of capital) depends on the source from which the capital has generated.



UNIDO Approach - Stage Two (Contd.)

Shadow Pricing of Resources (Contd.)

Generation of Capital	Opportunity Cost of Capital
Generation from additional savings	Consumption rate of interest or social discount rate (the price must be paid to the saver to sacrifice present consumption)
Generation from the denial of capital to alternatives projects	Investment rate of interest (Investment rate of return that would be earned from those alternative projects)



UNIDO Approach - Stage Two (Contd.)

Obtaining Net Benefit of the Project at Shadow Prices

- Determining the shadow price of
 - ✓ One-Shot Costs
 - ✓ Annual costs
 - ✓ Annual benefits
- Calculating Net-benefit of the project from social point of view by :

$$NPV = \sum_{t=0}^T \left\{ \frac{V_t - C_t}{(1 + K)^t} \right\} - I_o$$

Here,

V_t = Shadow price of Benefit at time t

C_t = Shadow price of Operating Expenses at time t

K = Social Discount Rate

T = Lifetime of the project

I_o = Initial cost at the start of the project.



UNIDO Approach - Stage Two (Contd.)

Obtaining Net benefit of the Project (An illustration)

The Government is considering a project which would supply water for irrigation, generate electricity and provide a measure of protection against floods. The project is expected to have a 25 year life time.

The costs and benefits of the project are:

COSTS:

1. Power equipment costing Tk. 30 crore.

(Additional Information: This equipment can be exported at \$ 4.5 million. The shadow price of per dollar is Tk. 70)

Cost Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Indigenous Power Equipment	One-Shot	30 crore	31.5 crore

UNIDO Approach - Stage Two (Contd.)

Obtaining Net benefit of the Project (An illustration)

2. 30,000 tones of cement produced indigenously are used in the project at a cost of Tk. 6,000.

(Additional Information: However, one-half of the cement will come from additional domestic production which cost Tk. 5,000 per tone and one-half come from diversion from other consumers who are willing to pay Tk.6,500 for per ton.)

Cost Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Cement	One-Shot	18 crore	17.25 crore

Obtaining Net benefit of the Project An illustration (contd.)

3. Other construction materials (sand, bricks, steel etc.)
cost 20 crore.

(Additional Information: these materials comes from
additional production, production cost of which is 15 crore.)

Cost Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Other Materials	One-Shot	20 crore	15 crore



Obtaining Net benefit of the Project An illustration (contd.)

4. Two million man days of unskilled labor for which the project committee decided to pay a daily wage of Tk. 100.
(Additional Information: The shadow price of unskilled labor is 80 Tk. Per day)

Cost Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Unskilled Labor	One-Shot	20 crore	16 core



Obtaining Net benefit of the Project An illustration (contd.)

5. Skilled labor costing Tk. 5 crore.

(However, this cost reflects what others are willing to pay for the skilled labor)

Cost Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Skilled labor	One-Shot	5 crore	5 crore

6. Operating & Maintenance cost of the project will be Tk. 7.5 crore annually. (However, the operating cost should be Tk. 6.5 crore from social view point)

Cost Type	Nature	Private Angle	Social Angle
Operating Cost	Annual	7.5 crore	6.5 crore

Obtaining Net benefit of the Project An illustration (contd.)

Benefits:

1. 0.5 million acres of land will be irrigated. The Government will charge the water levy at Tk. 150 for per acre. (Additional Information: The value of additional output per acre due to the irrigation will be Tk. 500 per acre).

Benefit Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Irrigation	Annual	7.5 crore	25 crore



2. 100 million units of electricity will be generated for domestic use. The electricity tariff will be charged at Tk. 1 per unit. (Additional Information: The consumers are willing to pay Tk. 1.5 for per unit of electricity).

Benefit Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Electricity	Annual	10 crore	15 crore

3. Flood damages can be saved by Tk. 2 crore annually. However, the Government will not able to collect anything for this.

Benefit Type	Nature	Private Angle (Market price)	Social Angle (Shadow Price)
Flood Relief	Annual	-	2 crore

Obtaining Net benefit of the Project An illustration (contd.)

Cost & Benefit of the Project (at a glance)

One-Shot cost:

Cost Type	Private Angle (Market price)	Social Angle (Shadow Price)
Power Equipment	30 crore	31.5 crore
Cement	18	17.25
Other Materials	20	15
Unskilled Labor	20	16
Skilled Labor	5	5
Total	93 Crore	84.75 Crore

Cost & Benefit of the Project (at a glance) (contd.)

Annual cost:

Cost Type	Private Angle (Market price)	Social Angle (Shadow Price)
Operating Cost	7.5crore	6.5 crore
Total	7.5Crore	6.5 Crore

Annual Benefit:

Benefit Type	Private Angle (Market price)	Social Angle (Shadow Price)
Irrigation	7.5 crore	25 crore
Electricity	10 crore	15 crore
Flood Relief	-	2 crore
Total	17.5 Crore	42 Crore

Determining Project Profitability from the Private Angle

- Net Present value of a Project is calculated as:

$$NPV = \sum_{t=0}^T \left\{ \frac{V_t - C_t}{(1 + K)^t} \right\} - I_o$$

Here,

V_t = Annual Benefit at time $t = 17.5$ crore

C_t = Annual cost at time $t = 7.5$ crore

K = Discount Rate = 10% (assuming)

T = Lifetime of the project = 25 years

I_o = Initial cost at the start of the project = 93 crore

Therefore,

$$\begin{aligned} NPV &= \sum_{t=1}^{25} \left\{ \frac{17.5 - 7.5}{(1 + .10)^t} \right\} - 93 \\ &= \{10 (\text{PVAF}_{.10\%, 25}) - 93\} \\ &= \{10 \times 9.0770 - 93\} \\ &= \text{Tk.}(2.23) \text{ crore} \end{aligned}$$

Therefore, the project is generating a negative NPV of Tk. 2.23 crore from the private angle.



Determining Project Profitability from the Social Angle

Net Present value of a Project from Social angle is calculated as:

$$NPV = \sum_{t=0}^T \left\{ \frac{V_t - C_t}{(1 + K)^t} \right\} - I_o$$

Here,

V_t = Shadow price of Benefit at time $t = 42$ crore

C_t = Shadow price of Operating Expenses at time $t = 6.5$ crore

K = Social Discount Rate = 10% (assuming)

T = Lifetime of the project = 25 years

I_o = Initial cost at the start of the project = 84.75 crore

Therefore,

$$\begin{aligned} NPV &= \sum_{t=1}^{25} \left\{ \frac{42 - 6.5}{(1 + .10)^t} \right\} - 84.75 \\ &= \{35.5 (\text{PVAF}_{.10\%, 25}) - 84.75\} \\ &= \{35.5 \times 9.0770 - 84.75\} \\ &= \{322.23 - 84.75\} \\ &= \text{Tk. } 237.48 \text{ crore} \end{aligned}$$

From the view point of society, the project is generating a positive NPV of Tk. 237.48 crore.



UNIDO Approach (Contd.)

Stage – 3: Adjustment for the impact of the project on Savings & Investment

- The purposes of this stage are to –
 - determine the amount of income gained or lost because of the project by different income groups (such as project other than business, government, workers, customers etc.)
 - evaluate the net impact of these gains and losses on savings
 - measure the adjustment factor for savings and thus the adjusted values for savings impact.
 - adjust the impact on savings to the net present value calculated in stage two.



UNIDO Approach - Stage Three (Contd.)

□ Measurement of Gain or Loss:

A project appoints 1,000 laborers at a wage rate of Tk. 150 per day. These workers were ready to work for a daily wage of Tk. 100.

Therefore, the gain of the group of 1,000 workers from the project is $\{(150 - 100) \times 1,000\} = \text{Tk. } 50,000$ per day.

□ Evaluation of the Net Impact on Savings:

Net Savings Impact of a project = $\sum \Delta Y_i MPS_i$

Here , ΔY_i = *change in income of group i as a result of the project*

MPS_i = *marginal propensity to save of group i*



UNIDO Approach - Stage Three (Contd.)

Assuming that the income gained or lost by 4 group is:

Worker (W)=Tk. 2,50,000, Consumer (C) = Tk. -7,00,000

Project (P)=Tk. 10,00,000, External Sector(E)=Tk.5,00,000

The marginal propensity to save of these four groups is:

$$MPS_W = 0.04, MPS_C = 0.25, MPS_P = 0.4 \text{ \& } MPS_E = 0.3$$

Therefore, the net impact of the project on savings is:

$$\{2,50,000 \times 0.04 + (-7,00,000) \times 0.25 + 10,00,000 \times 0.4 \\ + 5,00,000 \times 0.3\}$$

$$= 1,00,000 - 1,75,000 + 4,00,000 + 1,50,000$$

$$= \text{Tk. } 4,75,000$$



UNIDO Approach - Stage Three (Contd.)

□ Adjustment Factor for Savings (AFs):

AFs measures the percentage by which the social value of investment of one taka exceeds social value of consumption one taka.

$$AF_s = \frac{MPC \times MP^{cap}}{CRI - MP^{cap} \times MPS} - 1$$

Here,

MPC = Marginal Propensity to Consume

MPS = Marginal Propensity to Saving

MP^{cap} = Marginal Productivity of Capital

CRI = Consumption Rate of Interest (social discount rate)



UNIDO Approach - Stage Three (Contd.)

- Assuming that MPC, MPS, MP^{cap} & CRI of an economy is given:

MPC = 70%, MPS = 30%, MP^{cap} = 25% and CRI = 10%

Therefore, adjustment factor for saving is:

$$AF_s = \frac{0.7 \times 0.25}{0.10 - (0.25 \times 0.3)} - 1 = 6.00$$

- Adjusted value of the impact of the project on savings:
Adjusted value of saving = (Net impact on savings × AFs)
= Tk. 4,75,000 × 6
= Tk. 28,50,000.



UNIDO Approach - Stage Three (Contd.)

- This Tk. 28,50,000 is now added to the net present value of the project calculated in stage -2 (Tk. 237.48 crore)
- Therefore, the adjusted net present value at this stage will be Tk. (237.48 + .285) = Tk.237.765 crore.



UNIDO Approach (Contd.)

Stage – 4: Adjustment for the impact of the project on Income Distribution

- ❑ Government considers a project as an investment for the redistribution of income in favor of economically weak sections or economically backward regions.
- ❑ This stage provides a value on the effects of a project on income distribution between rich & poor and among regions.
- ❑ Distribution Adjustment Factor (Weight) is calculated and the impacts of the project on income distribution have been valued by multiplying the adjustment factor with the particular income of a group. This value will then be added to the net present value re-calculated in stage three to produce the social net present value of the project.



UNIDO Approach - Stage Four (Contd.)

Determination of Weights:

- If there are only two groups in a society, poor and rich, the determination of weight is just an iterative process between the analysts (at the bottom) and the planners (at the top). This is called “bottom-up” approach.
- When more than two groups are involved, weights are calculated by the elasticity of marginal utility of income. The marginal utility of income is the weight attached to an income is:

$$w_i = \left(\frac{b}{c_i}\right)^n$$

Where, w_i = weight of income at c_i level

c_i = level of income of group i

b = base level of income that has a weight of 1.00

n = elasticity of the marginal utility of income



UNIDO Approach - Stage Four (Contd.)

- Assuming that the worker group gains an income of Tk. 2,50,000 from a project, the base level of income is Tk. 50,000 which has a weight of 1.00 and elasticity of marginal utility of income is 0.20.

Therefore, weight is: $W_i = \left(\frac{50,000}{2,50,000} \right)^{0.2}$

- So, value of the impact of the project on income distribution to this group is:

$$(\text{Tk. } 2,50,000 \times 0.72) = \text{Tk. } 1,80,000.$$

- Now, this value will be added to the net present value adjusted in stage three.
- Therefore, Adjusted NPV in this stage will be
Tk. $(237.765 + 0.018) = \text{Tk. } 237.78$ crore



UNIDO Approach (Contd.)

Stage – 5: Adjustment for Merit and Demerit Goods

- ❑ If there is no difference between the economic value of inputs and outputs and the social value of those, the UNIDO approach for project evaluation ends at stage four.
- ❑ In practical, there are some goods (merit goods), social value of which exceed the economic value (e.g. oil, creation of employment etc.) and also there are some goods (demerits goods), social value of which is less than their economic value (e.g., cigarette, alcohol, high-grade cosmetics etc.)
- ❑ Adjustment to the net present value of stage 4 is required if there is any difference between the social and economic value.



UNIDO Approach - Stage Five (Contd.)

- The steps of adjustment procedure are:
 - Estimating the present economic value
 - Calculating the adjustment factor
 - Multiplying the economic value by the adjustment factor to obtain the adjusted value
 - Adding or subtracting the adjusted value to or from the net present value of the project as calculated in stage four.



UNIDO Approach - Stage Five (Contd.)

An alcohol factory is under construction. The present economic value of the project is Tk. 237.78 crore (Adjusted NPV up to stage 4). The output of the project has no social value than its cost of production. Cost of production is the 60 percent of the economic price.

Therefore, adjustment factor is: $\left(\frac{60}{100} - 1\right) = -0.4$

So, the adjusted value = (Tk. 237.78 crore \times - 0.40)
= - Tk. 95.11 crore

Therefore, the net present value of the project in terms of socially acceptable consumption is

Tk.(237.78-95.11) = Tk. 142.67 crore.



L-M Approach

- ❑ I.M.D. Little and James A. Mirrlees have developed an approach to SCBA which is famously known as L-M approach.
- ❑ The core of this approach is that the social cost of using a resource in developing countries differs widely from the price paid for it.
- ❑ Hence, it requires **Shadow Prices** to denote the real value of a resource to society. (mentioned earlier)



L-M Approach (Contd.)

Features of L-M Approach

- L-M Numeraire is *present uncommitted social income*.
 - ❑ L-M methods opt for savings as the yardstick of their entire approach. Present savings is more valuable to them than present consumption since the savings can be converted into investment for future.
 - ❑ L-M approach rejects the 'consumption' numeraire of UNIDO approach since the authors (L & M) feel that the consumption of all level is valuable.



L-M Approach (Contd.)

Features of L-M Approach (Contd.)

- This approach measures the cost and benefits in terms of *international or border prices*.

Why Border prices?

Because the border prices represent the correct social opportunity costs or benefits of using or producing a traded goods.



L-M Approach (Contd.)

Social Cost-Benefit Analysis (SCBA)

The resources – inputs & outputs – of a project are classified into mainly:

- Labor
- Traded Goods
- Non-traded Goods

Therefore, to find out the real value of these resources, we should calculate –

- a) Shadow wage rate (SWR)
- b) Shadow price of Traded Goods
- c) Shadow price of Non-traded Goods



L-M Approach (Contd.)

a) Shadow Wage Rate (SWR)

The purpose of computing the SWR is to determine the opportunity cost of employing an additional worker in the project. For this we have to determine –

- ❑ The value of the output foregone due to the use of a unit of labor
- ❑ The cost of additional consumption due to the transfer of labor



L-M Approach (Contd.)

L-M suggest the following formula for calculating the SWR:

$$SWR = m + (c' - c) + (1 - 1/s)(c - m)$$

Here, m = marginal productivity of the wage earner

$c' - c$ = cost of urbanization

$(1 - 1/s)(c - m)$ = cost of additional committed consumption

c' = additional resources devoted to consumption

c = consumption of wage earner

1 = value of uncommitted resources

$1/s$ = value of committed resources

$c - m$ = additional consumption of labor

c' (transportation system, e.g. road construction, motor vehicles) – c (e.g. bus rent)

= cost of urbanization (e.g. road construction)



L-M Approach (Contd.)

b) Shadow price of Traded Goods

Shadow price of traded goods is simply its border or international price.

- ❑ If a good is exported, its shadow price is its FOB price;
- ❑ If a good is imported, its shadow price is its CIF price.

c) Shadow price of Non-traded Goods

- ❑ Non-traded goods are those which do not enter into international trade by their very nature. (e.g. land, building, transportation)
- ❑ Hence, no border price is observable for them.



L-M Approach (Contd.)

- ❑ Ideally, Shadow price of Non-traded Good is defined in terms of marginal social cost (MSC) and marginal social benefit (MSB).
- ❑ L-M suggest that the monetary cost of non-traded goods be broken down into –
 - Labor ➡ SWR (Social Wage Rate)
 - Tradable ➡ Social Conversion Factor (SCF)
 - Residual components ➡ SCF



L-M Approach (Contd.)

Accounting Rate of Return (ARR):

This is the rate used for discounting social profits.

- Experience is the best guide to the choice of ARR.
- ARR should be such that all mutually compatible projects with positive present social value can be undertaken.



A Comparative Illustration of UNIDO & L-M Approach

COSTS:

1. Power equipment costing Tk. 300 million. This equipment can be exported at \$4.5 million. The shadow price of per dollar is Tk. 70.

Cost Type	Nature	UNIDO Approach	L-M Approach
Power Equipment	One-Shot	Tk. 315 million	\$ 4.5 million



A Comparative Illustration of UNIDO & L-M Approach (contd.)

2. 30,000 tones of cement produced indigenously are used in the project at a cost of Tk. 6,000. One-third of the cement will come from additional domestic production which cost Tk. 5,000 per tone and Two-third will come from diversion from other consumers who are willing to pay Tk.6,500 for per ton. The shadow price of per dollar is Tk. 70.

Cost Type	Nature	UNIDO Approach	L-M Approach
Cement	One-Shot	Tk. 180 million	\$ 1.48 million

A Comparative Illustration of UNIDO & L-M Approach (contd.)

3. Other construction materials (sand, bricks, steel etc.) cost 200 million. These materials comes from additional production, production cost of which is 150 million.

Cost Type	Nature	UNIDO Approach	L-M Approach
Other Materials	One-Shot	Tk. 150 million	\$ 2.14 million

4. Two million man days of unskilled labor for which the project committee decided to pay a daily wage of Tk. 100. The shadow price of unskilled labor is 80 Tk. Per day.

Cost Type	Nature	UNIDO Approach	L-M Approach
Unskilled Labor	One-Shot	Tk. 160 million	\$ 2.29 million

A Comparative Illustration of UNIDO & L-M Approach (contd.)

5. Skilled labor costing Tk. 50 million. However, this cost reflects what others are willing to pay for the skilled labor.

Cost Type	Nature	UNIDO Approach	L-M Approach
Skilled Labor	One-Shot	Tk. 50 million	\$ 0.71 million

6. Operating & Maintenance cost of the project will be Tk. 75 million annually. However, the operating cost should be Tk. 65 million from social view point.

Cost Type	Nature	UNIDO Approach	L-M Approach
Operating Cost	Annual	Tk. 65 million	\$ 0.93 million

A Comparative Illustration of UNIDO & L-M Approach (contd.)

Benefits:

1. 0.5 million acres of land will be irrigated. The Government will charge the water levy at Tk. 150 for per acre. The value of additional output per acre due to the irrigation will be Tk. 500 per acre.

Benefit Type	Nature	UNIDO Approach	L-M Approach
Irrigation	Annual	Tk. 250 million	\$ 3.57 million



2. 100 million units of electricity will be generated for domestic use. The electricity tariff will be charged at Tk. 1 per unit. The consumers are willing to pay Tk. 1.5 for per unit of electricity.

Benefit Type	Nature	UNIDO Approach	L-M Approach
Electricity	Annual	Tk. 150 million	\$ 2.14 million

3. Flood damages can be saved by Tk. 20 million annually.

Benefit Type	Nature	UNIDO Approach	L-M Approach
Flood Relief	Annual	Tk. 20 million	\$ 0.29 million



Dissimilarities between Two Approaches

UNIDO Approach

- Domestic currency is used as Numeraire
- Consumption is the measurement base
- SCBA objectives are met through stage by stage

L-M Approach

- International Price is used as Numeraire
- Uncommitted Social Income is the measurement base
- At one place all SCBA objectives are fulfilled

Similarities between Two Approaches

- Calculation of **Shadow Prices** to reflect social value
- Usage of **Discounted Cash Flow Techniques**
- Taking into account about the effect of a project on **savings, investment and income** of a society



References

- Chandra, Prasanna, *Project: Planning, Analysis, Financing, Implementation, and Review*, 6/e, Tata McGraw-Hill Publishing Co. Limited, New Delhi, 2006.
- Little, I.M.D. & J. Mirrlees, *Manual of Industrial Project analysis in developing countries*, Vol. II, OECD, 1968.
- Puttaswamaiah, K., & Venu, S., *A Theoretical and Applied Critique of Alternative Methodologies*.
- UNIDO, *Guidelines For Project Evaluation*, 1981.
- www.citechco.net/jmba



Questions

1. “Social cost – benefits are always equivalent to monetary cost – benefits”. Do you agree? Why or why not? Explain.
2. What do you mean by externalities? Give at least three examples of externalities. How do you measure these externalities?
3. How a project can be evaluated? Explain briefly.
4. What is shadow pricing? Is there any difference between shadow price and market price?
5. Define ‘Numeraire’ and give the general ideas about Numeraire.
6. Distinguish between tradable and non-tradable g/s.



Questions

7. Determine the shadow price of the followings:
 - Tradable inputs & outputs
 - Non-tradable inputs
 - Non-tradable outputs
 - Labor
 - Capital
8. Briefly explain about L-M approach.
9. What are the main features of L-M approach that differ from UNIDO approach?



Thank You
!!! For Your Great Patience !!!



Possible Impacts	Shadow Price of Labor
1. Taking labor away from other employments	Willingness to pay of other users for this labor
2. Stimulating the production of new workers	<ul style="list-style-type: none">○ The value assigned by the worker on the leisure that he has forego.○ The additional consumption of food;○ The cost of transport and rehabilitation;○ Negative impact on savings and investments due to the increased consumption by workers;○ the cost of training;○ The marginal product in the previous employment;
3. Importing workers	Flighting of foreign currency equivalent to the wages commanded by the foreign workers along with a premium on account of the foreign exchange.

