Economic Appraisal

Chapter 4

Difference between financial analysis and economic analysis

- Financial analysis looks at financial viability (monetary profitability): cost of making a bridge and tolls (revenue) collected from using the bridge
- Economic analysis investigates efficiency and social impacts: connectivity, market and trade, living standard

Even if the economic viability is established, the authorities may still decide not to take up the project due to financial constraints, such as lack of funds or unattractive returns.

Purposes of economic analysis of a project

- **Ensuring efficient allocation of the resources** towards the economy of the community at the **national, regional and local** level within the overall development plan. Consequently, the efficiency with which the resources are used can have an impact on the performance of the economy and prosperity of the country;
- **Ranking of different options** considering scarce resources in order of priority;
- **Assisting in phasing the development program** over a period of time considering availability of resources;
- **Comparing different options and selecting** the most attractive one;
- **Determining whether the option is worth** the investment at all;
- **Evaluating alternative strategies** in respect of specifications, design standards and other parameters.

Economic strategies for public and private projects

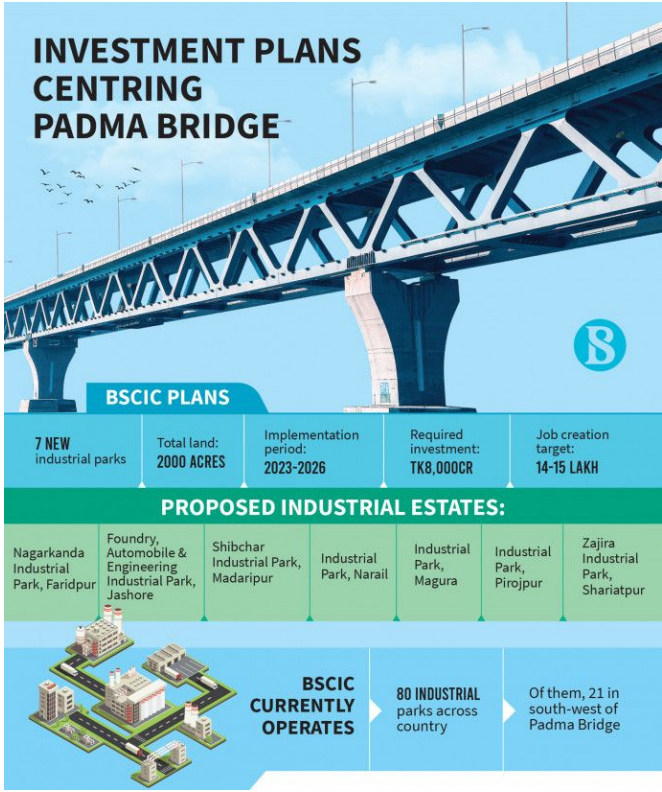
Public projects	Private projects
Goods, services, jobs, etc. are provided at a ‘no-profit-basis’	Profit basis
The source of capital is primarily taxation, occasionally financing is done by self-liquidating bonds issued to the public or by subsidies or loans from financial institutions	Generally private investors, or promoters
Multipurpose projects, such as flood control, irrigation and power generation.	Rare
Project may run for longer period (20–50 years)	Lifespan is generally shorter (say 5–10 years)
Likely political pressure	Less likely political pressure

Economic strategies for public and private projects

Private sector is primarily concerned with maximization of profit and consequently private wealth, e.g., the investment required to construct the plant, the costs of equipment, raw materials, labor, overheads, etc. and the revenues arising out of the operation are generally considered.

Private monetary costs and benefits of a project do not necessarily reflect its **true social costs and benefits**, e.g., increased employment potential and effect on balance of trade position (if the product is exported) and environmental pollution, effect on local property prices, etc. contribute to the detrimental effects.

Social costs and benefits are quite often inclined to differ from financial costs and benefits.



Sources of differences between social and financial costs and benefits

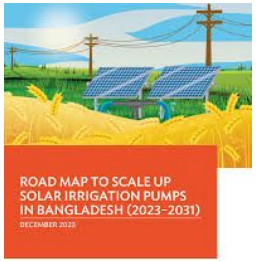
- Market imperfections
- Externalities
- Taxes and subsidies
- Concern for savings
- Concern for redistribution
- Merit wants

SMC plus is a beverage for the educated youth, those who are health-conscious.

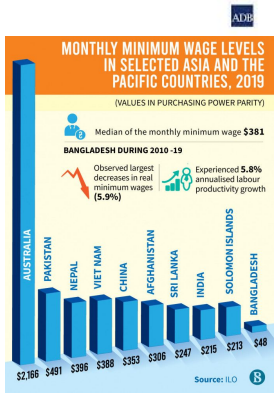
Sources of differences: market imperfections

Market prices which form the basis of monetary costs and benefits are not always under perfect competition, e.g., monopoly controls market and can set higher prices. Under the circumstances, they do not always reflect the actual social values. Some common examples of imperfections are as follows:

- Rationing system: the price paid by the consumer for consumables purchased in this system is often less than the competitive market rate, i.e., the items are subsidized.



- Minimum wages rate system: the prescribed minimum wages paid to labor are more than those which would have been prescribed in a free labor market.



Sources of differences: externalities

- Beneficiary impacts: external benefits are considered in SCBA, though they are ignored in assessing the monetary benefits to the project sponsors because they do not receive any monetary compensation from those who enjoy this external benefit created by the project.

- Negative effects: harmful external effect like environmental pollution or congestion. In SCBA, the cost of such environmental pollution is relevant, though the project sponsors may not incur any monetary costs. It may be emphasised that externalities are relevant in SCBA because in such analysis all costs and benefits, irrespective of to whom they accrue and whether they are paid for or not, are relevant.

Sources of differences: taxes and subsidies

From the private point of view, taxes are definite monetary costs and subsidies are definite monetary gains. From the **social point of view**, however, **taxes and subsidies are generally regarded as transfer payments** and hence considered irrelevant.

To encourage more remittances through legal channels, the Bangladeshi government offers a 2.5% incentive on remittances. This initiative aims to increase foreign exchange reserves and strengthen the local economy.

Under this policy, for every remittance sent to Bangladesh, the government adds an additional 2.5% of the transferred amount. For instance, if you send 10,000 BDT to Bangladesh, the recipient will receive an extra 250 BDT, which represents the 2.5% incentive.

This incentive was implemented to boost the foreign exchange reserves of the country, promote the use of formal remittance channels, and indirectly stimulate the local economy. Not only does this policy benefit the recipients, but it also aids in the country's economic development.

Sources of differences: concern for savings and distribution

Concern for savings: In economic analysis, savings and investments are considered as more valuable than consumption. A private firm does not bother about differential valuation on savings and consumptions. From a social point of view, however, difference between consumption and savings is relevant since saving will lead to investment, particularly in **capital-scarce countries**. **One BDT of benefits saved is deemed more valuable than one BDT of benefits consumed.**

Safety net programs in Bangladesh have been contributing to the reduction of poverty and vulnerability by addressing a range of population groups through different forms of assistance. These include the provision of income security for the elderly, widows and persons-with-disabilities, generating temporary employment for working age men and women, and supporting the healthy development of young mothers and children.

Concern for redistribution: A private firm does not bother how its benefits are distributed across various groups in the society. The society, however, is concerned about the distribution of benefits across different groups. **One BDT of benefits going to an economically poor section is considered more valuable than one BDT of benefit going to an affluent section.**

Sources of differences: merit wants

Goals and preferences not expressed in the marketplace, but believed by policy makers to be in the larger interest, may be referred to as merit wants.

For example, the government may prefer to promote an adult education programme or a balanced nutrition programme for school-going children even though these are not sought by consumers in the marketplace. While merit wants are not relevant from the private point of view, they are important from the social point of view.

Friendship Education Programme from Bangladesh wins UNESCO Confucius Prize for Literacy 2023

Friendship embarked on its education programme in 2006, driven by a vision to provide primary education to remote, climate-vulnerable riverine islands in Bangladesh. This initiative aimed to ensure the fundamental right to education for communities often overlooked.

Shadow pricing

Actual expenses and revenues from goods and services do not always reflect the measurement of the costs and benefits to the society. **For evaluating such expenses and revenues in terms of social costs and benefits, adjustments are required in the expenses and revenues in order to make them reflect their proper market value. These adjustments are known as shadow pricing.** The principle of shadow pricing applies to both the cost stream and the benefit stream. Shadow pricing technique is adopted basically for overcoming the following difficulties-

- **Imperfect Pricing Mechanism**
- **Variation in Wages Rates**
- **Disparity in Interest Rates**
- **Disparity in Exchange Rates**
- **Inflationary Forces**

Shadow price, or shadow pricing, is the real economic price of projects, activities, goods, and services that have no market price. It also includes projects, etc. for which prices are difficult to estimate. The shadow price is the opportunity cost, i.e., what somebody had to give up when they made a choice. Specifically, the highest price one would pay for one extra unit of something.

Shadow pricing: Imperfect Pricing Mechanism

In many countries, particularly in developing countries, **because of lack of perfect competition, domestic pricing mechanism does not operate perfectly.** Relative costs, benefits and scarcities are not always reflected correctly in the pricing mechanism. This is due to direct and/or indirect influences on the demand and supply of goods and services originated from operations by government agencies. As a result, domestic prices are not in line with the rates at which they could be traded in the international market. Such difficulties can be overcome with the help of shadow pricing technique.

Example: When a pharmaceutical company holds a patent for a certain drug, it often enjoys a monopoly over the production and sale of that drug for a certain period.

By estimating the social cost of monopoly pricing decisions and assessing efficiency losses (drugs may not be affordable), shadow pricing can help policymakers make informed decisions about patent policies and regulations.

Shadow pricing technique helps to devise pricing regulation, e.g., setting price caps, negotiating prices with manufacturers, or referencing drug prices to those in other countries. Price regulation aims to prevent excessive pricing by patent holders and ensure affordability for patients.

Shadow pricing: Variation in Wages Rates

Due to unemployment problems in many developing countries, the wages of labor, particularly in the non-organized sectors, are often regulated by the government (minimum wage policy) and tend to be lower than the logical level. This is primarily due to mass underemployment and unemployment at existing wages rates. These are distortions, reflecting true/social value of labour. In the organized industrial sector, on the other hand, labor forces have strong trade unions and wages tend to be higher than the opportunity cost of labor. Thus, actual wages of the labor need to be adjusted for calculating the labor cost for the purpose of shadow pricing.

Following Scott (1972), for any type of labour, **the cost to society of a person entering a particular job (the shadow wage) is the sum of four elements:**
(i) the value of output lost in the occupation from which labour may be drawn to meet the needs of a specific new activity;
(ii) the cost of any additional direct resource use resulting from the increase in employment;
(iii) the value of any increase in benefits to the worker associated with the new employment; and
(iv) any external costs (or benefits) that arise from the creation of new employment.

The shadow price is then, Shadow Wage = (i) + (ii) - (iii) + (iv)

The shadow wage is lower than the market wage when there is unemployment. This is because there is no loss in output elsewhere when a worker gains employment (opportunity cost of employment is zero). Therefore, the marginal social cost of hiring the worker is lower than the market wage.

Shadow pricing: Disparity in Interest Rates

Cost of capital is generally indicated by the interest rate. In developing countries, the majority of the population are impoverished with low savings level and therefore do not have the propensity to save and invest. Moreover, the relationship between supply of capital and interest rates prevalent in the country is minimal. There is thus wide disparity between interest rates prevailing in different geographical areas.

In April 2020, interest rates cut to zero (ZLB) in US, Europe and UK in response to Corona recession. ZLB (zero lower bound) explained:

The main tool of conventional monetary policy is interest rates, set by the Central Bank. If inflation is low and economic growth negative, the Central Bank will cut interest rates to stimulate demand and higher economic growth. There may come a point when interest rates have fallen to zero and therefore, they can't fall any further. This is the zero lower bound rate – interest rates have fallen as far as they can. It is considered not practical to have negative nominal interest rates. No one would lend money at a negative interest rate – you would be better off just holding cash. This means the Central Bank can no longer use interest rates to stimulate the economy. People often term this a **liquidity trap**.

A shadow rate that measures the monetary policy stance in any lower-bound environment. To overcome such problems, shadow rate of interest is estimated based on the interest rates paid by private investors.

Shadow pricing: Disparity in Exchange Rates

In general, the developing countries suffer from adverse balance of payment in the foreign exchange area. As a result, the rate of foreign exchange tends to be lower in the open market than the official rate. The problem is solved by fixing a higher exchange rate than by fixing the official exchange rate in the project. This is equal to attaching weight to the cost of foreign exchanges in the project.

An exchange rate, which is the price of foreign currency, also has a shadow price: the shadow exchange rate. The shadow exchange rate is important in project analysis, because a simple way to measure the economic value of goods and services is to classify them into “tradables” and “nontradables.”

Suppose the United States (US) government subsidizes American wheat farmers, who sell their output in international markets. The economic value of wheat to the US is the international price plus the cost of subsidies, but the economic value of wheat to any other country is only the international price. The wheat subsidies are an economic cost only to the US economy (disparity in exchange rates).

Measuring the economic value of any tradable good or service: use the international price, plus transport and transaction costs, to calculate a value in terms of a foreign currency; and then convert the foreign currency into the domestic currency using the economic or “shadow” exchange rate. All tradable goods and services therefore require only one shadow price, the shadow exchange rate. **Shadow exchange rate is the official exchange rate if all trade distortions, e.g., import duties, export subsidies are eliminated.**

Shadow pricing: Inflationary Forces

Some projects take considerable time from conception to completion. During this period, due to inflationary trend, cost of labor, material, equipment, etc. may go up. Similarly, benefits arising out of the project tend to be higher in future years for the same reason. Since relative costs and benefits remain almost the same, it is often common to disregard inflationary effects both in the cost and in the benefit streams. However, where these can be distinctly identified, these need to be considered in the analysis.

Shadow pricing: examples

Early delivery means a shadow price to gain extra benefit from an improved relationship with customers.

Reduced service (shadow rent practice) in controlled rent (Rent control laws impose a price ceiling on rental units, meaning that landlords are legally restricted from charging more than a specified amount for rent.): **While the tenant pays $1,000 in rent, they now must cover an additional $200 per month for utilities and $100 for maintenance that were previously included, bringing their total monthly cost to $1,300.**

Microsoft Corporation placed a $27/ton (shadow) price on its carbon emissions. This was then billed to the P&L (profit & loss) of each business unit.

A World Bank initiative, has recommended (shadow) carbon prices of at least $40-$80 per ton of CO2 by 2020 and $50-100 per ton by 2030 to keep global warming below 2°C.

Shadow Carbon Pricing takes into account different factors such as the economic cost of carbon emissions, the taxes applied to fossil fuels, and changes in user usage, oriented towards new habits and demands by society. Shadow carbon pricing encourage low-carbon investments, and deprioritise high-emission projects.

Consumer and producer surplus

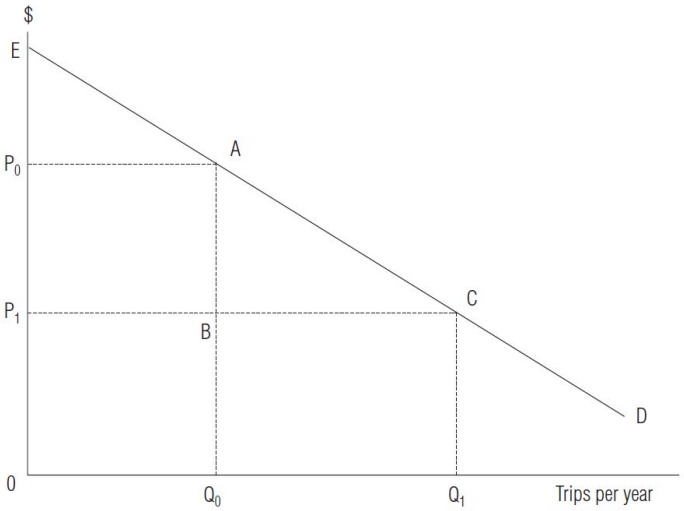
A surplus is generated when a consumer is able to buy a unit of a good at a price lower than their willingness to pay for that unit, or when a producer is able to sell a unit of a good or factor of production at a price higher than that at which they would willingly part with that unit.

People would pay very high prices for drinking water, as they need it to survive. The difference in the price that they would pay, if they had to, and the amount that they pay now is their consumer surplus. The utility of the first few litres of drinking water is very high (as it prevents death), so the **first few litres would likely have more consumer surplus than subsequent litres.**

Buying coffee from Starbucks is more expensive than buying a 7-11 cup of coffee, because people will buy the Starbucks brand. **Starbucks identifies those willing to spend more for a cup of coffee and markets to that group. The higher prices result in producer surplus with higher profits.**

Consumer surplus

The consumer is willing to pay 0E dollars for the first unit of the good they purchase, and lower amounts, as measured by the demand curve, labelled D, for subsequent units until they are just willing to pay the current market price P0, and no more, for the last unit they purchase. The reason the consumer is not willing to purchase more than Q0 units is that additional units are worth less, as measured by the height of the demand curve, than the market price. **The consumer's total willingness to pay for 0Q0 units of the good is measured by the area EAQ00, while the actual amount they pay is measured by P0AQ00.** The difference between these two amounts is termed the **consumer surplus** – the value to the consumer of the quantity 0Q0 over and above what she actually has to pay – and it **is measured by area EAP0**.

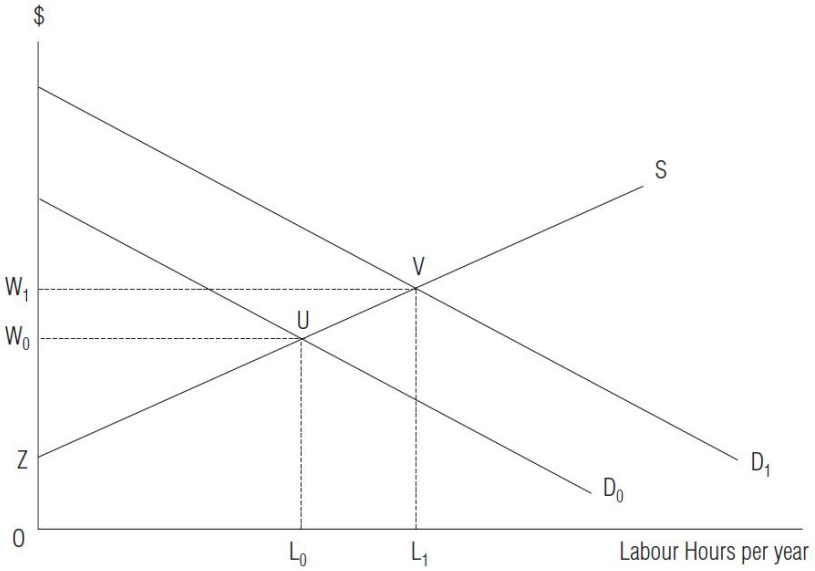


Consumer Surplus

If price falls to P1, then what is consumer surplus?

Producer surplus

The first unit of labour can be drawn into the market at a wage of 0Z dollars, but subsequent units will present themselves only at higher wage rates. A wage rate of W0 is required to induce the quantity supplied 0L0. **While the total amount of wages paid to that quantity of labour is measured by area W0UL00, that quantity of labour could be hired for ZUL00** if each unit was paid the minimum amount required to induce its supply. The difference between the wages actually paid and **the minimum sum required to induce the number of units supplied is measured by area W0UZ, and this amount is termed a producer surplus**.



Effect of an Increase in Demand for Labour

Consumer and producer surplus in cost-benefit analysis: The Kaldor-Hicks Criterion

A benefit-cost analysis is an attempt at implementing the Kaldor–Hicks (K–H) criterion for an improvement in economic welfare: the project contributes to an increase in welfare if the gainers from the project could, in principle, compensate the losers – in other words, if the project represents a potential Pareto improvement (a Pareto improvement is a situation where at least one person is made better off without making anyone else worse off.).

The gain to an individual is measured by the sum of money which, if the project were undertaken, could be taken from them while still leaving them as well off as they would have been in the absence of the project. Conversely, a loss is measured as a sum of money which must be paid to an individual to compensate them for the effects of the project.

Kaldor-Hicks compensation criterion states that a policy is more efficient as long as there is a net gain to society as this enables compensation between winners and losers of a project, resulting in a net gain to society. Therefore, a change is "socially desirable" if it means at least one person is made better off, and the gains to that person made better off are sufficient to compensate the loser (shown through a positive change in the social surplus). When compensation occurs, it leads to an actual Pareto improvement.

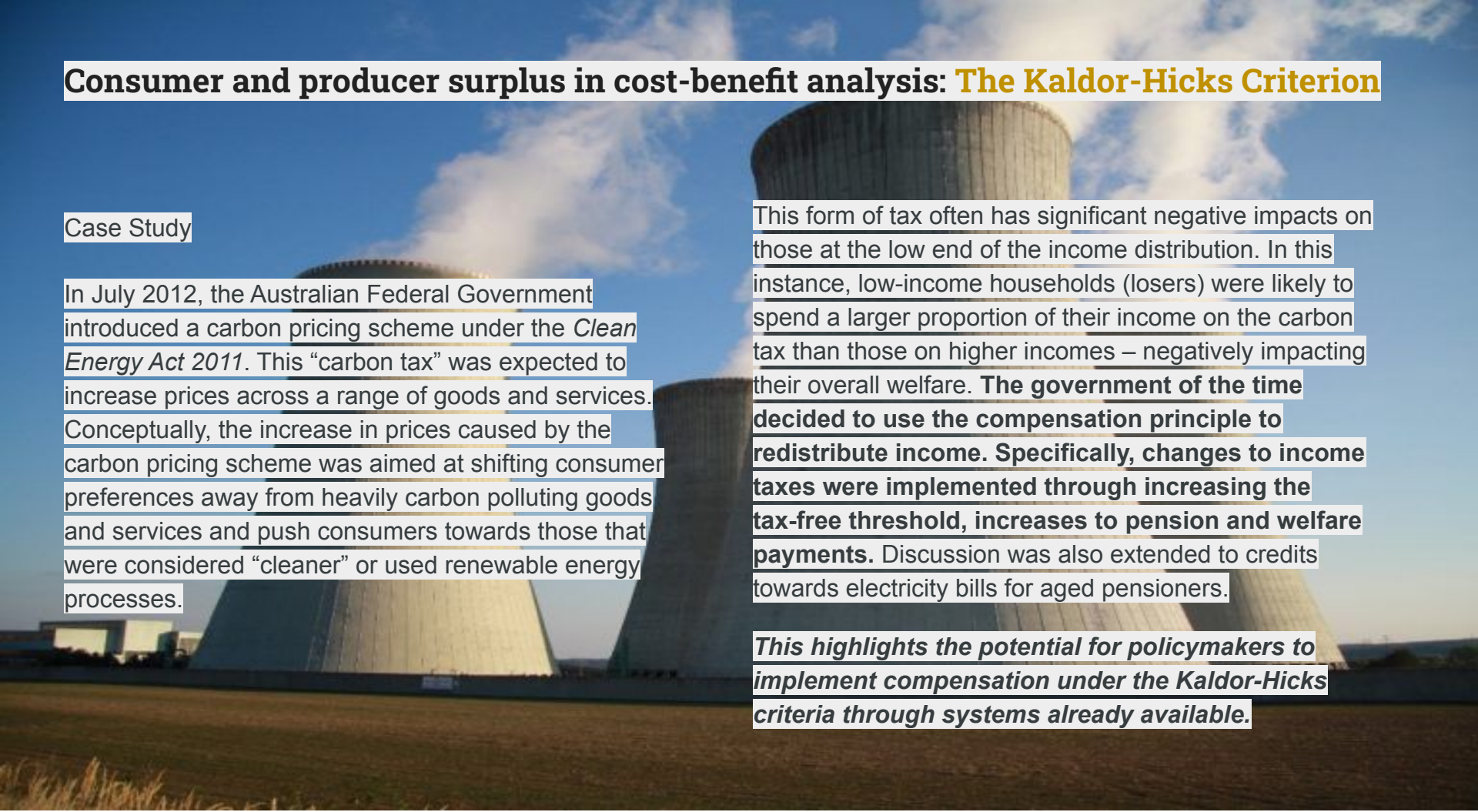
Consumer and producer surplus in cost-benefit analysis: The Kaldor-Hicks Criterion

Suppose, there will be a new railway. Table below lists the benefits and the costs of the project to those who have standing in the project.

Stakeholder	Benefits	Costs
Train Company	$100 million	
Local Residents:		
– Environmental degradation		$20 million
– Noise		$15 million

The net social benefit is greater than zero (= $65 million). To build the railway tracks under this project would not be Pareto efficient. Although there is a net gain of $65 million, the local residents are made worse off by the project. However, as NSB>0 this project meets the requirement the Kaldor-Hicks criterion. There is an ability to compensate the local residents (losers) by taking some of the gains from the train company (winners) and re-distributing the income to the local residents.

Consumer and producer surplus in cost-benefit analysis: The Kaldor-Hicks Criterion



Case Study

In July 2012, the Australian Federal Government introduced a carbon pricing scheme under the *Clean Energy Act 2011*. This “carbon tax” was expected to increase prices across a range of goods and services. Conceptually, the increase in prices caused by the carbon pricing scheme was aimed at shifting consumer preferences away from heavily carbon polluting goods and services and push consumers towards those that were considered “cleaner” or used renewable energy processes.

This form of tax often has significant negative impacts on those at the low end of the income distribution. In this instance, low-income households (losers) were likely to spend a larger proportion of their income on the carbon tax than those on higher incomes – negatively impacting their overall welfare. **The government of the time decided to use the compensation principle to redistribute income. Specifically, changes to income taxes were implemented through increasing the tax-free threshold, increases to pension and welfare payments.** Discussion was also extended to credits towards electricity bills for aged pensioners.

This highlights the potential for policymakers to implement compensation under the Kaldor-Hicks criteria through systems already available.

Types of project goods: Traded and Non-traded

A project undertaken in an open economy may result in changes in the flows of goods and services which are exported or imported. It is not important whether the actual output of the project is exported, or the actual inputs imported.

If the **output** is **a traded commodity** (a commodity which the country exchanges in international trade) it **may be exported** or it **may replace imports**; similarly, if the **inputs** are **traded commodities** they **may be imported** or they **may come from domestic sources** which are **replaced by increased imports or reduced exports**.

The changes in international trade flows resulting from the project need to be valued, and **the prices which measure the benefit or cost to the economy of changes in exports or imports are international prices.**

Projects which involve outputs or inputs of traded commodities are likely also to involve **outputs and inputs of non-traded commodities (goods and services which are not involved in the country's international trade), and these non-traded commodities are valued at domestic prices**.

Traded and Non-traded goods

Non-traded commodities

- Goods and services which are not involved in the country's international trade
- The main reason some commodities are non-tradeable is that they have high international transport costs relative to their production cost.
- the domestic price of the good is lower than the c.i.f. (cost, insurance and freight) import price and hence no domestic customer wants to import the good
- the domestic price of the good is higher than the f.o.b. (free on board) export price and hence no foreign customer wants to import it (i.e., export it from the producing country)
- The basic condition for a commodity to be a non-tradeable commodity under current cost conditions is:
  f.o.b. price < domestic price < c.i.f. Price
- The basic condition for a commodity to be non-traded is (considering taxes and duties, however, tariffs are not social cost as no real resources are involved):
  f.o.b. price less export tax < domestic price < c.i.f. price plus import duty

Traded and Non-traded goods

Valuing Traded and Non-traded Commodities in Benefit-Cost Analysis

Once we introduce international trade into the benefit-cost framework we must take account of both traded and non-traded outputs and inputs. **The value or cost to the economy of project output or inputs of traded goods is established in international markets.**

It is necessary either to convert domestic prices to equivalent international prices (the border price – the price of exports f.o.b. or the price of imports c.i.f.), or to convert international prices to equivalent domestic prices: **two sets of prices.**

An exchange rate is required to convert from one to another, and while there is normally only one official exchange rate, there is also a notional exchange rate devised by economists to take account of the effects of tariffs and other taxes or subsidies on domestic relative to international prices, and known as the shadow-exchange rate: **two sets of exchange rates.**

Benefit-cost analysis of an import-replacing project

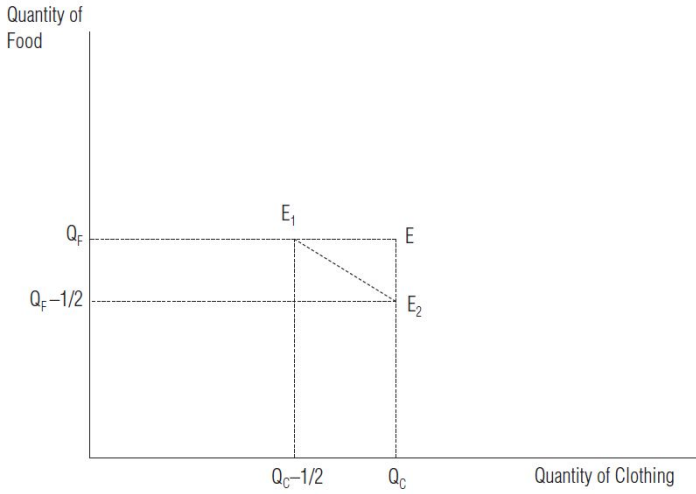
Suppose a country has one factor of production, **labour**, which **is non-traded** and fully employed. **Two traded goods** are produced – **food and clothing**, and there is a 100% tariff on imported clothing. There are two sets of relative prices – **domestic and international**.

We can choose units of food and clothing such that **the international price (border price) ratio is 1:** for example, **if a unit of clothing – thirty suits – costs the same as a unit of food – 1 tonne – then the ratio of the price of a unit of clothing to a unit of food is 1**.

On the domestic market, the price of a unit of clothing will be twice the price of a unit of food because of the tariff on clothing. Clothing is imported and food is exported.

Now, suppose that the **domestic economy is competitive, with no tax distortions apart from the tariff on clothing**. This means that labour transferred from food to clothing production would reduce the value of output of food by the same amount as it would increase the value of output of clothing, where both values are measured at current domestic prices.

Since the domestic price of clothing is twice that of food, this means that **if we choose the quantity of labour such that food production is reduced by one unit by the reallocation of labour, clothing production will increase by half a unit. What would be the efficiency net benefit of a project involving such a reallocation of labour?**



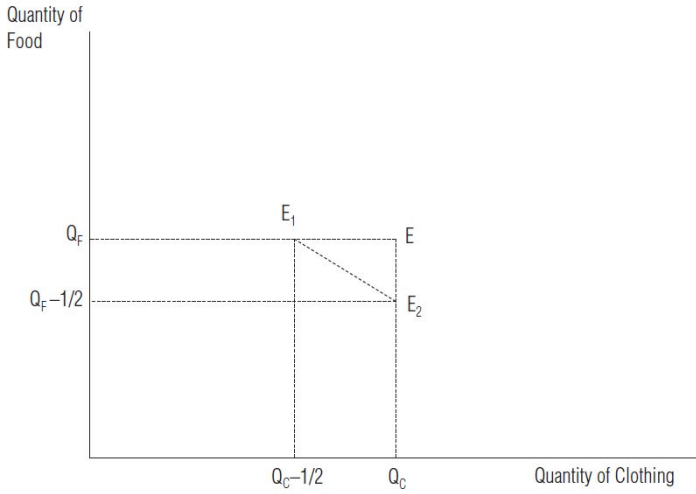
Benefit-cost analysis of an import-replacing project

The **extra half unit of clothing produced domestically** could be used to **replace imports of half a unit of clothing.** Since units of food and clothing trade on a 1:1 basis on world markets, **exports of food could be reduced by half a unit.**

The net effect of the reallocation of labour in this case is a loss of half a unit of food – a reduction of one unit of domestic production partially offset by a reduction in exports by half a unit.

Alternatively, **exports of food could be reduced by one full unit, to keep the domestic supply of food constant, in which case imports of clothing would have to fall by one unit** (as trade is 1:1 basis)**. The net loss to the economy would then be half a unit of clothing** (as half a unit of clothing is produced domestically now).

The country is worse off as a result of the proposed import-replacing project: the loss is some weighted average of half a unit of clothing and half a unit of food, with the weights depending on how the economy wishes to absorb the loss.



Benefit-cost analysis of an import-replacing project

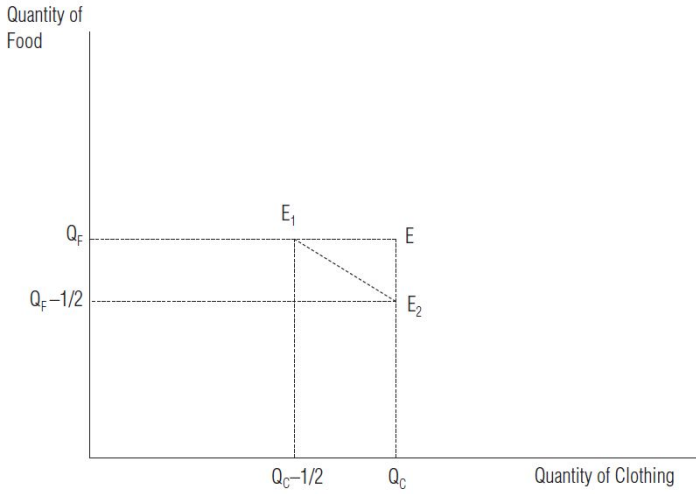
This Figure illustrates the options available to consumers with and without the project:

Without the project the initial consumption bundle is denoted by point E; with the project a consumption bundle along E1E2 must be chosen. Clearly such a point will represent less of at least one of the goods, implying that undertaking the project makes the country worse off.

In project evaluation we argue that the efficiency net benefit is given by the value of the extra clothing (of half a unit) less the cost of the labour transferred to clothing production.

At first sight, the project appears to have a net benefit of zero: at domestic market prices the value of the extra clothing equals the cost of the extra labour in clothing production.

However, the value to the economy of traded goods such as food and clothing is expressed at international prices, whereas the cost of a non-traded good such as labour is expressed at domestic prices. **We have to either convert the value of traded goods to equivalent domestic prices, or convert the value of the non-traded good to world prices to make an appropriate comparison.**



UNIDO method

The UNIDO approach, named after the United Nations International Development Organization guidelines, which advocates the use of non-traded goods (domestic) price equivalents.

Under the UNIDO approach non-traded commodities are valued at domestic prices (shadow-priced to reflect domestic market imperfections), and traded commodities are valued at international prices (US$) which are converted to domestic prices using the shadow-exchange rate (SER). **Shadow exchange rate is the official exchange rate if all trade distortions, e.g., import duties, export subsidies are eliminated.**

Suppose that a project uses imports, M, and a non-traded commodity such as unskilled domestic labour, N, to produce an exported good, X. The traded commodities X and M are denominated in US$ and the non-traded commodity is denominated in domestic currency. Suppose that there are two types of distortions in the domestic economy: tariffs, resulting in a divergence between the OER and the SER; and a minimum wage resulting in unemployment of unskilled labour. The two approaches to calculating project NPV in an efficiency benefit-cost analysis can be summarized as follows:

$$\text{UNIDO: } NPV(1) = (1/SER)X - (1/SER)M - bN,$$

where SER is the shadow-exchange rate (measured in US$ per unit of local currency, and b is the shadow-price of domestic labour which takes account of unemployment

LM method

The LM approach, named after its authors, Little and Mirrlees and adopted by the Organization for Economic Cooperation and Development (OECD), which advocates using traded goods price equivalents (border prices). The LM approach was further developed by Squire and van der Tak (1975) and is sometimes referred to as the LMST approach.

Under the LM approach traded commodities are valued at international prices converted to domestic currency by means of the official exchange rate (OER), and non-traded commodities are shadow-priced to account for domestic market imperfections, and also adjusted for foreign exchange market distortions using the SER. The OER is either the fixed rate set by the government or the market rate established by the foreign exchange (FOREX) market.

$$\text{LM: NPV(2)} = (1/\text{OER})X - (1/\text{OER})M - cN,$$

where OER is the official exchange rate (measured in US$ per unit of local currency), and c is the shadow-price of domestic labour which takes account of both unemployment and trade distortions.

Equivalence of UNIDO and LM methods

UNIDO: NPV(1) = (1/SER)X – (1/SER)M – bN

LM: NPV(2) = (1/OER)X – (1/OER)M – cN

UNIDO		LM	
Tradeables	**Non-Tradeables**	**Tradeables**	**Non-Tradeables**
Use border prices in US dollars converted to domestic currency using the SER	Use domestic prices in domestic currency shadow-priced for domestic distortions	Use border prices in US dollars converted to domestic currency using the OER	Use domestic prices in domestic currency shadow-priced for domestic distortions and adjusted for FOREX market distortions using SER/OER

Example: OER: $0.75/Kina, implying that 1.3333 Kina = 1US$
SER: $0.67/Kina, implying that 1.4925 Kina = 1US$
Shadow-price of labour: 60% of market wage

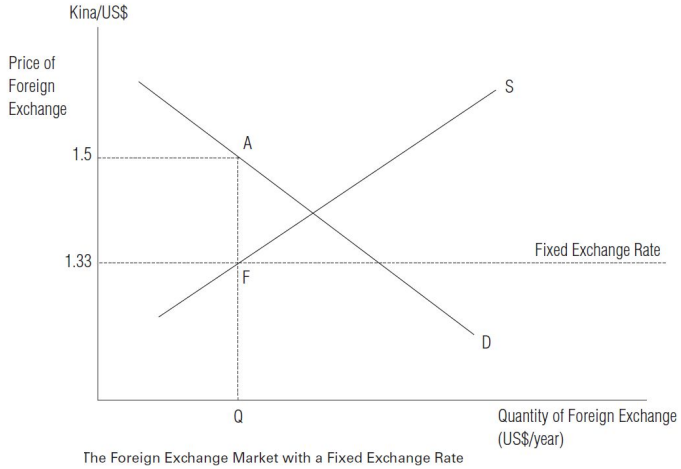
Exports	Imports	Labour	Exports	Imports	Labour
$6	$1	K5	$6	$1	K5
K8.96	K1.49	K3	K8.0	K1.33	K2.68
	Net Benefit = K4.47			**Net Benefit = K3.99**	

Shadow exchange rate

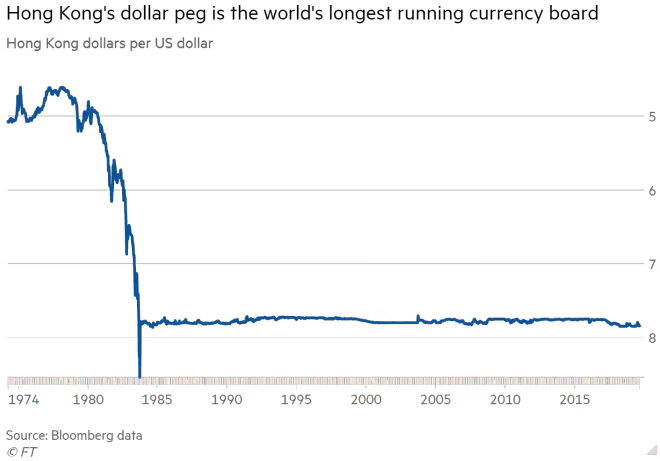
The need for an SER arises from imperfections in international markets which have two main sources: fixed exchange rates and tariffs, taxes and subsidies on exports and imports.

A fixed exchange rate is a monetary policy where a country's currency value is pegged to another currency's value.The government or the central bank may decide on the target rate, as well as the ceiling (upper limit) and floor (lower limit) between which the exchange rate is allowed to move. However, it is the central bank that has the sole responsibility of monitoring and intervening to bring the rate back within the range.

The advantages of a fixed exchange rate are certainty, less speculation, and economic management. The disadvantages of a fixed exchange rate are inflation (in devaluation, cost-push inflation), less freedom and flexibility (govt loses freedom of using interest rates), and setting it at the wrong rate.



The Foreign Exchange Market with a Fixed Exchange Rate



Shadow pricing of labour

Suppose a development project is being evaluated in a region with high unemployment. The market wage is influenced by minimum wage laws (distortion), but many workers are willing to work for less due to lack of opportunities. Steps to calculate shadow price of labour:

- Identify the impact of minimum wage laws and adjust the market wage downward to reflect what workers might realistically accept in the absence of such laws.
- Calculate opportunity cost: If the alternative for most workers is unemployment or informal work with very low wages, the opportunity cost of labor might be close to zero or very low.
- Consider the positive externalities of employing these workers, such as reduced poverty and improved social outcomes, which increase the shadow price of labor.
- Include benefits like skill development and health improvements from stable employment.

Aggregate these components to estimate a shadow wage that reflects the true economic value of employing labor in the project.

Shadow pricing of land

Suppose a piece of agricultural land is being considered for conversion into an industrial site. The market price of the land is influenced by agricultural subsidies (distortion), leading to an artificially low price. Steps to calculate shadow price of land:

- Identify the subsidy amount and adjust the market price upward to reflect its true value without subsidies.
- Calculate opportunity cost: Evaluate the potential revenue from continuing agricultural production versus the benefits of industrial development. For instance, if the land could produce crops worth $10,000 annually, this represents the opportunity cost.
- Factor in negative externalities such as pollution and displacement of communities due to industrialization. Also, consider positive externalities like job creation and economic growth.
- Include values like biodiversity conservation or cultural heritage if the land holds such significance.

Aggregate all these components to estimate the land's shadow price, which might be significantly higher than the distorted market price.

Shadow pricing of natural resources

Suppose a project involves logging in a forest area. The market price of timber may not reflect the true economic value of the forest due to subsidies (distortion) and the failure to account for environmental impacts. Steps to calculate shadow price of natural resources:

- Identify the subsidies affecting the market price of timber and adjust the price upward to reflect its true value without these subsidies.
- Calculate opportunity cost: Evaluate the value of alternative uses of the forest, such as ecotourism, carbon sequestration, and biodiversity conservation. The opportunity cost would be the benefits foregone from these alternative uses.
- Factor in negative externalities like deforestation, loss of biodiversity, and greenhouse gas emissions, as well as positive externalities such as potential reforestation efforts and their environmental benefits.
- Include values like the forest's role in maintaining biodiversity, cultural heritage, and providing ecosystem services such as water purification and soil conservation.

Aggregate all these components to estimate the shadow price of timber, which might be significantly higher than the distorted market price.

Notes on shadow pricing

- Shadow prices are often used to approximate the opportunity cost of resources when market prices are not available or are distorted. Shadow pricing removes distortions and calculates new prices that reflect the real scarcity to society.
- The shadow price of a resource should reflect its true opportunity cost, incorporating all relevant economic factors, reflect the value of a resource in its next best alternative use.
- When the shadow price of land is higher than the shadow price of labor, it indicates that the economic value or opportunity cost of land is higher compared to labor. This suggest that land is relatively scarcer or more valuable, and optimizing land use to maximize its value could be a priority. Net benefit will increase if more land and less labour should be used in such a project. However, this may induce inequality between landowners and labourers.

If you increase the land available for the project by one hectare and the NPV increases by $10,000, then you know that land has a shadow price of $10,000 per hectare.

If the shadow price of pollution is $50 per ton, it means that reducing one ton of pollution would increase the net benefits of the project by $50.

Exemplar questions

- Calculate NPV of a project with traded outputs and non-traded inputs using UNIDO and LM methods.

- Suppose, there is an eco-tourism project planned for your city and the project manager wants to address youth unemployment and resource management. What resources/factors should be considered and how is the value of this project determined?