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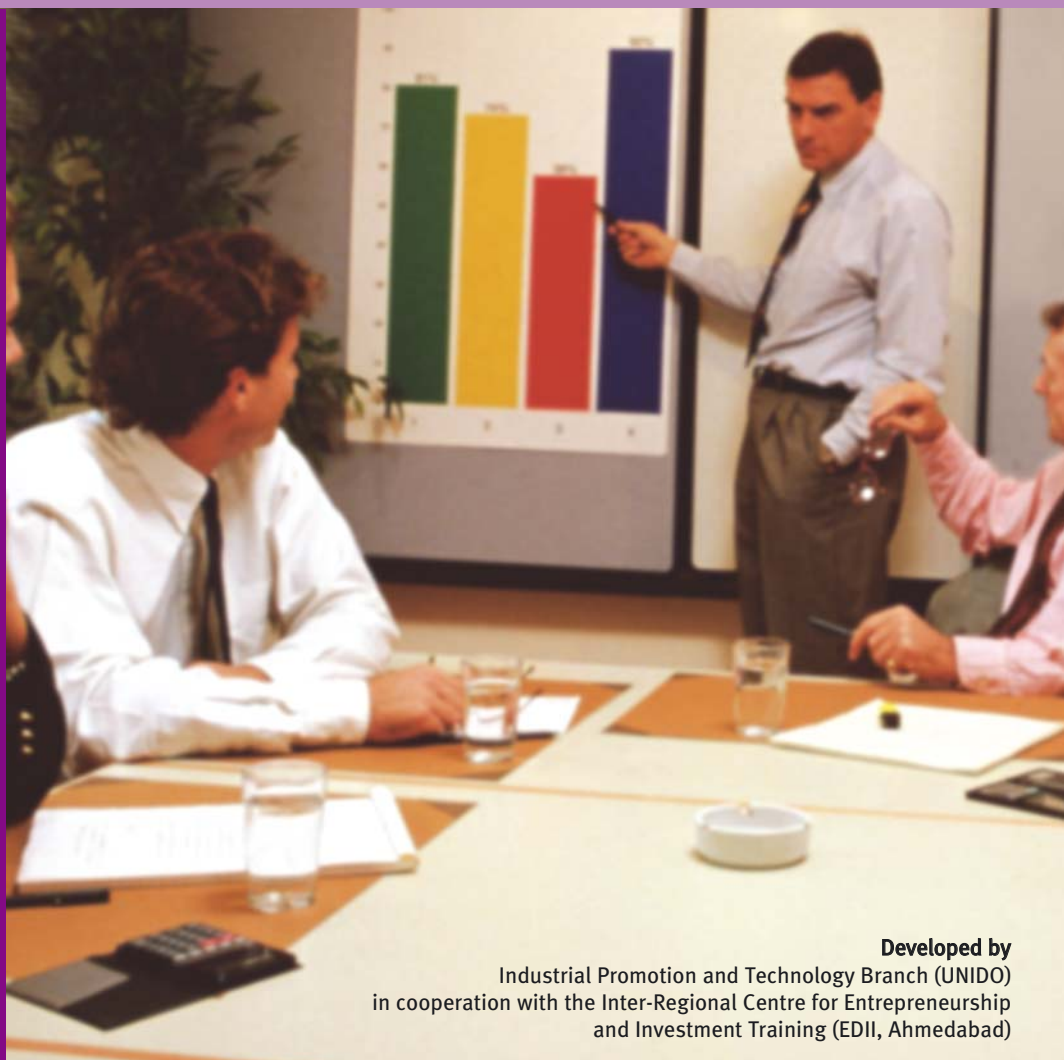
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Developed by
Industrial Promotion and Technology Branch (UNIDO)
in cooperation with the Inter-Regional Centre for Entrepreneurship
and Investment Training (EDII, Ahmedabad)

Economic Analysis



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INVESTMENT PROJECT PREPARATION AND APPRAISAL

IPPA Teaching Materials

Economic Analysis

Module 5

Developed by

Industrial Promotion and Technology Branch (UNIDO)

in cooperation with

The Inter-Regional Centre for Entrepreneurship and Investment Training
(EDII, Ahmedabad)



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MODULE 5 – ECONOMIC ANALYSIS

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INTRODUCTION

ECONOMIC ANALYSIS



Economic analysis is an attempt to measure the impact of an investment project on the national or regional economy and on the social environment.

Although most stakeholders in an investment project are concerned with its viability in terms of markets, technical aspects and ultimately its projected financial returns, as resource constraints are increasingly encountered throughout the world the importance of considering how a project will fare in the broader

context of the economy takes on greater significance. The price of a scarce resource may not presently reflect its true economic value, but this is probably only a temporary phenomenon resulting from lack of sufficient information about availability and consequences of its use or generation. Economic analysis may be relevant to stakeholders if only to have a preview of the situation that will eventually prevail when information concerning the resource becomes more widely available. This is relevant to small and large projects.

Decision-makers at the national or regional level may want to understand the impact of the project on economic indicators, such as the national income or gross domestic product, particularly if the effect will be significant. However, officials may be concerned with the cumulative effects of many small projects, and so may apply the same economic criteria to projects large and small.

ECONOMIC PROFIT - MEASURE OF PROJECT VALUE

ECONOMIC PROFIT: MEASURE OF PROJECT VALUE

- ❖ A rational basis for decentralized economic decisions
- ❖ Commercial profit not good signaling mechanism
- ❖ Receipts and expenditures do not reflect social benefits and costs
- ❖ Price adjustments to reflect social value
- ❖ Economic analysis – determining surplus of economic benefits over costs

A rational basis for decentralized economic decisions: Profit is a rational criterion for decentralized decision-making in regard to the economic consequences of investment. Although economic concerns can be over-ridden by other national criteria, knowledge of economic profitability is a useful, if not necessary, feature of any decentralized framework for economic decision making.

Commercial profit not good signaling mechanism: Financial analysis mainly

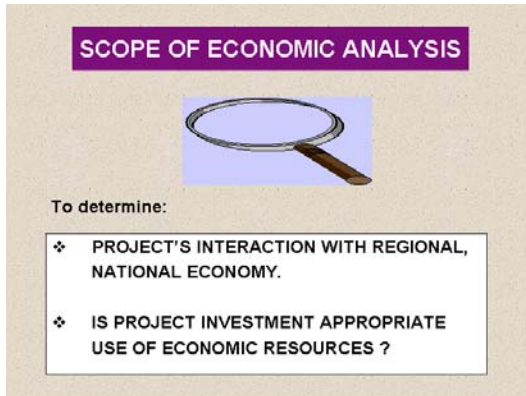
focuses on arriving at profit/surplus measuring indicators to help investment decision-making. Potential profits attract investors, who allocate their resources for such profitable projects, suo-moto. However, actual receipts and expenditures usually do not reflect social benefits and costs. Market prices are often distorted from their economic values. From the national perspective, such a decentralized process may not produce desirable results if the profits arrived on the basis of market prices fail to reflect the social consequences.

Receipts and expenditures do not reflect social benefits and costs: Commercial profit is an indispensable indicator for guiding decentralized investment decisions, but it may not be a good signaling mechanism if expenditures and receipts do not measure social costs and benefits.

Price adjustments to reflect social value: In a systematic economic analysis market prices of inputs, outputs and external effects are adjusted to economic or social value.

Economic analysis - surplus of economic benefits over costs: In economic terms, profit is the surplus of economic benefits of a project over its economic costs. Economic analysis is a means of determining social gains/profits by applying appropriately adjusted prices for project receipts, expenditures and externalities. The appropriateness of economic analysis increases to the extent that actual project expenditures and receipts differ from the social costs and benefits.

SCOPE OF ECONOMIC ANALYSIS



Analysis of the economic consequences of an investment project is more thorough and penetrating than the standard approach of investors and commercially-oriented stakeholders. The scope of impacts considered is much wider.

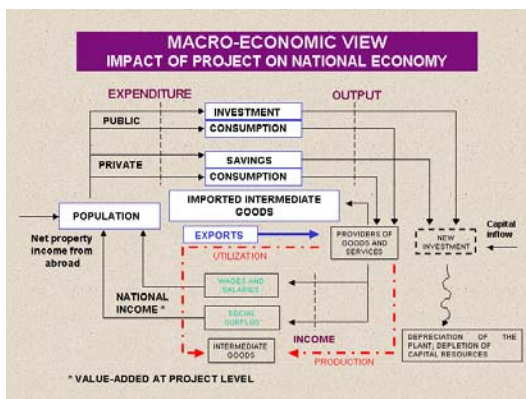
Project's interaction with the national economy: When an investment project is implemented it becomes part of the larger economy, using and generating resources and precipitating financial flows. A producer can not exist in isolation. There

are interactions not only with suppliers, clients and financial institutions, but with the society as a whole. A manufacturing company becomes part of the community, sustained by its presence and contributing to its welfare. In the larger view, it is of considerable interest to understand these interactions.

Is project investment appropriate use of economic resources: When resources such as capital are scarce, prudence demands that they be applied in the manner that will do the most good. The perspective of interest is the good of society rather than focusing on the criteria of controllers of the capital. Capital owners are greatly motivated to make good decisions, so their ideas should be respected. However, even the wise and sharp-eyed owl occasionally misses a tasty morsel, its range of observation limited by internal and external constraints.

The question of whether or not a project investment is an appropriate use of economic resources appears to be answerable from at least two perspectives, but these perspectives merge in the longer term as resource information becomes more widely available, and as the organic concept of the enterprise is adopted.

MACRO-ECONOMIC VIEW - IMPACT OF PROJECT ON NATIONAL ECONOMY



The illustration describes the flow of resources in the national economy. Actually, in the direction shown the flow is of funds - resources flow in the opposite direction.

The economy consists of producers (providers of goods and services) and consumers (population).

Starting from producers, their output can be considered as income to wage earners and others included in 'social surplus' (the population), e.g. profit, interest and rents earners and indirect taxes to the government. The value of output is reduced for an individual producer by intermediate inputs that are counted as output for the supplier. The net is the

value-added for the economy or national income, the value of all goods and services produced. This is the basis for Value-Added analysis. Total income is enhanced by property income from abroad.

The population, in turn, disposes of (expends) its income directly or turns some over to the government in the form of taxes. Ultimately these expenditures become revenues for producers in return for their output. Revenues for producers are enhanced with exports, which represent additional flows into the economy.

Individuals and governments decide either to save or spend. Savings ultimately find their way into investment and consumption represents revenue for producers. In other words, the income stream divides into consumption and investment. This is the basis for Economic Cost Benefit Analysis (ECBA) of investment projects. In the UNIDO methodology consumption related to a project is measured, with investment converted to its consumption equivalent.

Investment is necessary to build the economy, increasing plant size at the national level. However, capital goods depreciate over time, from use and from natural deterioration. It is necessary to reinvest part of the flow to maintain the production status quo.

RATIONALE FOR ECONOMIC ANALYSIS



Distorted national price structures in comparison with world market: Prices in the domestic markets - commodities, capital, wages, etc., often do not reflect economic value (see below).

Social imbalances

Distribution of wealth among contemporaries: The distribution of project benefits among contemporary social groups may be of concern. Private firms are usually not concerned about

social inequality and therefore do not differentiate between projects in this regard. However, governments often have social distribution goals, which aim to alter income inequities among the population. The government might favor projects that provide more benefits to workers rather than to investors.

Inadequate domestic savings: In a developing country capital is generally in short supply. As current savings flow into present investment that can produce higher future consumption, the government may assign a relatively high value to future consumption than investors depending upon its temporal outlook. If the government chooses a discount rate for projects that is lower than the market rate of interest, this indicates that the government places a higher value on savings and future benefits than the value indicated by the choices of private firms.

Uneven regional development: The government may wish to place greater weight on economic development in depressed regions of the country.

Unstructured labor market, unemployment: A national objective may be to provide greater structure to the labor market by promoting projects that would develop valuable technical skills for workers or to address a problem of unemployment or underemployment in a region.

DISTORTED PRICE STRUCTURE



The economic value of resources consumed and generated by a project (inputs and outputs) are not necessarily reflected in their market prices. Distortions in the market cause economic value and market price to diverge. In a perfect market with free information flow, ubiquitous potential suppliers and lack of constraints (see standard economic text for a more comprehensive definition of a perfect market) there would be no deviation between market and economic price. However, in the real world nothing,

including markets, is perfect. Among other factors, government intervention in the economy creates distortions in prices leading producers and consumers to make production and consumption decisions that are not economically efficient. The result is price distortions that derive from a variety of causes, some of which are as follows:

Market imperfections:

Market information: Information about the consequences of use of a resource is usually incomplete. Most consumers are not aware of alternative uses of a resource and their consequences for individual or collective welfare.

Capital markets: In a perfect capital market the expected rate of return by capital subscribers should be equal for projects with equal risk. In developing countries capital markets are usually not well developed, resulting in price distortions that are exacerbated by imperfections in other markets. Credit capital forms a substantial portion of total capital invested, and rates on loans vary widely. As a result the actual cost of capital differs from the social cost of capital, the discount rate that is appropriate for economic appraisal of projects.

Market structure:

Monopoly: Markets are often dominated by one or a few suppliers (oligopoly) with the ability to set prices in the absence of competition.

Monopsony: This is a consumer monopoly, domination by a one or more buyers who control the market.

Low elasticity of demand for exports: When a country is engaged in exporting a product with low elasticity of demand (demand does not change significantly with change in price), wide fluctuations in export prices can result as producers compete for a limited market.

Wage rates and under employment: In a free labour market the wages paid should be equal to the marginal product. In developing countries for many reasons the actual earnings of labour (mainly unskilled) often exceeds its marginal product. For example, unskilled workers in growing sectors earn more than the casual labour in conventional sectors such as agriculture. Under-employment creates a situation where a dependent member of a rural family may consume more than his marginal product. If the government tries to compensate by increasing compensation to meet the consumption requirement, marginal production remains constant and a gap is created between market prices and social costs.

Market interventions:

Industry protection: Governments may impose constraints on trade to protect a particular industry, such as quotas and import duties. In the absence of foreign competition, such industries may be able to raise prices beyond international levels. Quotas on imports create a supply gap that further distorts the price of the good on local markets. Tariffs and duties represent transfers from consumer to taxing authorities that may not reflect product value.

Taxes and subsidies: From the commercial perspective, taxes are actual costs and subsidies receipts. However, taxes and subsidies are transfer payments (move costs and benefits from one social segment to another). For measuring social costs and benefits they may or may not be irrelevant; in any case they are a distribution factor. Taxes and subsidies alter the normal resource allocation pattern and consequently affect the structure of prices.

Price controls: Controls on prices inevitably result in distortions between market price and economic value.

Currency overvaluation: The government may favor domestic consumers and producers for local markets by maintaining artificially high exchange rates. Prices are then distorted in regard to world markets. Imports become relatively cheap and exports more expensive for trading partners. Demand for foreign exchange exceeds supply, often resulting in the emergence of a parallel market in the currency, in which the exchange rate reflects a risk premium over what would otherwise be the free exchange rate. The result is distortion in prices at the border (imports and exports), usually with impacts upon domestic prices as well.

Resource constraints:

Availability: Resources that are not freely available to the market cause price distortions. If the use of a scarce resource involves its diversion from another productive use, the productivity loss in its alternative application may not be fully taken into account by the market.

Distribution: How resources are distributed can distort prices. Regional differences could be the result of transportation or other bottlenecks.

Inflation:

Fiscal policy may result in too much money (demand) chasing too few goods (supply). Equilibrium conditions spiral out of control. A gap in supply in sectors such as agriculture, which is relatively inelastic, results in rapid price increases. Government interventions, e.g. price controls, may discourage production by rendering such sectors unprofitable and exacerbating the inflation problem.

Externalities:

These are project impacts that do not affect commercial viability. Externalities are perhaps one of the most significant and widespread roots of deviation between the market and economic cost or benefit. A project may have beneficial external effects not taken into account by private firms that are considered by government decision-makers, such as the creation of infrastructure facilities (e.g. roads, railways), or providing an upgrade in worker skills that can result in future public benefit.

Some externalities may be negative, such as environmental degradation or displacement of populations. The life-cycle benefits and costs of a product are rarely, if ever, taken into account by the market, such as the cost and environmental impact of product disposal. Others are the costs or benefits of social and cultural displacements or health impacts.

Merit goods:

The concept of a merit good is based on the idea of values that are held in common by society - values that are different from those expressed in individual demands. For example, an education programme might be considered to have positive social merit whereas tobacco and alcohol are viewed as having negative social merit. Private firms tend to disregard the effects of merit or demerit goods on actual profits, but governments consider them as additional social benefits or costs.

CORRECTING PRICES

POLITICALLY DIFFICULT TO CORRECT PRICES AT MACRO LEVEL: Governments can attempt to achieve distribution of wealth at the micro or project level that they would be reluctant to do at the macro level

Economic 'inertia': It is difficult for governments to remove price distortions through economic policy changes because powerful forces resist change in the status quo. Inertia developed over long periods of drift in the political economy, is like a huge ship in the ocean, difficult to turn in

the short term.

Political conflicts: Often resistance to change in the pattern of inequitable distribution of wealth arises from opposition from the potentially injured side of the political spectrum. Redistribution through corrections in pricing mechanisms is generally favored on one side and opposed on the other. Incumbent governments are reluctant to overtly antagonize constituents, and can possibly achieve their goals through stealth (selection of projects) that would otherwise be politically unpalatable.

Resistance to including externalities in pricing system: Producers and consumers usually oppose the inclusion of externalities in the pricing system. Even when there is consciousness of beneficial or harmful external impacts, individual enterprises or consumers are resistant to either pricing in or paying for them, either

choosing to ignore them or preferring to let the society at large deal with such matters.

ECONOMIC ANALYSIS - BREADTH AND DEPTH vs. SIZE OF PROJECT

ECONOMIC ANALYSIS BREADTH AND DEPTH vs. SIZE OF PROJECT		
•MICRO (up to 10)	→	only if program component
•SMALL (11-50)	→	only if program component
•MEDIUM (51-250)	→	if project elements justify this type of appraisal
•LARGE (over 250)	→	almost always
•VERY LARGE	→	extent often dictated by political decisions; in any case - all types of appraisal are necessary
•MAMMOTH	→	

Economic appraisal has a cost, so the question inevitably arises concerning whether or not it is worth the effort. "Those who evaluate projects by [economic] analysis should evaluate their own work by the same criteria. It is easy to become so involved in the theoretical niceties of economic project appraisal that it is carried to the point where it produces only superfluous information instead of better investment decisions." (Guide, p. 4).

Although, economic consequences should be in the consciousness of every stakeholder to a project, there is little doubt that the extent and depth of this type of appraisal will vary from virtually nothing to comprehensive.

In the illustration the following suggestions concerning the applicability of economic analysis are offered in regard to the size of the project:

- Micro or small - only if a component of a larger investment programme.
- Medium - if some element of the project justifies economic appraisal
- Large - almost always
- Very large, mammoth - extent often dictated by political decisions; in any case - all types of appraisal are necessary

What is a small, medium or mammoth project? It depends on the size of the economy. In some industrialized countries a small business is considered to have a capitalization of under \$1 billion, whereas in some developing economies a small business investment might be smaller by a factor of 1 million. Clearly what is considered small, medium or large depends upon the size of the economy.

Breadth of economic analysis should be limited to those items that have both large impact and large distortion. This criterion is, of course, related to the size of the project. For a micro-sized project, there may be large distortion in an item, but the economic impact is bound to be small to insignificant. However, even for micro and small enterprises, consciousness of economic factors is useful if only to understand better the future course of markets and public policy.

Depth of analysis has the dimensions of time and space. If economic analysis is warranted, the extent to which economic pricing is attempted may vary with project stage, with greater depth as the project nears the investment decision point. The degree to which externalities are investigated has both time and space dimensions, increasing in depth with the stage of project development, but also in the sense of repercussions in the economy. A project sends out waves that impact like ripples on a pond. To what extent such 'ripples' are to be considered is a function of their significance, but often at the later stages study of more than one round of impacts

is often warranted. For example, a dam project has the immediate impact of providing energy and irrigation, the inundated areas involving loss of existing land uses, displacement of populations and disruption of habitats. Secondary effects may include disruption of nutrient distribution patterns in river deltas, salinization and waterlogging of irrigated farmland.

APPLICABILITY OF ECONOMIC ANALYSIS BY PROJECT CLASSIFICATION



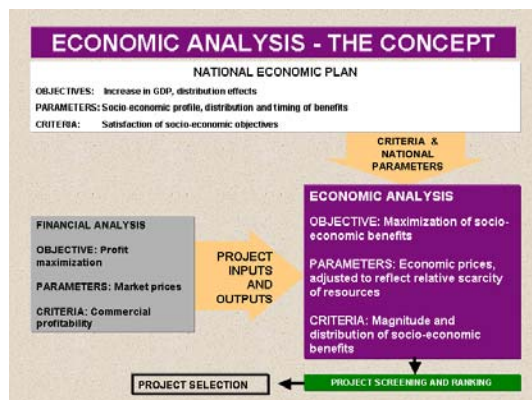
Private and public sectors: Is economic analysis applicable to projects both in the private and public sectors? Either case requires the allocation of resources for the generation of benefits. In some respects analysis is more applicable to the private sector as public sector projects inherently accord with public policy. However, knowledge of the impact of resource allocations has relevance regardless of sector.

Income projects: Economic analysis will provide important information even if all project costs are covered by project income (private and public sectors).

Semi-income projects: If the investment is to be covered only partially by income in the form of tariffs or fees, economic analysis is warranted to determine if the project is an acceptable use of public resources. An example of such a project would be a transportation system with rider fees covering only operating rather than investment costs.

Non-income projects: If a project requires the allocation of public resources with no attendant revenues, the justification for economic analysis is clear, as the most accurate way of determining value for the project's output.

ECONOMIC ANALYSIS - THE CONCEPT



National economic plan: Policies that are reflected in a national economic plan are the framework for economic analysis. The basic question is how the benefits to be realized by the allocation of resources committed to a project accord with national economic and social policies. National policies have objectives, such as increase in GDP and distribution of wealth. Parameters such as socio-economic profile, distribution and timing of benefits, are adjusted in accordance with objectives. Officials determine criteria to

measure results against objectives. The national plan provides criteria and parameters that are used in the economic analysis.

Financial analysis: Usually financial (commercial) analysis of a project is a starting point for economic analysis, although it is not essential. Commercial analysis defines inputs, outputs and their market prices. Externalities are, by definition, excluded from consideration. The objective of commercial investment is profit maximization. Parameters are market prices of inputs and outputs, including investment. Criteria are commercial profitability and risk avoidance.

Economic analysis: Estimates of costs and benefits in accordance with national goals and objectives are the purpose of economic analysis for a project. In this national context the project is examined in regard to the objective of maximizing socio-economic benefits of available resources. Parameters are economic valuations of resources reflecting their scarcity and usually derived for commercially identified inputs and outputs by adjusting their market prices accordingly. Project criteria reflect the magnitude and distribution of socio-economic benefits to be realized.

Project ranking and screening: Government officials responsible for investment allocation first screen projects, eliminating some and suggesting modifications to others, to determine projects that meet criteria. They are ranked according to the degree to which criteria are satisfied.

Project selection: Selection of projects is usually based upon a combination of objective and subjective criteria. This is a fact that investors and their analysts have to take into account.

NATIONAL OBJECTIVES - A CHECKLIST



Stakeholders and analysts should be aware of goals and objectives of governments and officials responsible for approving investment projects, some of which may be as follows:

GDP growth rate: The fundamental measure of economic performance.

Income redistribution: Changing patterns of wealth distribution to provide a higher standard of living for contemporary groups and future

generations.

Growth in industry, agriculture, services: Objectives of increasing apportionment of investment in economic sectors.

Infrastructure improvements: Interest in improving the status of infrastructure - transportation, communications, housing.

Employment opportunities: The geographical and social distribution of desired job creation.

Education and health: How projects will impact on education and health improvements.

Economic independence: To what extent the project will reduced dependencies of foreign entities.

Technological progress and independence: How and to what extent a project enhances technological skills of citizens to function independent of external inputs.

Balance of payments, foreign reserves buildup: To what extent the project contributes to improvements in the balance of payments.

Regional development: How the project responds to regional development goals.

National security: If the project includes features that will enhance national security by eliminating potential breaches or shoring up security measures.

PERSPECTIVES ON INVESTMENT - NATIONAL vs. PROJECT

PERSPECTIVES ON INVESTMENT – NATIONAL vs. PROJECT		
ELEMENT	NATIONAL	PROJECT
DEVELOPMENT	Public benefits, e.g. national income	Investor benefits, e.g. financial surplus
CAPITAL INVESTMENT	Mobilize for social welfare	Invest for rate of return
PRICES	Shadow prices	Market prices
RANGE	Direct	Direct and indirect
DISCOUNT RATE	Cost of capital	Social discount rate
FOREIGN EXCHANGE	Balance of payments	Project requirements
EMPLOYMENT	Creation	Exploitation
TECHNOLOGY	Public benefit	Improve market share
NATURAL RESOURCES	Conserve, preserve environment	Resource requirements
LOCATION	Economic stimulation, strategic value	Minimize operating costs

As the appearance of a diamond differs depending on the facet viewed, the nature and significance a project's characteristics vary according to the position of the analyst. The project can be viewed from the perspectives of each participant. The national and project perspectives are compared in the table below, with due consideration of the fact that regardless of the facet it is still the same diamond.

Generally the public interest is served when social benefits are maximized.

Project sponsors seek to maximize their returns. These goals are not necessarily mutually exclusive. In the long run prices that affect profitability will reflect social value as information is disseminated. Project sponsors and those commissioned to protect the public interest can attempt to accommodate both needs to the greatest extent practicable.

Development goals: Public benefits from industrial development can be measured in terms of improvements in national parameters such as GDP and national income per capita. Investors seek financial surplus, which contributes to national income through distribution of profits, rents, wages, etc.

Capital investment: Investment in private and public sectors is intended to generate future benefits - goods and services to be consumed by people within and without the country. Interests of project sponsors and the general public can be served when investment capital is put to productive use.

Prices: Shadow prices reflect opportunity cost of resources (inputs) or the contribution to national objectives (outputs). Market prices will eventually approach shadow prices as general awareness of resource values is enhanced through increasingly effective communications media.

Range: Although project sponsors are concerned primarily with the direct impacts of the project, awareness of indirect effects is important to achieve more cooperative integration with the public in regard to the workforce, to consumers and to the political environment in general.

Discount rate: Sponsors apply a discount rate according to their cost of capital. The distinction between a social discount rate, essentially a method of discounting future consumption, and the productivity of capital diminishes as the goals of society and investors converge.

Foreign exchange: To sponsors, foreign exchange may be required for investment and expenditures and generated from exports. Countries need foreign exchange to acquire goods and services that would otherwise not be available in the country. Both benefit when national foreign exchange objectives are supported by project operations.

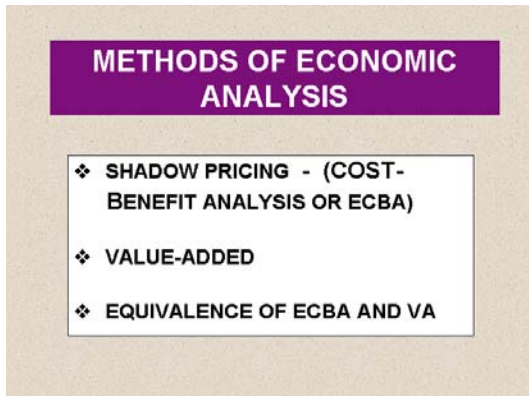
Employment: National representatives seek to maximize employment opportunities in the country. Sponsors seek to employ workers to generate surplus. Both interests are served to the extent that employment provides access to compensation that rewards workers adequately for their efforts and that inspires commitment to the project.

Technology: Sponsors utilize technology to improve operations and its effect on market share and profitability. From the national point of view, command of technology is beneficial in regard to international competitiveness and security. To the extent that technology is absorbed (rather than merely utilized) it can serve the interests of both project sponsors and the country.

Natural resources: As the world population expands, access to natural and produced resources becomes increasingly of concern to both project sponsors and to the country. The project perspective is to employ resources to meet its production requirements. The country seeks to conserve, preserve and to maximize the utility of its resources. Project sponsors will benefit by considering national (and even international) interest in regard to resource consumption and generation in the project design.

Location: Project sponsors seek to maximize operational efficiency in their selection of location, e.g. minimum total transportation cost for inputs and outputs. Countries may have other priorities, such as development of economically depressed regions. It is certainly worthwhile for sponsors to consider the benefits (and costs) of conforming to national goals in this regard. Even if not presently available, discussions with public officials may lead to the offer of incentives to locate in areas that serve the public interest.

METHODS OF ECONOMIC ANALYSIS



Shadow pricing (Cost-benefit analysis or ECBA): Economic prices are applied to project inputs and outputs to determine the net economic benefit of the project. A distinction is made between real and financial flows, the latter included only for estimating distribution effects.

Value-added: The value-added attributable to project and its distribution is analyzed over the project life to estimate the contribution of the project to national income.

Equivalence of ECBA and VA: When performed comprehensively and with the same unit of account, these methods should lead to essentially equivalent results. For example, if 'income' is the unit of account for each method the quantitative result should be similar.

As a very simple example of equivalence of the methods, consider the following.

A group of villagers are now employed locally producing income of R10 (it does not matter if the net of their labours are in the form of wages or equivalent goods). The villagers are now to be engaged in producing goods in an industrial enterprise with an output of R100 that represents its commercial and economic value. This value is comprised of three components: wages, material inputs and profit. Material inputs have a value of R50, both in market and economic terms. The wages will be R30 and profit is R20.

The result of **economic cost-benefit analysis** in terms of income is as follows:

Benefits	100	
Costs		
Labor	10	
Materials	<u>50</u>	
	60	
Net benefits		40

Labor is priced at its 'shadow' value, the cost in economic terms (value foregone) of employing the labor in the project.

Value-added analysis would approach the problem as follows:

Value of output	100	
Less: Material inputs	50	
Net value added		50

Now consider the components of the VA: Profit - R20; Wages - R30. However, the actual contribution of wages to VA must be reduced by the VA sacrificed by employing the workers in the project. The value-added content of the wages attributable to the project would be $R30 - R10$ or R20 which, combined with the VA in profit is a net VA of R40, equal to the net benefits calculated in the ECBA approach.

Pricing approaches are presented for resources (see Economic Price) that are common to both methods of analysis.

ECONOMIC PRICING

ECONOMIC PRICING

Impact of resource use or production on economic indicators
Leads to improved/optimal allocation of resources

The graphic consists of a purple header box with the text 'ECONOMIC PRICING' and a white box below it containing the text 'Impact of resource use or production on economic indicators' and 'Leads to improved/optimal allocation of resources'.

Markets usually do not reflect the true economic value of resources. Economic values are measures of the impact on regional or national indicators of the use or production of resources. Decision makers should be aware that commercial evaluation of a project, based upon market prices of inputs and outputs, does not necessarily result in the best resource allocation.

In addition, a commercial evaluation does not take into account externalities, effects that are consequences of the existence and operation of a project but that do not enter into the resource and financial flows that are of primary concern to investors. Externalities may confer additional benefits or costs that should be included in a broader system of accounting.

This section deals with the economic pricing of project inputs and outputs. Technological impacts related to systemic externalities are discussed in Technology, Environment. Economic impacts of externalities are discussed in Externalities.

An alternate approach to shadow pricing, based upon decomposition of project inputs and outputs, and relating prices to a few primary factors such as the shadow prices of labor, foreign exchange and taxes/subsidies, is provided in Semi Input-Output Analysis (SIOA), a summary of the work of J. Weiss of Bradford University.

ACCOUNTING PRICES

ACCOUNTING PRICES

- ❖ **CLASSICAL SHADOW PRICE**
DERIVES FROM ECONOMIC MODEL
- ❖ **'SECOND BEST' ACCOUNTING**
- ❖ **ACCOUNTING PRICES**

The graphic consists of a purple header box with the text 'ACCOUNTING PRICES' and a white box below it containing a list of three items: 'CLASSICAL SHADOW PRICE' (with a sub-note 'DERIVES FROM ECONOMIC MODEL'), ''SECOND BEST' ACCOUNTING', and 'ACCOUNTING PRICES'.

Classical shadow price: Shadow prices are derived from a general equilibrium economic optimization model with the following features:

- An objective function describing the effects of the use and generation of resources on the measure of economic value (e.g. Gross Domestic Product, National Income)
- Constraints on the use of resources (technological coefficients for each economic activity and a limit for the resource as a whole).
- Non-zero constraints for the value of resources.
- Non-negativity constraints for resources

The shadow price is the effect on the value of the objective function resulting from an increase or decrease of one unit in the availability of a scarce resource. Technically, the shadow price of a resource which is not scarce is zero.

"Second best" accounting: Owing to complexity and other constraints (see Little, I.M.D. and J.A. Mirlees, Project Appraisal and Planning for Developing Countries, London, Heinemann, 1974, p.368) it is not possible to derive economic prices from a general equilibrium model. This has led to the adoption of the "second-best" approach to economic analysis, in which 'accounting prices' are employed in lieu of shadow prices. However, in applying this approach "there is considerable empirical evidence that governments can do good by stealth through decisions on individual projects even when, at the same time, they find it impossible ...to 'get the prices right' .." (Guide to Practical Project Appraisal, UNIDO 1984, p.20).

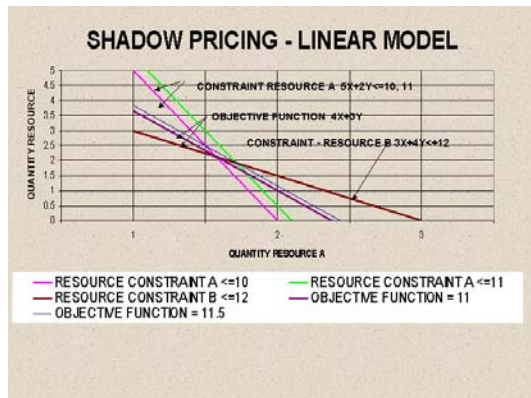
Accounting prices: These are economic prices that are derived by means other than a general equilibrium optimization model. Practical definitions of the prices of inputs and outputs are as follows:

Input - the opportunity cost, i.e. the cost to the economy of utilizing one unit of the resource in the project of interest which is the opportunity foregone in the best of alternative uses.

Output - the contribution of one unit of the produced good or service to the economic objective(s).

In this section methods of estimating economic or accounting prices for various classes of goods and services utilised or generated by the project are described. 'Shadow price' and 'accounting price' are used interchangeably, but the reference is invariably to accounting prices.

SHADOW PRICING - LINEAR MODEL



An idea of the formal definition of a shadow price can be seen in the application to a linear optimisation model. Here there is an objective function that relates the overall criterion to the impact of constrained variables and their coefficients. The value of the objective function can be considered as economic benefit, the variables as economic resources and the coefficients as the benefit per unit of resource.

The optimum solution is the point where the constraints intersect and the objective function is at its maximum without violating the constraints:

Constraint a: $5x + 2y = 10 \quad x = 8/7$
 Constraint b: $3x + 4y = 12 \quad y = 15/7$

At this point the value of the objective function is: $4(8/7) + 3(15/7) = 11$

What is the marginal effect of relaxing (or tightening) the constraint on resource A by one unit?


Constraint a: $5x+2y=11$ $x=10/7$

Constraint b: $3x+4y=12$ $y=27/14$

The new value of the objective function: $4(10/7)+3(27/14) = 11.5$

In terms of the unit of account used in the objective function the value of a unit of resource a, or its shadow price, is 0.5 units ($11.5 - 11.0 = 0.5$).

APPLICABILITY OF ACCOUNTING PRICES



If accounting prices are expressed in terms of a unit of account (numeraire) that measures contribution to undifferentiated income, the pricing rules discussed herein are applicable, with slight variations for each, to both economic cost-benefit analysis (ECBA) and to analysis of value-added (VA). ECBA, at the level of economic efficiency prices, and VA require that economic constraints be taken into account in seeking those values of resources that tend toward optimization of income.

Value-added analysis: The VA concept derives from the system of national accounts, which is intended to measure the contributions of all producers of goods and services to the national income. Interactions among various economic activities are implicit in these measurements, but do not implicitly enter into the analysis of a project's contribution to VA. For this reason, a simplified approach to measuring the VA of a project, in which such interactions are ignored, is a distortion of its true impact. For example, use of a scarce resource by the project that deprives another activity of its use is not taken into account in the simplified project VA measurement.

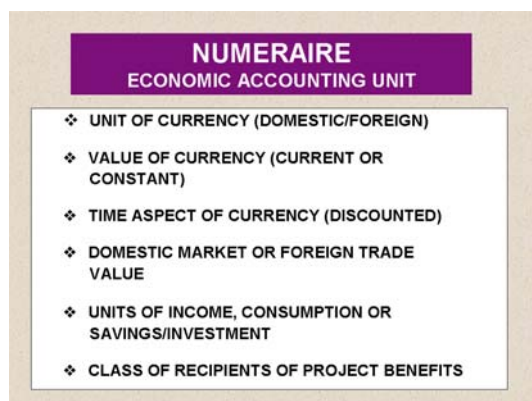
Another problem is that the standard VA measurements do not account for price distortions arising from market imperfections. A further issue is the universal application of consumer prices (essentially willingness to pay), whereas in some situations the producer price would be applicable.

Labour is treated as a benefit in the VA method, but as a cost in ECBA, This difference requires that the adjustment factor for the shadow price of labour in the VA approach is the mathematical complement of the value as determined in the ECBA method. In other words, if the Adjustment Factor for labour cost in the ECBA method is AF, the adjustment factor for labour in the VA approach would be $(1-AF)$. For example, assume that labour cost at market price is 100 with an Adjustment Factor of 0.4 (the shadow wage is 40% of market wage). In ECBA the wage at efficiency level is 40. Another way of expressing this is that the income foregone and/or expended in employing a unit of labor is 40. In the VA approach the wage content is nominally 100 but the economic cost of employment (income sacrificed) is 40. The net benefit of employing a unit of labour is 60. The AF for VA is then 0.6 or $(1-0.4)$.

For skilled labour the shadow wage may equal the market wage, in which case none of the skilled labour value should be included in VA. The AF for ECBA would be 1.0. The AF for VA would be $(1.0 - 1.0 = 0)$.

Cost-benefit analysis: Shadow (accounting) prices that correct for market price distortions are directly applicable to ECBA.

NUMERAIRE - ECONOMIC ACCOUNTING UNIT



A common unit of account should be selected for expressing economic value. It should be consistent with the units of the objective. For example, if increase in income is the goal of the investment policies of government, economic values would be expressed in terms of income. If distribution effects are to be considered, consumption would be a more appropriate measure of value.

For completeness, the units of measurement of economic value should

include the following components:

Value of currency (current or constant): Value is normally expressed in units of currency, at either constant or current prices. Constant prices can be derived from current prices by applying the appropriate deflator.

Unit of currency (domestic/foreign): The currency in which value is expressed can be the local (domestic) currency or some foreign currency. Conversion from one to the other is nominally calculated at the official exchange rate.

Time aspect of currency (discounted): Prices compared or aggregated at a particular point in time are discounted (or compounded) to bring all values to a common framework.

Domestic market or foreign trade value: Accounting prices can be assigned to an input or output based on domestic prices, or on their trade value as imports or exports.

Units of income, consumption or savings/investment: The stream of income flows can be applied by recipients for consumption or savings/investment. Any of these can be employed as the basic measure of value, and they are mutually convertible.

Class of recipients of project benefits: When distribution is a factor in the economic value of inputs and outputs, the type of recipient that is the basis for value should be specified. Distributions to other classes of recipients can be converted to the base recipient class included in the description of the numeraire.

In the UNIDO method of analysis, the numeraire (economic unit of account) is consumption.

If savings are more valuable to the country than consumption, which is often the case in developing countries as capital is scarce, benefits going to savings will be more valuable than those used for consumption. Benefits saved are converted to their equivalent consumption value. Other methods express value in terms of income or investment.

The government may regard redistribution of income in favour of economically weaker groups or regions as a socially desirable objective. Interventions such as taxes, subsidies or other distribution mechanisms have limitations. Through selection of investment projects governments are able to place a higher value on income to the poor than to the rich. A base level of consumption is adopted in the UNIDO approach as a component of the numeraire, the level of consumption for which the government is indifferent to additional income going to individuals at that level or to the government, i.e. the level at which the group would be neither taxed nor subsidised.

The UNIDO numeraire has the following specifications:

1. Domestic currency (e.g. rupees)
2. Constant prices (unadjusted for inflation)
3. Discounted (expressed in present values)
4. Expressed in domestic accounting currency, with a premium added for the border price of tradables accounting for the relatively higher value to society of a unit of foreign exchange than that expressed by the official rate (assuming over-valued local currency).
5. Expressed in units of consumption value (units of aggregate consumption) for society.
6. At a "base level of consumption" defined as the level at which the government is indifferent to a unit of income in the hands of the group or the government (the group would be neither taxed nor subsidized).

In practice, the numeraire can be expressed as follows:

1. Value of project inputs and outputs expressed in domestic accounting currency, (points 1,4,5,6 above).
2. Resource flows expressed initially in constant financial prices (point 2).
3. Net resource flows adjusted to present value by discounting (point 3).

The numeraire is rarely encountered as a single denominator, as it may vary among regions of the country.

MARKET VS. CURRENCY

MARKET vs. CURRENCY

- ❖ MARKET DETERMINES FLOW OF FOREIGN EXCHANGE
- ❖ CURRENCY AFFECTS NUMERICAL VALUE
- ❖ DOMESTIC VS. FOREIGN CURRENCY

In determining the economic price, or estimation of value per unit of resource, it is necessary to consider both the market and the currency used to designate value.

Market determines flow of foreign exchange: The market in which the item is either procured or sold determines whether foreign exchange or local currency either is directly involved in the transaction or is induced as a consequence of its use or generation. The principle issue is whether the transaction

is in the domestic market or if foreign exchange is involved in the transaction.

Currency determines the designation of value: The currency used in the unit of account determines the numerical value of the cost or benefit. If the numeraire is expressed in local currency, any item involving a foreign currency transaction must ultimately be converted to local currency at the shadow exchange rate. The exchange distortion is the difference between the value at the official and shadow exchange rates. If the numeraire is expressed in a foreign currency, the value expressed in local currency must similarly be converted to foreign exchange using (dividing by) the shadow exchange rate (units of local currency per unit of foreign currency).

Domestic vs. foreign currency: The selection of domestic vs. foreign currency for the numeraire is usually inconsequential. The values will differ, but the outcome will be identical.

If hyper-inflation exists in the local currency, it may be more comprehensible to use foreign exchange in the numeraire. If local currency is the basis for the numeraire, uncertainty in the selection of the shadow exchange rate (when foreign transactions are involved) may create differences in valuation of the project depending upon the choice of numeraire.

NATIONAL PARAMETERS

NATIONAL PARAMETERS EQUAL TREATMENT FOR ALL PROJECTS

- SUBJECTIVE PARAMETERS:**
- CUTOFF DISCOUNT RATE
 - INCOME WEIGHT BY ECONOMIC CLASS
 - INCOME WEIGHT BY REGION
- OBJECTIVE PARAMETERS:**
- MARGINAL PROPENSITY TO SAVE FOR ECONOMIC GROUP
 - MARGINAL RETURN ON CAPITAL
 - FOREIGN EXCHANGE PAYMENTS AND RECEIPTS
- SHADOW PRICES**
- FOREIGN EXCHANGE
 - LABOUR

Some parameters applicable to the calculations of shadow prices at efficiency and social levels are determined at the national (or regional) level. These parameters can be subjectively or objectively determined. Some shadow prices are parameters that may be mandated by central authorities to be applied in all project analyses to be reviewed at that level. For project analysis to be meaningful in the context of resource allocation, a 'level playing field' requires that they be 'treated' equally.

Parameters derived for the region of country should apply uniformly to all projects (eventually adjusted according to the specific location of the project).

Some examples of these parameters are as follows:

Subjective parameters: These parameters are derive from subjective judgments of authorities.

Cutoff discount rate: The economic rate of discount that is the criterion of acceptability for a project's economic return.

Income weight by economic class: The degree of preference assigned by government authorities to income or consumption for each economic class.

Income weight by region: The degree of preference assigned to income accruing to various geographical regions.

Objective parameters: These parameters derive from national statistics.

Marginal propensity to save for economic group: Proportion of savings for income of each group.

Marginal return on capital: Rate of return on investment capital at the margin.

Foreign exchange payments and receipts: Foreign exchange flows, balance of payments.

Shadow prices: Application of some or all shadow prices used in the analysis of projects that are to be reviewed by the central authorities may be required, e.g.

Foreign exchange: The actual value of foreign exchange may differ from the official exchange rate.

Labour: The shadow price of labour may vary among geographical regions. Its shadow price is the economic value of a unit of labour, which may differ from actual wages paid.

ECONOMIC PRICING OF PROJECT RESOURCES

ECONOMIC PRICING OF PROJECT RESOURCES

- ❖ PROMINENT EFFECT ON THE ANALYSIS *and*
- ❖ LARGE PRICE DISTORTION
- ❖ 'SHADOW PRICING' APPLICATION:
 - Main outputs.
 - Imported or potentially importable material inputs.
 - Main non-imported material inputs.
 - Unskilled labour.

It is appropriate to limit determination of economic prices to those resources used or generated by the project that will have a significant impact on the economic valuation. Two criteria should be applied simultaneously in selecting resources for this purpose:

Prominent effect on the analysis: Resources having a prominent effect on the analysis (costs or benefits) of the project, i.e. those that have values

comprising a significant portion of the flows; and

Large price distortion: Those resources for which the market price is far out of line with the real value to society.

'Shadow pricing' application: 'Shadow pricing' and accounting prices are used interchangeably; in all cases the reference is to accounting prices as herein defined. Within the general margin-of-error adjustment factors 'shadow pricing' should be applied only if the adjustment is greater than about 5% and to those inputs and outputs with significant effect on the resource flows. This implies adjustments normally restricted to:

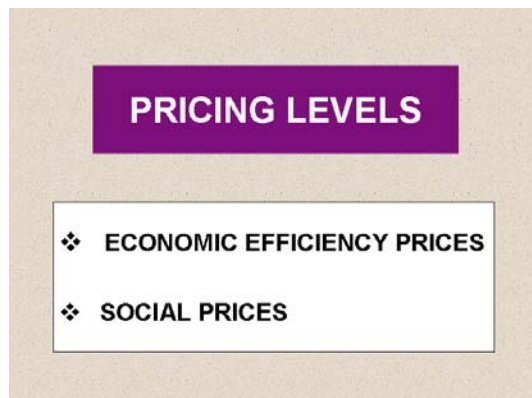
Main outputs: Primary products and services (usually not by-products)

Imported or potentially importable material inputs: Input items that are priced at the border.

Main non-imported material inputs: Domestically procured material inputs with significant cost implications.

Unskilled labour: The economic price of unskilled labor is often highly distorted from the market price.

PRICING LEVELS



Economic analysis requires that values be assigned to resources consumed or generated by a project. The values can be expressed in terms of a numeraire or unit of account that reflects the parameters of interest to the government, or to the analyst in the absence of central guidance. The usual fundamental measure is undifferentiated income or its disposition for consumption or investment, but could be any other measure that accords with societal goals, for example, the degree of self-sufficiency afforded by

the project.

A project's economic impact can be analyzed at different levels:


Economic efficiency prices: Valuations of resources at this level are derived ideally from a general equilibrium optimisation model, as previously discussed, but more practically, from a set of 'second best' pricing rules. In the most common measure of economic value these prices would reflect the gross impact of the use or generation of the good or service on undifferentiated income, i.e. without regard to its distribution. They would be responsive to the criterion of income growth.

Social prices: How income (or other measures of welfare) is distributed is taken into account in social pricing. The usual considerations are the distribution of benefits among contemporaries and among generations, addressing the issue of equity.

In the UNIDO approach to ECBA social prices are not determined per se. Rather, the distortions between efficiency and market prices are adjusted by weighting factors to determine distribution of benefit additions or diminutions accruing to various classifications of stakeholders.

Only price distortions are considered because efficiency prices are intended to fully reflect economic value of inputs, outputs and externalities (to the extent that they can be expressed in terms of the numeraire). Providers and consumers of goods and services would be appropriately charged or compensated for their economic cost or contribution at efficiency prices. It would be inappropriate to include the full value of wages, for example, in the labour distribution adjustment, as the distribution impact of the project is only the difference between the market wage and the shadow price of labour.

PRICING BASES



Consumer willingness to pay reflects the marginal utility of consumers for traded and non traded goods. In some cases consumer willingness to pay is the best measure of economic value in terms of impacts on society's income. The accounting price for each unit of output is based upon the marginal willingness of consumers to pay for the good so consumer surplus should ideally be included in the estimation of value.

Production cost: In some cases production cost is the best estimate of value. Components of production cost should be priced at their respective economic values. This can best be accomplished by decomposition of the item into traded, domestic intermediates and non-traded components in several rounds. Ultimately decomposition can lead to the disappearance of domestic intermediates so that only traded and non-traded components remain. This can simplify the job of determining the economic price.

Border prices: Goods that are either traded or that have impacts on trade are priced at the border - CIF for imports and FOB for exports, both adjusted appropriately for inland transport and handling costs.

PRICING FRAMEWORK



The frame of reference for pricing decisions by central authorities, or by the analyst in the absence of guidance from central authorities, can vary in accordance with the degree to which international markets or local aspirations are allowed to predominate. In practice, one or a combination of the following perspectives can be employed:

International markets: A global perspective places emphasis on international markets as the most

accurate gauge of value, reflecting the most efficient allocation of resources. Virtually all goods and services, except those that are clearly non-tradable (the domestic price is above export price but below import price) should be priced at the border. Under this assumption, differences between domestic and international prices constitute distributional effects of the project.

Society's goals: The rationale of the system of accounting prices "is that of estimating those prices that would prevail in the economy if it were to operate so as to maximize society's ends, this maximisation being constrained by the available resources, and by the possibilities of the tax system." (Little and Mirlees, *Project Planning and Appraisal for Developing Countries*, 1982 p.72). The question arises as to what is 'society'. Is it the human population of the world, the country, the region or does it even extend to other forms of life and habitats? Assignment of value would depend to some extent on the dimension of society. Trade associations of nations, for example, erect barriers that restrict external trade. Even major industrialized countries erect trade barriers when it appears to be in their interests.

Development policies: Trade restrictions are a reflection of government development policy. Goods and services precluded or restricted from trade should be priced at the domestic accounting price (consumer willingness to pay or the cost of production, as applicable). "...the price in the home markets ..applies in cases where government policy isolates commodities from foreign markets through import or export prohibitions or quotas." (Squire and van der Tak, *Economic Analysis of Projects*, World Bank, 1984, p. 32).

The following discussion of pricing rules are predicated primarily on the international market framework. However, this emphasis is not intended to diminish the importance of national or regional priorities, as expressed by interventions of governments such as trade barriers or preferential treatment of some industries or sectors. Some differences with a framework more responsive to national or regional policies are identified.

PRICING CLASSIFICATIONS



Economic pricing requires classification of goods and services according to the degree of tradability. The assignment of a resource to one of these classifications will depend to some extent on the pricing framework adopted by the central authorities, or by the analyst.

Traded: A good or service used or produced by the project that is actually traded or whose use or production leads to additional trade.

Tradable: A good or service that would be traded in the absence of trade barriers and/or restrictions such as tariffs and quantitative restrictions.

Non-tradable: Trade is excluded by the combination of production and international transport costs. The price is below the import price but above the export price.

Non-traded: A good or service that is tradable but that is not traded due to trade policies (as reflected in regulations). Since these may change over the life of the project, evaluation of future trade policy should be undertaken by the analyst.

TRADED GOODS



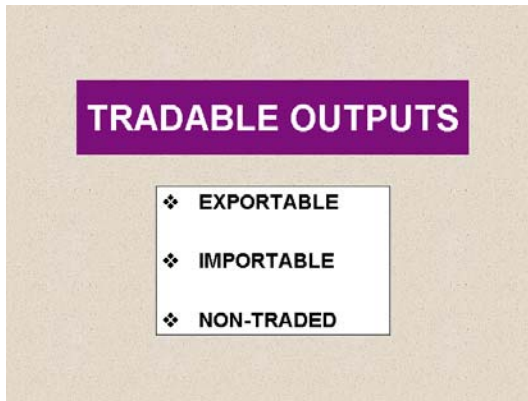
Traded goods are those that are imported or exported or that induce trade. For a traded good the international price, the amount of foreign exchange gained or expended, is the measure of value, FOB for exports and CIF for imports, each adjusted for levies, taxes, subsidies and for internal costs between the port of entry or exit and the project site (border prices).

Increased production - more exports or fewer imports: A good or service can

be considered as traded if increased production of the good or service by the project causes an increase in exports or a decrease in imports. In the latter case the production is import substituting.

Increased consumption - more imports or fewer exports: A good or service can be considered as traded if consumption by the project results in more imports or fewer exports of project inputs. In the latter case consumption by the project is export diversion.

TRADABLE OUTPUTS



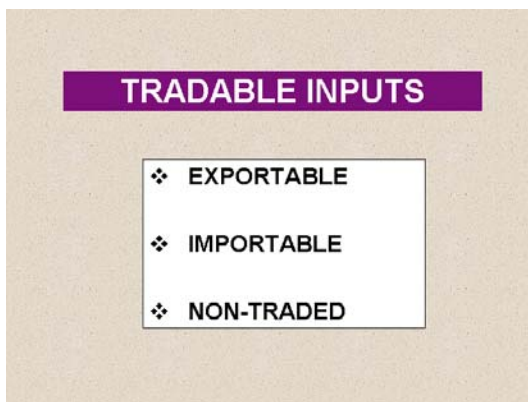
If an output could be exported or imported the pricing decision should reflect the opportunity foregone.

Exportable: Goods produced and marketed locally by the project that could have been exported (exportable) should be priced either at the domestic or export price, whichever is lower. If the export price is higher than the domestic price (both measured in economic terms) the opportunity foregone is the export price, and the opportunity realized is the domestic value, but the difference represents a cost to the country in having created barriers to export. In this case consumers gain by paying less than the international price and the project loses by not realizing the international price.

Importable: If the price of imports is lower than the domestic price (both measured in economic terms) there is a cost to the country in not importing. The value of the output should then be the border price rather than the (higher) domestic value. In this case consumers lose by paying higher than the import price and the project gains by receiving higher than the import price. If the local currency is over-valued, imports can appear less expensive while actually more expensive economically.

Non-traded: In most cases such goods are non-traded as a result of government trade policy, i.e. trade is not permitted for the good according to government regulations. In practice such non-traded tradables, if expected to remain non-traded in the future, can be treated as non-tradables.

TRADABLE INPUTS



If an input could be exported or imported the pricing decision should reflect the opportunity foregone.

Exportable: Goods procured locally that could have been exported should be priced at the higher of the domestic or export price (both measured in economic terms). If the export price is higher the opportunity foregone is the export earnings. A higher domestic price reflects either consumer willingness to pay or the domestic resources used in production of the input. For further discussion see Manual for Evaluation of Industrial Projects, UNIDO, p.57 (IDCAS).

Importable: Suppose that the import price for the input is lower than the domestic supplier's price. If the development policy that precludes import of the input, as

reflected in trade restrictions, in favor of a domestic supplier is the framework for pricing decisions, the relevant accounting price is the (higher) domestic market or production price (both measured in economic terms). If the local currency is over-valued, imports can appear less expensive while actually more expensive economically.

Another view is expressed in IDCAS (see p. 58). In this view the lower of domestic market or border price is to be used, on the basis that the real social value is the border price (if lower) because it would be preferable for the country to import. "To take the higher price would mean an overestimation of the real value of the input."

This is an example of applying the internationalist pricing framework. Note that applying the lower (import) price would tend to increase economic profitability of the project, even though the more favorable import option is not exercised.

Suppose the situation is as follows:

Import price of input	100 (Accounting price)
Domestic price of input	150 (Market price)
Distortion	-50 (market price is the base)
Distribution	Project loses (-50) but assume passed on to consumer
	Supplier gains (+50)

As consumer distribution weighting would ordinarily be higher than that for the supplier, the distribution impact would be a negative for the project.

The decision on which approach to employ depends on the pricing framework adopted. If a strict internationalist approach is employed, border prices would be applied in most cases as the social value. Distortions would be treated in terms of their effects on distribution. If the framework is societal goals or development policy, the application of actual domestic prices would be more appropriate (consumer or producer prices as applicable, with content shadow priced).

Non-traded: In most cases such goods are non-traded as a result of quotas and/or tariffs that reflect government trade policy. In practice non-traded tradables, if expected to remain non-traded in the future, can be treated as non-tradables.

NON - TRADABLE OUTPUTS



Natural non-tradables: Valuation of natural non-tradables is similar to non-traded tradables:

More for local users (increased consumption): consumer's willingness to pay, if relatively free market conditions prevail.

Replaced production (decreased output of alternate producer): The marginal production costs of the replaced

production decomposed and shadow priced.

Not traded due to restrictions: Some tradables are not traded because the authorities have placed restrictions on trade. If the adopted pricing framework is responsive to government trade policy the pricing rules can be as follows:

Additional production adds to consumption by local users: The price should be consumer's willingness to pay (including consumer surplus). However, the issue of whether or not the market price is a sufficient approximation of the accounting price should be investigated. Are following conditions met or approximated?

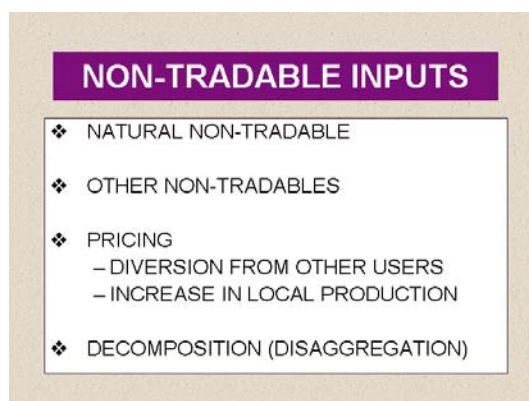
- The good should be freely available to everyone willing to pay the (nominal) price.
- No customer can exert monopsony (buyer's monopoly) power.
- Any possible marginal supply (increase or decrease) does not affect the price.
- No suppliers of inputs that are necessary to produce the good realizes monopoly profits through artificially inflated prices.

If these conditions are not met, attempts should be made to estimate economic value in the absence of the identified distorting constraint(s).

Project output replaces existing local production: The marginal cost of production of the alternative producers is the relevant price, decomposed with components expressed in accounting prices (is difficulty of calculation worth the effort?). The benefit is the difference between the higher cost of the displaced (presumably less efficient) production and the project's production cost.

Infrastructure services: The price should be the domestic market or production cost, whichever is higher. The domestic price may be lower than production cost, but the subsidy is a clear reflection of government policy. Another approach is to apply the ordinary pricing rules for non-tradables and deal with subsidies as a distributional effect.

NON - TRADABLE INPUTS



Natural non-tradable: The price of a natural non-tradable input is higher than the import price but lower than the export price. International transport costs raise the import price above local production cost and the sales price above the international market price.

Other non-tradables (non-traded tradables): Some items are not traded as a result of tariffs and other barriers to trade erected by regional or national authorities in response to trade policy.

These might be treated as non-tradables in regard to shadow pricing, depending upon the pricing framework adopted.

Pricing:

Diversion from other users: If a project input is diverted from other domestic users the basis for pricing is the willingness to pay of other potential users.

Increase in local production: If the result of the demand by the project for additional input is an increase in local production, the marginal production costs is the relevant price (including producer surplus).

Decomposition (disaggregation): If the marginal cost of production is the basis for pricing of an input, the item can be decomposed to determine a more accurate assessment of economic value.

Tradable components of the item can be valued at border prices.

The labour component is priced at the shadow wage rate.

Remaining elements can normally be valued at market price.

BORDER PRICES



Traded inputs and outputs, and those that are considered 'tradable' and priced accordingly, are valued at the border price. The relevant accounting prices are determined as follows:

Exports: The FOB (free-on-board) price is the basic export value. This is the amount of foreign exchange that is earned per unit of export good or service.

Imports: The CIF (cost, insurance, freight) price is the basic amount of

foreign exchange expended per unit of imported good or service.

Internal costs: To develop the border price the FOB or CIF price should be adjusted for inland charges such as shipping and handling. In the case of exports there will be additional costs to move the product from plant to port. For imports cost will be incurred in moving the product from port to plant. The incremental concept should be applied in determining border prices. This is the situation 'with' and 'without' the project ('with' minus 'without').

The cases of import substitution and export diversion are explained below. The internal costs should be shadow priced according to the rules for non-traded goods: For example, if the use of transportation facilities preclude their use in other productive activities, willingness to pay is the appropriate benchmark. If the project develops its own facilities that do not impact on demand by other users, the production cost is relevant.

BORDER PRICE EXAMPLE: COAL - EXPORT DIVERSION

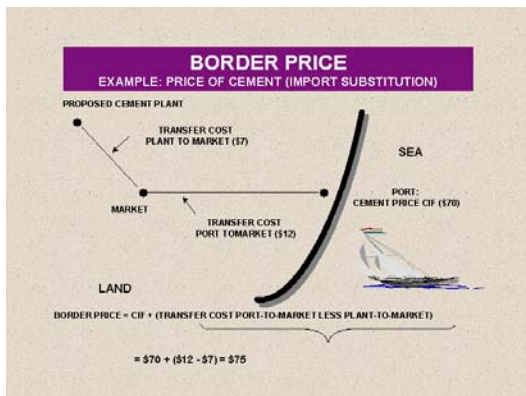


The basic border price is the FOB price per ton of coal that is an input for the project. This is the export earnings foregone (opportunity cost) when a ton of coal is used by the project rather than being exported.

The incremental principle is employed in adjusting the FOB price for inland costs. Without the project the coal would be exported by first moving it from from mine to port. With the project the ton of coal will be shipped from mine to plant.

The foregone FOB earnings would be reduced by the inland costs from mine to port, but there is an additional cost of moving the coal from mine to plant if the project is implemented. In other words, the adjusted border price, or accounting price, is FOB + mine-to-plant - mine-to-port (mine-to-plant and mine-to-port refer to shipping and handling charges, shadow priced as appropriate).

BORDER PRICE EXAMPLE: CEMENT - IMPORT SUBSTITUTION



The basic border price is the CIF price per ton of cement that is an output of the project. This is the avoided cost if a ton of cement would be imported rather than being produced by the project.

The incremental principle is employed in adjusting the CIF price for inland costs. Without the project the cement would be imported to the port and then moved to the market. With the project the ton of cement will be shipped from plant to market. Both the CIF cost and the cost of

transport and handling from port to market are avoided, but if the project is implemented there is a cost for moving the cement from plant to market. The adjusted border price, or accounting price, is CIF + port-to-market - plant-to-market (port-to-market and plant-to-market refer to shipping and handling charges, shadow priced as appropriate).

SELECTION OF PRICING MODEL

SELECTION OF PRICING MODEL		
CATEGORY	EXPLANATION	ACCOUNTING PRICE
TRADABLE	WOULD BE EXPORTED OR IMPORTED IN THE ABSENCE OF TRADE BARRIERS	???
NON-TRADED	GOVERNMENT POLICY PRECLUDES TRADE (AS REFLECTED IN REGULATIONS)	???

The alternative pricing frameworks described above leave some room for discretion in determining the appropriate pricing model for project inputs and outputs that fall into the categories of tradables and non-traded. The central principle in determining the accounting price is the net effect, in terms of the numeraire, if a unit of input is assigned to the project or a unit of output is produced. However, if the pricing model adopted is to reflect government trade policy as a 'given', then goods that would otherwise

be priced at the border in the absence of trade restrictions would be treated as non-traded goods and priced accordingly. Only goods that are actually traded would be priced at the border. If the international framework is adopted, there would be a greater tendency to price all items except those that are truly non-tradable at the border.

Tradable: For goods that would be imported or exported in the absence of trade barriers the central authorities or the analyst, as the case may be, has to decide what is the basis for pricing. Is it the border price, the domestic demand or supply price, or some combination? If the item is to be priced as a tradable (i.e. based on its import value) decomposition may be useful for determining a more accurate assessment of the proper accounting price.

Non-traded: If an item is not traded because it is precluded by government trade policies as reflected in regulations, the issue remains concerning the appropriate pricing rule. If the international market framework is adopted, the border price would be applied. If the framework involves the acceptance of trade restrictions as consistent with and reflecting national goals, then the domestic price would be applicable.

SUMMARY OF SHADOW PRICING RULES - UNIDO

SUMMARY OF SHADOW PRICING RULES (UNIDO)			
EFFECT ON:	PROJECT INPUT	FINAL OUTPUT OF PROJECT	VALUATION
NON-TRADED SUPPLY (PRODUCTION) DEMAND (CONSUMPTION)	INCREASE IN EXISTING PRODUCTION REDUCES SUPPLY AVAILABLE TO OTHER USERS	SUPPLY FROM EXISTING PRODUCERS (1) INCREASE IN SUPPLY	Marginal cost of additional production to BYT Consumer willingness to pay
TRADED SUPPLY (EXPORTS)	REDUCES EXPORTS	INCREASES EXPORTS	FOB minus the cost of transport and other local costs
DEMAND (IMPORTS)	INCREASES IMPORTS	IMPORT SUBSTITUTION	CIF plus net transport cost and other local costs

(1) COST OF SUPPLY BY EXISTING PRODUCERS NORMALLY INCLUDES EXPORT TAXES. THE NET BENEFIT IS THE COST OF THE DISPLACED PRODUCTION LESS THE COST OF THE NEW PRODUCTION.

In the final analysis goods and services are priced as either traded or non-traded. Each of these categories would include tradables and non-traded items depending upon the pricing framework adopted. With regard to both inputs and outputs, if the supply or demand elasticity at the margin is non-zero, consumer and producer surpluses should be considered. For example, if prices reduce in the face of increased supply, some consumers will pay less than they paid before and still would be willing to pay. Examples of

supply and demand relationships resulting in consumer and producer surplus are shown in Consumer-Producer Surplus.

Non-traded items:

Effect on supply - The supply price, or marginal cost of production is the appropriate price in the case of project inputs for which the existence of the project affects supply (additional capacity for the input) and project outputs that affect supply (output of existing producers is supplanted by the project). In the latter situation the benefit is the difference between the presumably higher alternative production cost and the project's production cost.

Effect on demand - The demand price, or marginal willingness to pay, is the appropriate price when the project's use of an input reduces availability for alternative users, and when its production of an output increases the availability for local users.

With regard to both inputs and outputs, if the input is supplied from both types of sources, reducing availability to other users and stimulating new output; or if the production of an output both increases availability for local users and supplants existing production, a weighted average of the demand and supply price should be applied.

Traded items:

Effect on supply (exports) - The FOB price (adjusted to the border) is the appropriate price if the project's operations result in the diversion of an input from export or if an output is actually exported.

Effect on demand (imports) - The CIF price (adjusted to the border) is the appropriate price if the project's operations result in increased imports of an input or if there is a substitution of imports as a consequence of the project's output.

**MARGINAL SHADOW PRICING OF NON
TRADED INPUTS AND OUTPUTS ***

**MARGINAL SHADOW PRICING OF NON
TRADED INPUTS AND OUTPUTS¹**

APPLICABLE PRICING RULE	MARGINAL SUPPLY	MARGINAL DEMAND
SUPPLY PRICE	PERFECTLY ELASTIC	PERFECTLY IN ELASTIC
DEMAND PRICE	PERFECTLY INELASTIC	PERFECTLY ELASTIC

¹ Square, Van der Tak, World Bank

If the price of supply or demand at the margin is highly elastic (ratio of the change in demand or supply to the corresponding change in price - see Market, Forecasting, Elasticity) , the project will have little or no effect on prices. Conversely, if supply or demand is highly inelastic, the project will have a considerable effect on prices. For these reasons the following conditions apply:

Supply price: The supply, or producer, price is applicable if the marginal supply

tends toward perfect elasticity or if the marginal demand tends toward perfect inelasticity. If the marginal supply of an input is highly elastic the existence of the project will have the effect of increasing production of the input, so the producer price is applicable. If marginal demand for the output is highly inelastic the project's output will displace production of other, presumably less efficient, producers so that the displaced production cost is the appropriate shadow price.

Demand price: The demand, or consumer price, is applicable if the marginal supply tends toward perfect inelasticity or if the marginal demand tends toward perfect elasticity. If demand for the output is highly elastic the project's effect will be to increase availability for users, so the demand price is applicable. If supply of an input is highly inelastic, use by the project reduces availability for other users so again the demand price is applicable.

* Squire and van der Tak, p.33

INDIRECT TAXES – UNIDO

INDIRECT TAXES
UNIDO*

NON TRADED GOODS

TYPE OF IMPACT	CASE	TREATMENT OF INDIRECT TAXES
DEMAND FOR INPUT	REDUCE SUPPLY OF INPUT AVAILABLE TO OTHER USERS	INCLUDED AS A PART OF THE WILLINGNESS TO PAY
DEMAND FOR OUTPUT	INCREASED OUTPUT	INCLUDED AS A PART OF THE WILLINGNESS TO PAY
SUPPLY OF AN INPUT	ADDITIONAL PRODUCTION OF INPUT	NOT INCLUDED – NOT A PART OF MARGINAL COST OF PRODUCTION
SUPPLY OF OUTPUT	SUPLANT OTHER PRODUCTION OF OUTPUT	NOT INCLUDED – NOT A PART OF MARGINAL COST OF PRODUCTION

TRADED GOODS
INDIRECT TAXES NOT INCLUDED - TRANSFERS

*Guide

Non-traded goods:

Demand: If the effect of the project is on demand for an input or output indirect taxes are included in the accounting price as part of consumer willingness to pay (the demand price). When a project results in diversion of non-traded inputs that are in fixed supply from other producers or in the addition to non-traded consumer goods, taxes should be included as part of consumers' willingness to pay, i.e. the demand price.

Supply: If the effect of the project is on supply of an input or output, indirect taxes are not included as they are not a part of the marginal production cost (the supply price). This situation prevails if the existence of the project causes additional input to be produced (by others) or if output supplants production by others.

Traded goods: Taxes on traded goods are generally transfer payments and should not be included in the accounting price.

SUBSIDIES

SUBSIDIES

- ❖ A COST TO SOCIETY?
- ❖ INPUTS – GENERALLY INCLUDED
- ❖ OUTPUTS – GENERALLY EXCLUDED

A cost to society?

The inclusion of a subsidy in the price of an input or output depends on whether or not it represents a cost to society. If a subsidy is drawn from scarce resources not balanced by a corresponding benefit the subsidy is considered a cost. If the subsidy is in conformance with government goals, the condition above may be satisfied and the subsidy included. In all cases the distributional effects of the subsidy should be taken into account in

social evaluation.

Input - generally included: For a project input, a subsidy would generally be included as part of the cost. However, if the subsidy conferred other societal benefits it would not necessarily be considered a cost. For example, if the subsidy permitted the production of a pharmaceutical that reduced health care costs to the populace that would otherwise be borne by the government (grantor of the subsidy) the corresponding benefits might offset the cost.

In any case the distributional effects of the subsidy should be taken into account in determining social value.

Output - generally excluded: A subsidy for a project output (grant to the producer) would generally represent a societal cost that would not be included in the economic value. For example, a subsidy that allows an otherwise internationally uncompetitive producer to export does not necessarily reflect an economic value to the country. If it does not, that portion of the export earnings should be excluded. The subsidy in this case is a transfer from government to the project (transfers should be considered in regard to the distribution effects of the project).

However, if government policy is to foment exports for strategic or other reasons, the subsidy could be included in the economic value of the export.

Consider a subsidy on a basic good, paid by the government by increasing consumer purchasing power in one way or another or by subsidising the producer. This is similar to the case of domestic infrastructure services. According to IDCAS (see p. 56) such a subsidy should be included in the economic value of the basic good, as it reflects the government's social distribution policy and is considered a societal benefit.

SHADOW PRICE OF FOREIGN EXCHANGE - CONDITIONS

SHADOW PRICE OF FOREIGN EXCHANGE CONDITIONS

- ❖ STRICT CONTROLS AND SUPERVISION OF INTERNATIONAL TRANSACTIONS
- ❖ ABSENCE OF FREE EXCHANGE BETWEEN DOMESTIC AND FOREIGN CURRENCIES
- ❖ TRADE OR PAYMENTS DEFICIT
- ❖ EXISTENCE OF UNOFFICIAL MARKET FOR FOREIGN CURRENCIES (TOLERATED BY THE AUTHORITIES OR NOT)

The official rate of foreign exchange (forex) is applicable in financial analysis as commercial transactions involving exports, imports and international payments are converted to domestic currency at official rate of exchange. Imports are paid with forex obtained from, and export earnings transferred to, the central bank at the official rate of exchange.

When the price of forex is distorted, its use and generation by a project will have values that differ from the official exchange rate. The costs and benefits derived on the basis of the official exchange rate do not convey the real impact of the project on country's economy, in which case the official exchange rate usually underestimates valuation of foreign exchange components and requires adjustment to reflect true economic value.

Some of the problems that arise from a distorted official foreign exchange rate are as follows:

Possible irregularities in forex allocation: 'Bad money replaces good money'. It is difficult to attract and retain FDI, for example, when the forex price is distorted.

Necessity of establishing and administering priorities: Mechanisms for controlling the use of scarce foreign exchange must be established and maintained, adding to government operating costs.

Difficulties for exporters and favouring industries selling to domestic market (cheap imported intermediates): The usual situation when there is intervention in the forex market is to overvalue local currency. Exporters find it difficult to compete and importers are subsidized.

Political obstacles to devaluation: Once forex distortions are in place it is politically difficult to change as the risk of the raising the displeasure and opposition of affected parties (usually influential domestic producers and consumers) is great.

Some of the conditions that precipitate and result from distortions in forex rates are as follows:

Strict controls and supervision of international transactions: When central authorities strictly control international transactions such as exports, imports and transfer payments, price distortions are inevitable. For example, import quotas open the opportunity for monopolistic pricing by limited local producers so that the relationship between the border price in forex at the official exchange rate and the domestic price is distorted.

Absence of free exchange between domestic and foreign currencies: If exchange between domestic and foreign currencies is controlled a price mechanism must be set in place that implicitly does not follow the market. Inevitably there will be distortions between the values of the two currencies, even when the rate floats according to some indicator. In some cases tiered exchange rates are administered by the government in an attempt to somewhat regulate forex flows.

Trade or payments deficit: Import and export duties and subsidies are often employed in an attempt to correct trade or payments deficits, rather than allowing markets to auto-correct. Such interventions are bound to distort exchange rates.

Existence of unofficial market for foreign currencies (tolerated by the authorities or not): A consequence of a distorted value of domestic currency is often the development of parallel currency markets. Often the parallel markets are not officially sanctioned, but are tolerated by authorities to avoid raising tensions.

ESTIMATING SHADOW RATE OF FOREIGN EXCHANGE

ESTIMATING
SHADOW RATE OF FOREIGN EXCHANGE

- ❖ "ECONOMIC ACQUISITION" COST
- ❖ UNOFFICIAL MARKET PRICE
- ❖ PURCHASING POWER PARITY
- ❖ COMPARING PRICES OF TRADED GOODS

If the availability of foreign exchange prevails during the planning stage it is safe to assume that the scarcity will prevail during the entire project life. Some approximations of the real exchange rate can be determined as follows:

"Economic acquisition" cost: The marginal cost of acquiring foreign exchange in relation to domestic resource prices can be estimated from the degree of ownership conferred to providers of foreign exchange flows into the country.

The estimation should be at marginal rather than average cost.

Unofficial market price: The black market price usually overestimates the value of foreign exchange as it contains a risk premium. In addition, it is a price in a narrow market with limited supply and very specific demand. The real value would lie between the official and black market price.

Purchasing power parity: This is determined from the price of typical basket of goods measured in the domestic currency compared with the price of the same basket of goods measured in the foreign currency. Resulting price relationship determines shadow rate of exchange.

Comparing prices of traded goods: A good measure of the real exchange rate can be determined by comparing the price in domestic and foreign currency for internationally traded goods.

SHADOW PRICE OF FOREIGN EXCHANGE

SHADOW PRICE OF FOREIGN EXCHANGE
(RELATION OF IMPORT PRICES IN INTERNATIONAL AND DOMESTIC MARKETS)

$$\frac{P^F}{R^F} = \sum_{i=1}^n f_i \frac{P_i^D}{P_i^{CIF}}$$

P^F	Shadow price of foreign exchange
R^F	Official exchange rate
f_i	Fraction of foreign exchange for importing good i
P_i^D	Equilibrium price in domestic market, good i
P_i^{CIF}	CIF price expressed in local currency

If guidance is not provided by central authorities, the analyst may be faced with the problem of determining the shadow price of foreign exchange in terms of local currency. Some approaches to determining the rate are shown. In each case the Adjustment Factor for foreign exchange is determined as the ration of Shadow Exchange Rate (SER) to Official Exchange Rate (OER).

Relation of foreign and domestic trading prices: The amount of import

duties and export subsidies necessary to balance trade is the basis for the shadow price. Where quantitative restrictions are important, their tariff equivalents should be included, and if there are other sources of difference between border and domestic ex-works prices (e.g. transport costs and importing profit), these should also be considered. Any prohibitive quantitative restrictions or tariffs should also be taken into account if possible.

Trade deficit: The trade deficit, excess of imports over exports, is a measure of the distortion in foreign exchange value. The value of imports is the total of visible (essentially merchandise) and invisible (essentially services) receipts. The value of exports is the visible and invisible payments. If trade is in balance the SER is equal to the OER, i.e. there is no distortion.

Relation of import prices in domestic and international markets: The ratio of shadow price of foreign exchange and the official rate is determined by a weighted average of the ratios of import price to domestic price for each imported item. The CIF price is expressed in local currency at the official exchange rate. This formulation focuses on availability of foreign exchange to the country through types of receipts and demands for payments. If the gap between receipts and demand is negative the demand of foreign exchange at the prevailing rate is higher than the supply and therefore the exchange rate needs to be upwardly adjusted. In the converse case the exchange rate needs to be reduced.

SHADOW PRICE OF FOREIGN EXCHANGE (RELATION WITH FOREIGN, DOMESTIC TRADING PRICES)

SHADOW PRICE OF FOREIGN EXCHANGE
(RELATION FOREIGN, DOMESTIC TRADING PRICES)

$$SER = OER \frac{(M + T_I) + (X + S_X)}{M + X}$$

SER	Shadow exchange rate
OER	Official exchange rate
M	CIF value of imports
T _I	Import tax revenues
X	FOB value of exports
S _X	Export subsidies (or tax rebates) of the state

(T_I, S_X, necessary to balance trade)

Price relationship of internationally traded goods in domestic and foreign currency. In this approach critical points of the purchasing power parity calculation are partially overcome. The basket of goods used as a comparison is only composed of those goods which are traded internationally. Hence, de facto the effects of duties, subsidies, import quotes and other protectionist measures which influence the domestic price level of internationally traded goods are reflected in the shadow exchange rate calculated in

this way.

Here the official rate of exchange is subject to a correction to explicitly take into account price distortions in international trade through import duties and export subsidies.

This approach takes into account, on the one hand, price distortions due to duties and subsidies, but, on the other hand, neglects the influence of quantitative restrictions such as quotas and other protectionist measures. These can, admittedly, be estimated through the calculation of an import duty-equivalent of these restrictions, namely, a premium rate included in the sales prices. The disadvantage of the method would then, however, be that it would no longer be easy to apply.

Here the official rate of exchange is subject to a correction to explicitly take into account price distortions in international trade through import duties and export subsidies.

SHADOW PRICE OF FOREIGN EXCHANGE (TRADE BALANCE DEFICIT)

**SHADOW PRICE OF FOREIGN EXCHANGE
(TRADE BALANCE DEFICIT)**

$$\text{SER} = \text{OER} \left(1 + \frac{M - X}{M} \right)$$

M	Value of visible and invisible payments expressed in domestic currency
X	Value of visible and invisible receipts expressed in domestic currency

Example: Deficit 10% of import volume and OER 10 domestic currency units per 1 unit forex.

$$\text{SER} = 10(1.0 + 0.1) = 11$$

Taxed goods valued at market price including indirect taxes as part of consumer willingness to pay

The implicit assumption of this method is that the balance of trade shows neither a surplus nor a deficit in the general balance of payments equilibrium and that a devaluation of the domestic currency by 1% will also reduce the trade balance deficit by 1%. This will not be true in most countries.

Taxed goods are valued at market price, including indirect tax. The tax is part of the consumers willingness to pay.

ADJUSTMENT AND ADJUSTMENT FACTOR

**ADJUSTMENT and
ADJUSTMENT FACTOR**

$$\text{AF} = \frac{\text{AMV}}{\text{MV}} - 1$$

$$\text{AMV} - \text{MV} = \text{AF}(\text{MV})$$

AF	ADJUSTMENT FACTOR
AMV	ADJUSTED MARKET VALUE
MV	MARKET PRICE

Adjustments are used to express distortions in value between the accounting price and the market price. In the analytical method adopted by UNIDO, prices are first determined at the level of economic efficiency and then the distortions are utilized to determine distributional (social) impacts. For this reason it is more useful to think in terms of adjustments, (AMV - MV) rather than adjustment factors, which are the ratios

[Adjusted Market Value (AMV)]/[Market Value (MV)]-1.

This formulation provides the increment or decrement in value resulting from elimination of the distortion.

Two types of adjustments are important. The first is the adjustment to convert market values to economic efficiency prices without taking the foreign exchange premium into account. The second adjustment accounts for any distortion due to foreign exchange. These separate adjustments are combined algebraically (they may add or subtract).

Several examples showing the determination of adjustments and their attribution to social groups are provided in Economic Adjustments.

ADJUSTMENT - FOREIGN EXCHANGE

ADJUSTMENT – FOREIGN EXCHANGE

$$CF = \frac{SER}{OER}$$

$$AF = CF - 1$$

$$AMV - MV = AF(MV)$$

CF	Conversion Factor
SER	Shadow exchange rate
OER	Official exchange rate
AF	Adjustment factor
AMV	Adjusted market value
MV	Market value

The adjustment for foreign exchange content of an item is determined as follows:

(1) Determination of foreign exchange content of project inputs and outputs, including externalities. This may require one or more rounds of decomposition.

(2) Estimation of conversion factor CF for foreign exchange using shadow rate of foreign exchange: **CF = SER / OER**

SER: shadow exchange rate

OER: official exchange rate

(3) Estimation of adjustment factors AF: For each foreign exchange: **AF = CF - 1**

(4) Calculation of adjustments: Adjustments are determined by multiplying the foreign exchange content of inputs and outputs by the AF's. (AMV-MV) is the adjustment. AMV is the value (expressed in local currency) after adjustment and MV is the nominal value of foreign exchange (expressed in local currency).

SHADOW PRICE OF LABOUR

SHADOW PRICE OF LABOUR

- ❖ **SHADOW WAGE RATE (WB)***
 - Foregone marginal production at accounting prices
 - Cost of increased consumption
 - Cost of reduced leisure
- ❖ **TRAINING**
- ❖ **INFRASTRUCTURE**
- ❖ **MIGRATION**

*Squire, van der Tak

The shadow price of labour at the level of economic efficiency consists of the shadow wage rate, the economic benefit per worker and additional costs of training, migration and infrastructure. If 'costs' have offsetting 'benefits' some or all of the costs can be ignored.

According to the characteristics of the formal optimisation model, a non-scarce resource has a shadow price of zero. If unskilled labour, for example, is plentiful, technically its shadow price could be zero.

However, in the 'second-best' approach, net income foregone by employing an unskilled worker is the sum of marginal production, increased consumption as a result of employment by the project and a cost of leisure. For this reason the shadow price of unskilled labour is rarely if ever considered to be zero.

Shadow wage rate: This is the annual economic cost of assigning a worker to the project who would be otherwise engaged in the absence of the project. Components of the shadow wage rate are as follows*:

Foregone marginal production at accounting prices: For unskilled labour the foregone marginal production is the subsistence activities carried out in the absence of the project. For skilled labour drawn from the general economy or from abroad, the wage can be a reflection of the foregone output. However, if the project trains its own skilled workers, rather than drawing them from the general economy, the marginal production value without the project would be augmented by the cost of 'producing' the skilled worker, one part of which would be training costs (see below).

Cost of increased consumption: The worker may require increased consumption as a consequence of employment in the project, which is an additional cost to be considered.

Cost of reduced leisure: A worker who, in the absence of the project, would enjoy leisure is deprived of such leisure when employed in the project. The leisure foregone has a social price.*

The World Bank (WB) approach to Shadow Wage Rate (SWR) is to determine social prices in one step, rather than in the multiple-step procedure described in Economic Cost Benefit Analysis. For this reason the definition, when applied to the UNIDO approach, should first determine the efficiency price and deal with the social impacts in terms of distribution in later stages. The actual WB definition is as follows: Labour's foregone marginal productivity + net social cost of increased consumption + net social cost of reduced leisure.

Training: If the project takes on unskilled workers and trains them so that they acquire skills, the cost of training may or may not be attributable to the project. If the training is project-specific, so that it has no relevance outside the project, then training costs (shadow priced) should be included as part of the labour cost. However, if the training is general, so that a skilled worker is then available for productive efforts beyond the time frame of the project, the increased productivity of the worker beyond employment by the project can be considered a benefit.

Infrastructure: Personnel infrastructure, such as housing and facilities for health maintenance and recreation, may be required. If such facilities are constructed by the project, their cost can be attributed to the project if there are no attendant benefits, i.e. if the facilities are to be applied only to the needs of project workers during the project's life. There is also the possibility that a benefit will be recognized from the upgraded lifestyle of workers attributable for the facilities, or if the facilities will be useful beyond the project life.

Migration: Project workers may be recruited from an area that requires migration. The cost of transporting workers and their families from the homeland to the plant site is attributable to the project. Another consequence might be that the project stimulates unnecessary migration with the lure of wage employment as a prospect. If the government wishes to discourage rural-urban migration, this might be a negative factor and be recognised as a cost of the project.

* (see Squire, van der Tak, p.83).

ALTERNATIVE VIEW OF SHADOW WAGE RATE (SWR)

ALTERNATIVE VIEW OF SWR

- ❖ LABOUR AS PROJECT 'INPUT'
- ❖ REDUCED SUPPLY TO OTHER USERS?
'CONSUMER' PRICE
- ❖ MORE AVAILABLE FOR DOMESTIC USERS?
'PRODUCER' PRICE (COST OF PRODUCTION)

Labour as project 'input': In this view labour can be considered an 'input', with its price determined in accordance with the pricing rules for non-traded or traded items, as the case may be.

Reduced supply to other users (employers)? 'Consumer' price: If labor is in short supply, so that appointment to the project reduces availability to other employers, the SWR would be based on 'consumer' (alternative employer) willingness to pay or other alternative employment, e.g. as a private contractor. This would ordinarily be the case for highly skilled workers whose wages generally reflect their level of income productivity. The market wage rate or output in the alternative activity would be the shadow price.

More available for domestic users? Cost of 'production' ('producer' price): If the consequence of the project is to make more of an input available, the appropriate SWR is the cost of 'producing' a worker. This includes the SWR as described above and ancillary items (training, infrastructure, migration). In the economic analysis SWR would be a recurring cost, while the ancillary items might be one time costs or benefits.

LABOUR CATEGORIES

LABOUR CATEGORIES

- ❖ EXPATRIATE WORKERS
- ❖ DOMESTIC SKILLED
- ❖ DOMESTIC SEMI SKILLED
- ❖ UNSKILLED

In the project planning stage it is usually sufficient to divide labour (manpower) into following categories:

Expatriate workers: Engineers, technicians and other skilled workers recruited from abroad are generally compensated completely or partially in foreign exchange, either directly or through conversion rights. The cost of such workers is the 'border' price, the foreign exchange equivalent of CIF converted by the shadow price of foreign exchange (if expressed in local currency). The domestic component, if any, probably reflects the productivity of the worker.

Domestic skilled labour: These are workers who have acquired skills in the host country. Cost is determined as in regard to scarcity and source. Usually the wage is a reflection of production foregone in alternative employment, although the rules for pricing previously discussed should be applied.

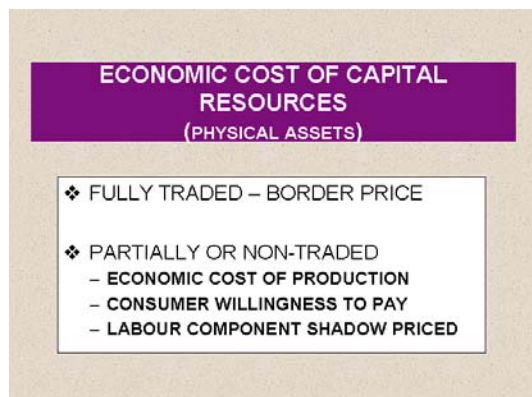
Semi-skilled labour: These might be workers with skills that are not generally applicable to other types of employment. The project would usually be required to provide specialised training to such workers so that the cost of training is part of the shadow price of this type of labour. The SWR would usually be determined on basis of 'production' cost.

Unskilled labour: In most cases SWR (shadow wage rate) for unskilled labour is taken to be between 50 and 100 per cent of the market rate.

The wage or salary paid to the foreign expert is competitive (i.e. the expert can accept it or refuse to come, leaving place to someone else). It is not necessary to correct the financial calculation. If income tax is paid to the domestic Revenue Office, then this reduces the cost from the economic point of view. Therefore, these taxes have to be subtracted when calculating the "economic" wage and consecutive adjustments. In some cases there is an indirect "taxation" of the income of the foreign experts due to the increased cost of living (e.g. extortionate rent). Such items have also to be subtracted from the wage used in the economic calculation in order to determine the shadow wage rate (they could be treated as transfer items - similar in character to taxes paid to house owners).

When considering domestic qualified manpower, there is often a surplus of people with certain qualifications that do not always correspond to the requirements of the project. On the other hand, there is a shortage of other personnel such as, for example, highly skilled labour. In the refined analysis for those professions where there is a surplus of manpower, the income in alternative employment shall be used as the shadow wage rate. This may be a completely different profession and the payment also relatively low. Hence, the wage paid by the project is higher than the cost of labour used in the economic analysis. In most cases, however, the skilled manpower is not shadowpriced. It is assumed that qualified workers or other professionals are employed on competitive terms. They could refuse the offered employment if the terms are below their expectations and they can choose to be unemployed.

ECONOMIC COST OF CAPITAL RESOURCES (PHYSICAL ASSETS)



The structure of the cost of economic capital is similar to commercial capital. There is a cost, at economic prices, for the physical assets dedicated to the project. These will be 'consumed' with use and deterioration. There may or may not be a salvage value at the termination of the project. The other component of cost is the rental price, discussed subsequently.

The rules for pricing capital assets are similar to those for other inputs.

Fully traded - border price: If the capital item is fully traded, its economic value is the border price.

Partially or non-traded: If the capital item is partially traded or non-traded, its shadow price is determined as follows:

Economic cost of production: If the project induces increased production of the capital good.

Consumer willingness to pay: If the project diverts the capital good from other potential users.

Labour component shadow priced: Labour involved in the construction is valued according to the shadow pricing rules previously described for project inputs.

ECONOMIC COST OF CAPITAL - Rent Component (Discount Rate)

ECONOMIC COST OF CAPITAL
Rent Component (Discount Rate)

$$\text{CRI} = ng + p$$

CRI	Consumption rate of discount
g	Rate of change of per capita income
p	Pure time preference

$$n = \frac{\Delta V/V}{\Delta C/C} = \frac{\% \text{ change of utility of consumption}}{\% \text{ change in per capita income}}$$

Just as the cost of capital is the discount rate for financial analysis, an economic discount rate is the 'cost' of deferred benefits, the rate at which their nominal values decrease over time. The foregone productivity of the capital in other uses is (a) the cost of capital resources generated through additional savings; (b) its economic value is the value of additional production in alternative uses.

The economic cost of the portion of capital for the project that is generated from additional savings is the consumption rate of interest (CRI). The cost for the portion drawn from competing investments is the marginal product at shadow prices in the "marginal investment" (the last that would be undertaken if all possible investments were ranked according to economic profitability and if available funds were apportioned accordingly).

Since the UNIDO method uses consumption as the unit of account, with all flows converted to their consumption equivalents, the CRI is the appropriate discount rate.

The CRI is theoretically determined as $\text{CRI} = ng + p$.

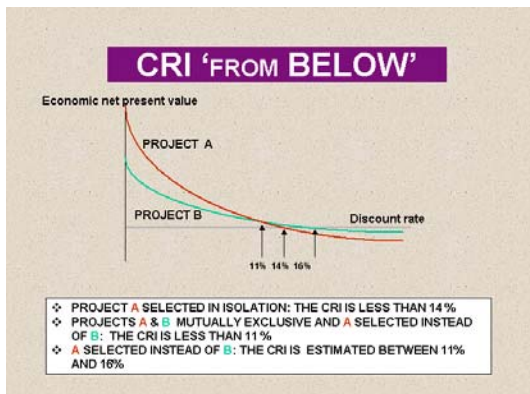
n - the elasticity of marginal utility of consumption with respect to changes in per capita income.

g - the annual growth of average per capita income

p - a pure time preference.

Because the values of n and g are subjective, the 'bottom up' procedure (discussed subsequently) is recommended.

CRI FROM 'BELOW'



One way to try to determine the appropriate CRI is to determine it empirically from the history of project selections. Information about the CRI is deduced depending on project selection. In this process the CRI is the 'switching' value, the rate at which projects become acceptable. For example, the economic rates of return for projects that have been accepted and rejected can be determined and examined for a pattern that would reveal the switching rate.

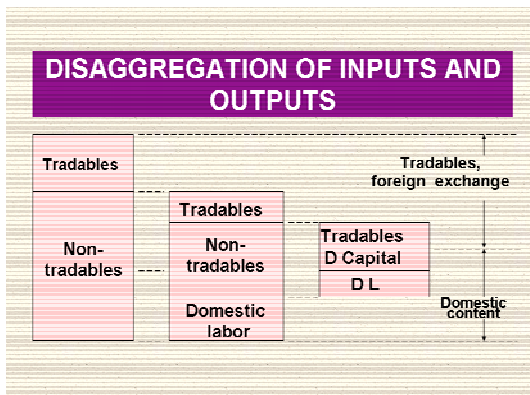
When more than one project is involved, the crossover rate can provide an indication of the CRI.

In the illustration the economic NPV is plotted vs. discount rate for two projects, A and B: If project A is selected in isolation the CRI must be less than 14 %, its economic internal rate of return.

If projects A and B are mutually exclusive and A is selected instead of B, the CRI must be less than the crossover rate of 11 %.

If A is selected instead of B the CRI is estimated to be between 11% y 16%.

DISAGGREGATION OF INPUTS AND OUTPUTS



Non-traded items can be disaggregated to arrive at a more accurate estimate of economic value. In principle, all inputs and outputs are either tradables or non-tradables. Tradables can be valued in terms of foreign exchange. Non-tradables can be disaggregated into their foreign and domestic content, the latter comprised of non-tradables and domestic labor. Successive rounds of disaggregation can result in the elimination of non-tradables so that all inputs and outputs can be expressed in

terms of foreign exchange and domestic content.

This can simplify the task of assigning economic prices to project components. All foreign exchange items are priced at the border and domestic content in terms of labor and capital more readily shadow-priced.

ECONOMIC COST-BENEFIT ANALYSIS (ECBA)

ECONOMIC COST-BENEFIT ANALYSIS (ECBA)

A MEANS OF ALLOCATING NATIONAL RESOURCES AT THE PROJECT LEVEL

Economic cost-benefit analysis provides a way to make decisions on resource allocations through selection of projects that comply best with national goals. It is a means for governments to avoid the difficult problem of changing the economic status quo at the macro level, where powerful resisting forces may be entrenched.

How resources within national borders, or the geographical bounds of other political entities such as trade blocks, are allocated to productive activities is of common concern, even though control of such resources is in private hands. From the commercial point of view the stakeholders are the investors, financiers, guarantors, suppliers and other parties directly affected by a project's financial performance. In the larger sense the entire community has a stake, as the efficacy of the commitment of resources has an effect on the economy as a whole.

Stakeholders who are commercially linked to a project have another reason to be concerned with its economic impacts. Markets are imperfect, but with an information revolution in progress - a process that promises to continue indefinitely - markets will increasingly respond to economic forces; investors are well-advised to attempt to take into account how markets will adjust to changing conditions.

PRINCIPLES OF ECBA

PRINCIPLES OF ECBA

- ❖ WITH' AND 'WITHOUT' PROJECT
- ❖ EVERYTHING INSIDE BORDERS
- ❖ SHADOW (ACCOUNTING) PRICES
- ❖ SELECTIVE ECONOMIC VALUATION
- ❖ EQUAL TREATMENT FOR ALL PROJECTS (NATIONAL PARAMETERS)

'With' and 'Without' project: The impact of the project is measured as the difference in two scenarios - with the project implemented and without the project. This is the incremental effect. It is not necessarily identical with the difference between the 'before' and 'after' situations.

Everything inside borders, national or other political-economic entity: ECBA considers all project-related activities inside the national or political-economic

boundaries. For example, resources employed in moving the output to a port are considered.

Shadow (accounting) prices: Prices that reflect the impact of generation and use of resources on socio-economic indicators are assigned to project inputs and outputs, rather than market prices.

Selective economic valuation: It is unnecessary and unduly complicated to shadow price all project inputs and outputs. Only those resources that have large distortions and that have a significant effect on indicators should be so adjusted.

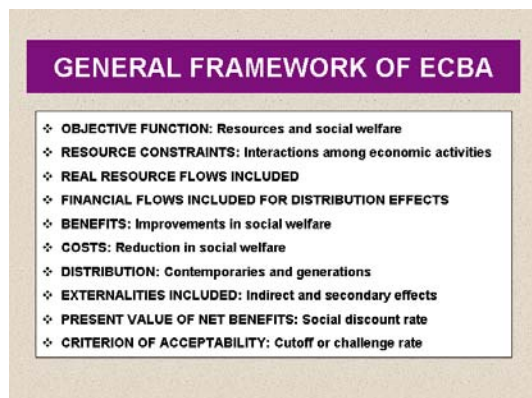
The following criteria should be applied simultaneously to select project variables subject to economic valuation:

- **Which resource figure most prominently in the costs and benefits at market prices?**
- **Which of the market prices are most clearly distorted?**

Especially to be considered are: principle products, imported materials, main domestic inputs. Of particular interest are labor (skilled or not?) and transactions involving foreign exchange.

Equal treatment for all projects (national parameters): Regional and national parameters should be applied uniformly to all projects under consideration so that they can be realistically compared. Some of these parameters are: shadow price of foreign exchange, social discount rate, shadow price of labor, marginal propensity to save, income distribution (the latter two are primarily utilized in social evaluation), etc.

GENERAL FRAMEWORK OF ECBA



Objective function: Relating allocation and generation of resources to income, consumption, investment or other measures of social welfare or quality of life.

Resource constraints: Resources are valued in terms of economic impact of their use or generation, as influenced by interactions among related economic activities.

Benefits: Production of resources and activities that contribute to improvement in the value of the objective function, usually measured in terms of income or consumption.

Costs: Consumption of resources by the project and other activities that tend to diminish the value of the objective function, with value often measured as the opportunity cost (benefits foregone) of resources employed, also usually measured in terms of income or consumption.

Real resource flows included: Production and use of goods and services over the entire life of the project, and including effects on future generations.

Financial flows for distribution effects: Except as they affect the distribution of costs and benefits to social groups, financial flows are excluded from consideration.


Distribution: The implications of distribution among contemporaries and generations are taken into account.

Externalities included: Economically and technologically linked effects that are commercially external to, but induced by the project, are included in the analysis, e.g. forward and backward economic linkages (indirect effects), which can sometimes be 'internalised', and environmental and social impacts linked to the technology (secondary effects).

Present value at economic/social rate: An economic or social discount rate is applied to periodic net costs and benefits to determine net present value (NPV). An economic social rate of return can also be determined.

Criterion of acceptability - cutoff or challenge rate: The economic or social discount rate is applied as the criterion for acceptability; a non-negative NPV or an IRR greater than or equal to the cut-off rate indicates that the project is acceptable according to this criterion.

ECONOMIC AND SOCIAL ANALYSIS



Economic and social dimensions are part of the larger view of project analysis that include markets, technological, institutional and financial considerations.

'Environment' has wide significance. There are the internal and external environments related to commercial operations. More broadly, the project's environment extends to the physical, political, economic and social frameworks, with economic and social analysis inextricably linked to these dimensions of the milieu.

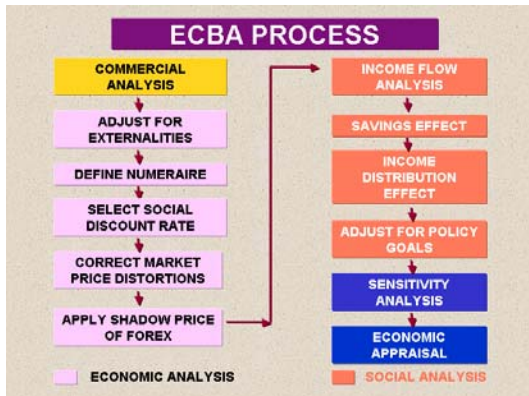
Economic analysis considers the impact of the project on regional or national goals such as increase in GDP, national income, gross consumption, balance of payments, employment, security. Usually benefits and costs are measured at economic efficiency prices, responding to optimization of the growth objective.

Social analysis takes into account distribution effects on income, savings and consumption, responding to the equity objective. It requires explicit weights for these items, which are inherently of a political or subjective nature. Market prices may reflect social prices to the extent that they adequately reflect government policies and weighting.

In the UNIDO methods of ECBA (and VA) economic prices are determined at the level of economic efficiency (economic analysis as indicated above). Social valuations of costs and benefits are derived on the basis of weights assigned to price distortions only, the differences between market and efficiency prices.

Distortions are distributed among social groups nominally on a 'zero-sum' basis, where for every gain there is a loss. Then weights are applied for distribution among contemporaries (income distribution adjustments) and among generations (savings adjustments). Finally merits and demerits are added.

ECBA PROCESS



An outline is provided of the general sequential process for conducting economic analysis. At each of the stages indicated below (*), the Net Present Value (of net benefits) can be determined to better understand the contribution of each factor to the overall measure of net benefits. To determine the net present value of benefits and costs a social discount rate (SRD) is applied to the 'flow' in each project period.

(* **Financial analysis:**

Commercial appraisal is predicated on analysis of the market and marketing strategy, technological and financial aspects. The rate of return to total capital and equity capital is estimated using prevailing market prices of project inputs and outputs. Projected performance indicators are developed to decide on the acceptability of the project, which are compared with investor criteria.

In this process the projections of resource and financial flows (inputs and outputs) are developed that form the basis for economic analysis.

Conventionally commercial appraisal is the foundation for economic analysis, but it is not essential. Non-revenue public infrastructure projects, for example, can be analysed directly in terms of economic impacts, without first establishing market prices. However, it is always useful to know how the market price of any resource is distorted from its economic value.

Economic analysis:

Adjust for externalities: Internal flows (real and financial) are adjusted for externalities where possible. In commercial analysis only transactions that directly affect the monetary flows of the enterprise are relevant. From the economic and social perspective, activities and their impacts that are linked economically and technologically are included in the analysis. Externalities that can only be assessed qualitatively should be analysed separately.

Define the numeraire: A unit of account is needed to express economic value of inputs and outputs in terms of economic objectives. The most common unit of account is 'income' or 'consumption', which are inter-convertible.

Select Social Rate of Discount (SRD): The discount rate for economic analysis should be selected in accordance with the procedure described in Economic Pricing. The discount rate is the rate at which future benefits decline in value over time (see SRD - Economic Pricing).

(* Correct market price distortions for inputs and outputs, i.e., shadow price: Government interventions in markets, which occur more consistently in developing countries, create price distortions that lead producers and consumers to make production and consumption decisions that are not economically efficient. At this stage market prices should be analysed for distortions. If no such distortions are

identified, analysis should be carried out on the basis of market prices with other necessary adjustments, such as the exclusion of financial flows. Otherwise, market prices are adjusted for distortions that are imposed (e.g. taxes, subsidies) or structural (e.g. monopoly pricing), some of which may be national or regional parameters (e.g. shadow price of labour, shadow price of foreign exchange). Imposed distortions such as taxes, subsidies and other transfer items should, in general, be excluded (see Economic Pricing). Border prices should be applied for main traded goods and services.

(*) Apply shadow price of foreign exchange: Adjustments for foreign exchange rate distortions are applied to transactions across the border.

At this point prices are at the level of economic efficiency, i.e. those prices that tend toward optimisation of the growth criterion.

Social analysis:

Social Analysis is comprised of adjustments to economic benefits for the impact of savings, income distribution and merit and demerit goods. Weights are employed that are inherently of a political or subjective nature. Social prices will be equal to market prices to the extent that weightings in accordance with government policies are reflected in market prices.

Income flow analysis: Determine distribution of distortions for gainers and losers at efficiency prices.

(*) Savings effect: Use income flow analysis and savings parameters to correct to social values for generations.

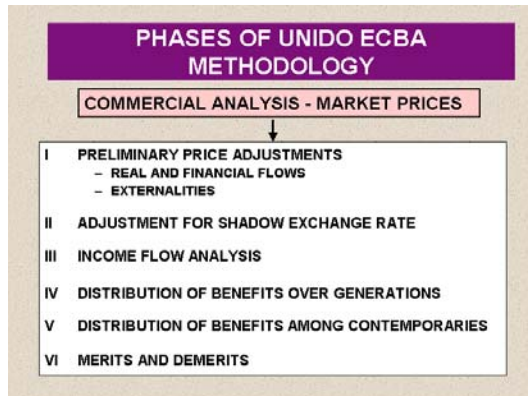
(*) Income distribution effect: Use income flow analysis and assigned weights to correct to social values for contemporaries.

(*) Adjust for policy goals: National policy is taken into account in adjusting the valuation of the project for 'merit and demerit' goods, depending upon the alignment of the project with national goals.

Sensitivity analysis: Project parameters that are subject to uncertainty are varied to determine their effect on net benefits.

Appraise results: Comparative analysis of project's projected economic and social impact with alternatives in regard to criteria, e.g. contribution to national income or consumption, security and other national indicators) - see Appraisal.

PHASES OF UNIDO ECBA METHODOLOGY



This description of the ECBA process differs slightly from the previous presentation, which is more inclusive and closer to a workable process, and is in accordance with the presentation in "Guide to Practical Project Appraisal - Social Cost Benefit Analysis in Developing Countries, UNIDO 1987".

Phase I - Preliminary price adjustments:

Real and financial flows are identified. Adjustments are made to cash flow for market price distortions. Externalities that are linked economically and technologically are identified and added to the commercial flows where they can be expressed in monetary terms. Others externalities that can be expressed only qualitatively are treated separately (e.g. in the Environmental Impact Analysis).

IDENTIFICATION OF ITEMS TO BE ADJUSTED FOR PRICE DISTORTIONS: Tradable, traded, non-tradable and non-traded goods.

EVALUATION OF ITEM CONTENT TO BE ADJUSTED: Not all items need adjustment, only those with a combination of large distortion and large impact. Some items may be disaggregated for more accurate conversion to economic prices.

ESTIMATION OF CONVERSION FACTORS/ADJUSTMENT FACTORS: Accounting prices for items to be adjusted and factors that convert market prices to economic prices at efficiency level are determined.

PRELIMINARY ADJUSTMENTS TO CASH - FLOW: Adjustments are determined at the preliminary level, which includes all distortions excepting that for foreign exchange rates. Adjustments are calculated and added algebraically (plus or minus) to market prices of inputs and outputs (including externalities).

PRELIMINARY ADJUSTED PRESENT VALUE: The present value of benefits and costs at efficiency prices is determined using the appropriate social discount rate.

Phase II - Adjustments for shadow exchange rate.

ADJUSTMENTS FOR FOREIGN EXCHANGE DISTORTIONS: Adjustments are determined that convert border prices from the official exchange rate to the shadow rate of foreign exchange.

EFFICIENCY LEVEL: Foreign exchange adjustments are added algebraically to the preliminary adjusted level. This is the level of economic efficiency, which responds to the growth criterion.

COMPARISONS OF THE IRR: The Internal Rate of Return at efficiency prices is compared with the social cutoff rate.

PHASE III: Income flow analysis:

In this part of the analysis gains and losses are treated as a 'zero sum game' with benefits to gainers matched by costs to losers. The sums of benefits and costs due to price distortions are equal at their nominal values, before weighting factors are included for social groups.

IDENTIFICATION OF SOCIAL GROUPS INVOLVED IN PROJECT (e.g. project, rest of private sector, government, workers, consumers, foreign sector)

SUMMARY OF PRICE DISTORTIONS FROM PHASES I AND II FOR 'REAL' AND FINANCIAL FLOWS. 'Real' flows are those involving the production and consumption of goods and services.

ATTRIBUTION OF GAINS AND LOSSES RESULTING FROM THE ADJUSTMENTS TO CASH - FLOW TO DIFFERENT SOCIAL GROUPS. The net gain or loss for any real or financial item is zero.

SUM OF GAINS AND LOSSES FOR SOCIAL GROUPS: The net of gains and losses for each social group are determined

Phase IV - Distribution of benefits over generations: Adjustments for the value of savings.

ESTIMATION OF MARGINAL PROPENSITY TO SAVE (MPS), which varies among social groups and indicates part of savings out of additional (marginal) income. MPS is determined for each social group identified in PHASE III.

MPS for each social group is applied to the total amount of gains and losses for each group. The sum of these impacts is the NET PROJECT IMPACT ON SAVINGS (NPIS).

CALCULATION OF ADJUSTMENT FACTOR FOR SAVINGS (AFs): The adjustment factor is the present value of a unit of investment for each social group considering the parameters Marginal Propensity to Save (MPS), Marginal Return on Investment (MRI) and the Consumption Rate of Interest (CRI) (see pg. 65 of Guide to Practical Project Appraisal, UNIDO 1986 - the Guide).

CALCULATION OF ADJUSTMENT VALUE: The adjustment value is the product of the "NET PROJECT IMPACT ON SAVINGS" and the Adjustment Factor for Savings. If the MPS for each group differs it would be preferable to calculate the Adjustment Value for each group rather than aggregating the NPIS and multiplying by a single AFS.

DETERMINATION OF PRESENT VALUE: The present value of periodic flows can be calculated to include the savings adjustments by discounting at the social discount rate (CRI).

COMPARISONS OF THE IRR: The Internal Rate of Return with the savings impacts included can be compared with the social cutoff rate, or social challenge rate.

NOTE: In the "Guide", pg. 90 the savings impacts for each group are aggregated before determining impact value at each alternative discount factor.

PHASE V: Distribution of benefits among contemporaries:

Income distribution determined in PHASE III is evaluated according to subjective weights assigned by central authorities or the analyst by default.

CALCULATION OF INCOME DISTRIBUTION WEIGHTS:

- determination of the base level of consumption.
- determination of consumption level for each social group.
- calculation of ratios of consumption to the base level.
- estimate elasticity of the marginal utility of consumption with respect to change in per capita income for each social group.

CALCULATION OF DISTRIBUTION ADJUSTMENT FACTORS (DAF): The DAF are determined on the basis of the parameters above (see Annex III pg. 97 of Guide, and below).

DETERMINATION OF DISTRIBUTION ADJUSTMENT VALUES (DAV): Distortions for each social group are multiplied by the respective DAF's and then summed. These values should be discounted to present value using the social discount rate (CRI).

DETERMINATION OF PRESENT VALUE: The present value of periodic flows can be calculated by adding the distribution adjustments to the values in Phase IV and discounting at the social discount rate.

COMPARISONS OF THE IRR: The Internal Rate of Return with the distribution impacts included can be compared with the social cutoff rate.

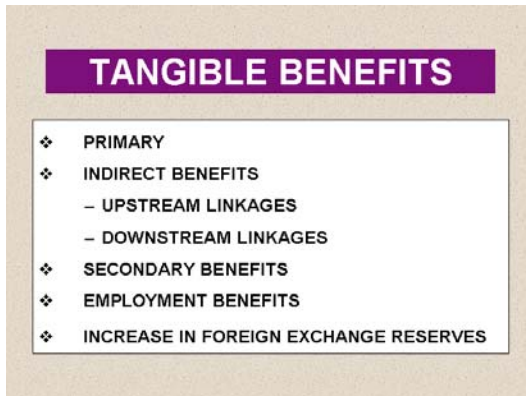
Phase VI project merits and demerits:

Adjustments can be added to (merits) or subtracted from (demerits) the periodic flows that reflect government policies in respect to effects such as:

1. Regional development
2. Use of strategic resources
3. Creation of new jobs
4. Industrialization policy
5. Sectoral industrial policy
6. Environmental goals
7. Other national priorities

Adjustment factors for these 'merit and demerit' goods can be added for each project period and then included in the calculations of Net Present Value (NPV) by discounting at the social discount rate and for calculating the IRR. The results in Phase VI represent the overall economic indicators for the project.

TANGIBLE BENEFITS



Tangible benefits can be assigned a monetary value without difficulty.

Primary benefits: Marketed project output (use of the product sold to the client). Physical effects for the user without a market transaction (e.g. use of irrigation by farmers)

Indirect benefits (increase in value-added activities connected to the project through economic links): A benefit intended for one purpose might

satisfy another, e.g. a flood control project increasing agricultural production and benefits for the transportation system at the same time.

Upstream (backward) linkages: Increase in industrial production increases demand for local raw materials.

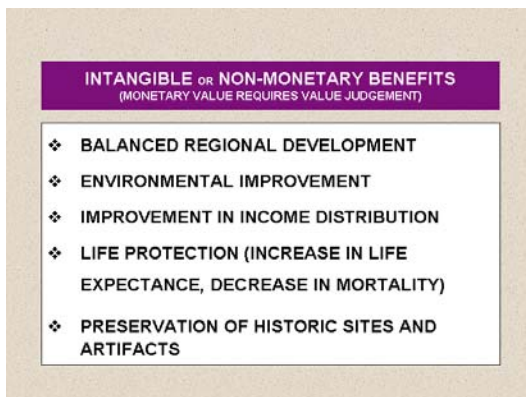
Downstream (forward) linkages: Increase in production of cotton positively affects output of the domestic textile industry.

Secondary benefits: Positive externalities linked technologically to the project, e.g. environmental improvements resulting from project activities.

Employment benefits: Creation of employment opportunities in the country or in a particular region of interest to planners

Net increase in foreign exchange reserves: For countries with problems of payments balances, the impact of the project on foreign reserves may be an important factor.

INTANGIBLE OR NON-MONETARY BENEFITS



Implementation of an investment project may have social or economic impacts that are not measurable in terms of goods or services but that are widely acknowledged as beneficial. A depressed region or area is a detriment to the national economy, as it requires the diversion of resources to public welfare that might be used elsewhere in the economy to improve the general standard of living.

A project may confer environmental benefits, e.g. draining of a low-lying swampy area that is a health hazard for the local inhabitants and converting it to useable plant area or cropland. This should be approved only after careful study, as wetlands are usually an important component of the ecological system.

A project that helps to lift the people of a depressed region or area out of poverty conveys societal benefits. Wide income disparities are conducive to social instability, so it is generally advantageous to narrow the income gap by creating opportunities for the unemployed and underemployed to find meaningful and rewarding work. The project may create a demand for inputs that can be filled by newly created small or micro enterprises.

Some industrial projects are intended to fill a need for pharmaceuticals that are out of the reach of the local population by reason of cost. Local companies often can produce generic drugs at a fraction of the cost of imports. Wider access to such medicines can have a dramatic impact on life expectancy and decrease in mortality rate.

Preservation of historic sites and artifacts can bring substantial benefits to the community. Such cultural symbols are part of the 'cement' that holds societies together. If an industrial development project encroaches upon such sites it may be required to enhance accessibility or include preservation in its development plan as a condition of acceptability.

TANGIBLE COSTS (LINKED TO THE MARKET)

The diagram consists of a light brown background. At the top left, there is a purple rectangular box with the text 'TANGIBLE COSTS (LINKED TO THE MARKET)' in white. Below this box is a white rectangular box with a thin black border containing a list of four items, each preceded by a small purple diamond symbol: 'PRIMARY COSTS', 'INDIRECT COSTS', 'SECONDARY COSTS', and 'COST OF UNEMPLOYMENT'. To the right of the diagram, there are two text blocks. The first is labeled 'Primary costs:' and describes project's purchased inputs, negative physical effects (e.g. displacement of current economic activity, e.g. forestry operation), indirect or complementary costs (costs incurred by third parties from technological effects due to the existence of the project; e.g. pesticide residues on neighboring crop production). The second is labeled 'Indirect costs:' and describes negative consequences for third parties from economically linked changes.

Primary costs: Project's purchased inputs, negative physical effects (e.g. displacement of current economic activity, e.g. forestry operation), indirect or complementary costs (costs incurred by third parties from technological effects due to the existence of the project; e.g. pesticide residues on neighboring crop production)

Indirect costs: (negative consequences for third parties from economically linked changes)

Elimination of forward or backward linkages, e.g. new technology does not require some input previously supplied by national industry or disrupts supply of some product previously used by national industry

Secondary costs: Negative impacts of technology, e.g. adverse environmental impacts, social disruption.

Cost of unemployment: The project may result in loss in job opportunities (e.g. displacement of labor-intensive with capital intensive production), reduced skill requirements of workers, reduced worker income.

INTANGIBLE OR NON-MONETARY COSTS



Economic analysis requires consideration of externalities, some of which may represent costs to the economy or the social fabric that are either intangible or that cannot be expressed in monetary terms. A few of these impacts that might be considered are the following:

Environmental degradation: The project may cause environmental degradation that is not quantifiable. Some health impacts of land, water or air degradation are difficult to assess in many

cases and are not easily quantified in terms of monetary costs. Even when emissions are determined to be within existing regulatory limits, adverse health impacts can occur. Load factors from other local industries and activities, and the state of contaminant absorption by the local community should be taken into account.

Disruption of eco-systems: Disruption or destruction of wildlife habitats as a consequence of the project should be explained qualitatively, with quantitative data presented concerning the extent of the impacts.

Exacerbation of income disparities: The effect of the project may be to introduce a high technology project into a rural area where incomes are generally low. High income technicians can disrupt the local economy by creating demand for goods and services that are in short supply.

Hazards to health and well-being of population: A project feature may be to present health or other hazards for the population, e.g. a large increase in traffic of heavy vehicles on rural roads.

Disruption of cultural values or life styles: Life styles may be degraded when small farmers are converted to factory workers. Cultural patterns and rhythms may be disrupted, e.g. observance of religious practices.

Destruction of historic sites and artifacts: Historic and archeological sites may be important components of a community that are disrupted or destroyed by a project.

Inconsistency with overall development plan: A project may disrupt the development plans for an area, e.g. a noisy or otherwise polluting industry in an area designated for eco-tourism.

REAL AND FINANCIAL FLOWS

REAL AND FINANCIAL FLOWS

- ❖ **REAL: PRODUCTION OR USE OF GOODS AND SERVICES**
 - RAW MATERIALS
 - SEMI FINISHED GOODS
 - LAND
 - CAPITAL GOODS
 - LABOR
 - etc.
- ❖ **FINANCIAL FLOWS**
 - EQUITY FUNDS
 - LOANS AND DEBT SERVICE (PRINCIPAL AND INTEREST)
 - TAXES
 - DIVIDEND, ETC.

As financial analysis is usually the foundation for economic analysis, distinction is needed between flows that are relevant to each. In financial analysis, essentially all flows are relevant - real flows representing monetary values of goods and services used and produced by the project, and flows that are purely financial in the sense that they do not represent goods and services but are part of the financial structure of the enterprise.

Real - production or use of goods and services: These flows are the monetary equivalents of raw materials, semi finished goods, land, capital goods, labor - in short, the 'tangible' resources used and generated by the project. Economic analysis is based primarily upon the flow of real resources.

Financial flows: These are monetary flows that are used to finance the project, to retire debt, to effect transfers to and from the government in the form of taxes and subsidies, to pay dividends to shareholders. Financial flows are taken into account in economic analysis only in relation to their effects on distribution of benefits. For example, if a loan is subsidized by the government by supplying capital at concessionary rates, this represents a distribution from the government to the project.

ADJUSTMENT FACTOR FOR INCOME DISTRIBUTION

ADJUSTMENT FACTOR FOR INCOME DISTRIBUTION

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

w_i	Weighting factor for social group i
b	Base level of consumption
c_i	Consumption level for social group i
n	Elasticity of marginal utility of consumption with respect to change in per capita income

GENERALLY ACCEPTED PRACTICAL LIMITS FOR n : $0 \leq n \leq 2$

0	No adjustment factor
1	Change in utility for x% change in income equally valuable for all classes
2	Strongly egalitarian

Central planning authorities, or the analysts by default, have to apply subjective weights to the distributional impacts of the project. A model for calculating the Adjustment Factors for income distribution among contemporary social groups is presented.

Parameters of the model are as follows:

w_i Weighting factor for social group i

b Base level of consumption - the level of income at which the authorities are indifferent to a unit of income in the hands of the government or the social group, i.e. the level at which the group would be neither taxed nor subsidised.

c_i Consumption level for social group i

n Elasticity of marginal utility of consumption with respect to change in per capita income.

The latter elasticity n , is difficult to determine. However, in the absence of central guidance, the analyst can attempt to examine the consequences of applying government distribution policy in the selection of n . Generally accepted practical limits for n are between $n \ 0 \leq n \leq 2$.

The consequences of values of n are as follows:

- 0 No adjustment factor
- 1 Change in utility for $x\%$ change in income equally valuable for all classes – somewhat egalitarian - tends toward consumption equality for social groups
- 2 Strongly tends toward consumption equality for social groups

ADJUSTMENT FACTOR FOR SAVINGS

ADJUSTMENT FACTOR FOR SAVINGS

$$AF_s = \left[\frac{(1-s)q}{i-sq} \right] - 1$$

AF_s	ADJUSTMENT FACTOR, SAVINGS
s	MARGINAL PROPENSITY TO SAVE FOR GROUP (MPS)
q	MARGINAL PRODUCTIVITY OF CAPITAL (MPC)
i	CONSUMPTION RATE OF INTEREST (CRI)

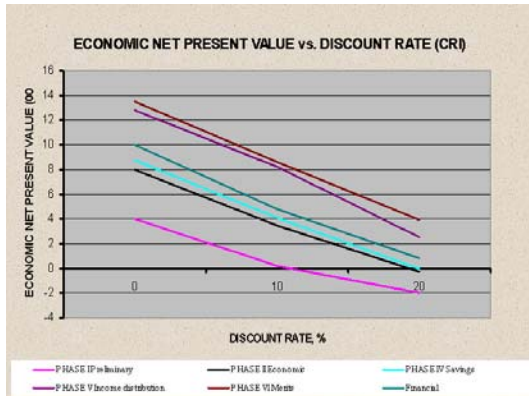
Income can be applied to savings or consumption. Savings are the basis for investment, leading to future consumption. The savings rates for social groups can be applied to determine the present value of a unit of savings in consumption terms. The formula shown represents the infinite series of consumption benefits arising from a unit of savings for a particular social group.

Parameters of this model are as follows:

- s** Marginal propensity to save (MPS), i.e. that portion of income devoted to savings for the group.
- q** The marginal rate of return on investment capital (MRC), i.e. the rate at which investment capital generates income.
- i** The consumption rate of interest (CRI) or social discount rate.

The Adjustment Factor for each social group is applied to the net benefits arising from price distortions for the group as determined in Phase III of the UNIDO methodology for economic analysis.

ECONOMIC NET PRESENT VALUE vs. CONSUMPTION RATE OF INTEREST




After adjustments are included in the real and financial flows of at various levels of development of net social benefits, the results can be calculated for each level by discounting at the social discount rate (CRI).

A graph of Economic Net Present Value (NPV) vs. Consumption Rate of Interest (the discount rate) can be prepared that compactly illustrates the effects of each factor.

In the graph the results for Phases I through VI are shown. In the example, the results at the economic efficiency level (Phase II) are lower than the value of NPV for financial analysis. This is true also for Phase IV results (savings impact). However, when the income distribution (Phase V) and merits/demerits are taken into account (Phase VI), the results exceed those for the financial case. The cutoff rate should be applied to determine whether or not the project is acceptable economically. If NPV is positive at the challenge rate (the rate required for acceptable projects), the project is a candidate for approval.

VALUE ADDED (VA)

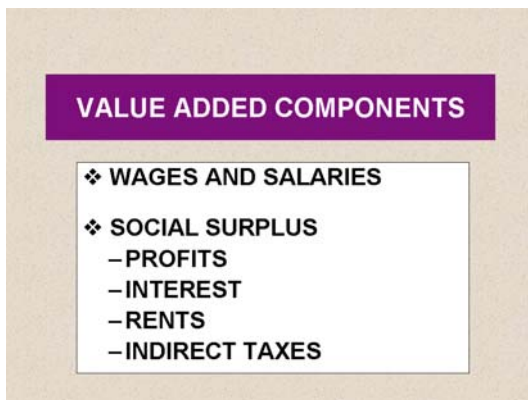


Value Added (VA) for all producers of goods and services in the country amounts to the national income, which in turn is the basis for consumption and savings (i.e. future consumption). VA contributed by an investment project is an important criterion for both public and private decision-makers.

VA created by a project can be divided into (1) wages and salaries and (2) what may be termed 'social surplus', all other income for individuals or other entities aside from wages and salaries. From the point of view of the project, wages and salaries are a cost factor, but from the national perspective they contribute to national income. The elements of VA for a particular project determine how the value created is distributed among members of society. The project might be considered favorably by national decision-makers if a large proportion of the VA is in the form of wages and salaries. However, if the national savings rate is low, a greater proportion of VA in the form of profits and interests might be favored as the savings rate (and consequently investment) for recipients would likely be higher than for wage earners.

A more formal approach to determining VA for a project, which includes the impacts of linkages, is provided in Value-Added, a summary of the 'Effects Method' of Chervel and Le Gal. A matrix approach is used in which intermediate inputs are decomposed so that ultimately, for all practical purposes, only value-added and imports remain. One caveat is that resource constraints are not taken into account; e.g. the shadow prices of labour and foreign exchange are not inherently included in the method.

VALUE-ADDED COMPONENTS



The composition of VA for an investment project can be divided into two components, wages and salaries and social surplus. VA is then the sum of wages and salaries and social surplus. Domestic wages and salaries and social surplus contribute to the national income at the project level.

Wages and salaries: This is the sum total of compensation to workers paid by the project in return for their labour.

Social surplus: This is the excess of VA after wages and salaries are taken into account. Social surplus can be in the form of profits to shareholders, interest to

lenders, rents to owners of property employed by the project, and indirect taxes to the government.

ACCOUNTING FOR VALUE-ADDED

ACCOUNTING FOR VALUE-ADDED

$$P = R - S - M - I - O$$

$$P + S + O = R - M - I$$

VALUE-ADDED CONTENT

P	Profit
S	Wages, salaries
O	Other costs (e.g. interest, royalties, rent, indirect taxes)
R	Revenue
M	Intermediate materials
I	Investment (dynamic) or
D	Depreciation (static)

At a basic level, as included in the national accounts, VA can be determined for a period of operations from the actual or projected accounts of an enterprise. The content of VA can be derived from the following equation for profit of the enterprise:

$$P = R - S - M - I - O$$

$$P + S + O = R - M - I$$

- P** Profit
- S** Wages and salaries
- O** Other costs (rents, interest, indirect taxes)
- R** Revenue (value of output)
- M** Material (intermediate) inputs
- I** Investment (physical or economic depreciation for a period)

Both the left and right sides of the above equation represent the VA. On the one hand, it consists of profit + wages and salaries + other cost elements. On the other hand, VA can be considered as the value of output - material inputs - investment.

VALUE-ADDED AND NATIONAL INCOME

VALUE-ADDED AND NATIONAL INCOME

- ❖ AGGREGATED VALUE-ADDED FOR ALL PRODUCERS OF GOODS AND SERVICES IN THE ECONOMY AMOUNTS TO NATIONAL INCOME
- ❖ VALUE-ADDED IS GOOD APPROXIMATION OF CONTRIBUTION OF PROJECT TO NATIONAL ECONOMY

INDICATORS

- Net National Value Added (NNVA)
- Income Distribution Effect
- Supplementary indicators

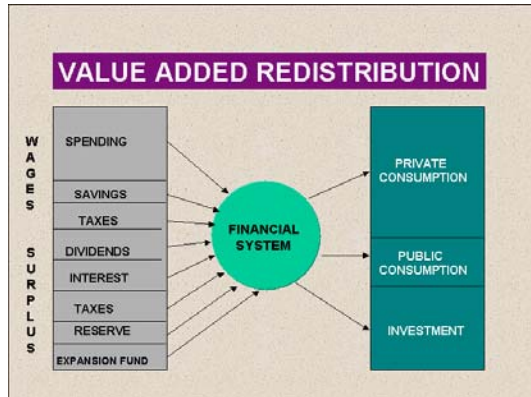
Aggregated VA for all producers of goods and services in the economy amounts to national income: Each enterprise that adds value to the economy is a contributor to national income. When the VA created by all producers of goods and services in the economy are aggregated, this equals the amount of income for all groups and individuals in the economy. Intermediate and investment goods that are consumed by a particular enterprise must be deducted from the value of output for the reasons

previously cited - to properly attribute VA to other producing entities and to avoid double counting.

Value-Added is good approximation of contribution of project to national economy: If VA analysis is done carefully so that only the elements attributable to an enterprise are counted, the measure is a useful way of determining the contribution to the national economy (national income).

Indicators: VA analysis leads to the determination of a set of indicators that are used in appraising an investment project from the national perspective. **Net National Value Added (NNVA)** is the VA produced and distributed within the county's borders. Other indicators can be developed, such as the Income Distribution Effect - how the VA created is distributed among social groups. Other types of indicators are discussed in Supplementary Indicators.

VALUE ADDED REDISTRIBUTION



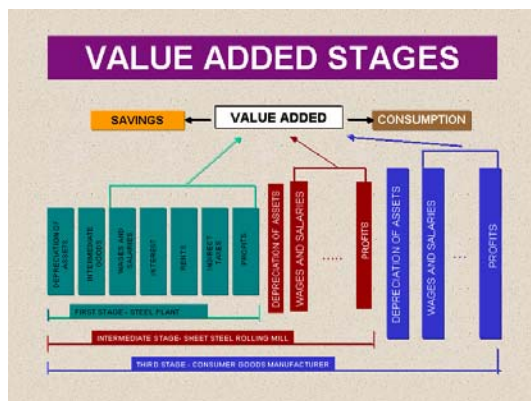
The content of VA in the form of wages and salaries and social surplus is redistributed in the economy. Redistribution occurs through the financial systems of the country.

Wages and salaries are spent, saved or paid to the government in the form of taxes.

Social surplus in the form of dividends to shareholders (distributed profits), interest payments to lenders, indirect taxes to the government, or reserves and expansion funds of the enterprise find their way into public and private consumption and investment. Normally savings are channeled through the financial institutions into investment that is the basis for future income and consumption. Reserves and expansion funds are used directly by the enterprise for future investment.

All of the VA is ultimately channeled either into savings/investment or consumption. Both contribute to the national economy - savings/investment for future income and spending into immediate consumption.

VALUE ADDED STAGES



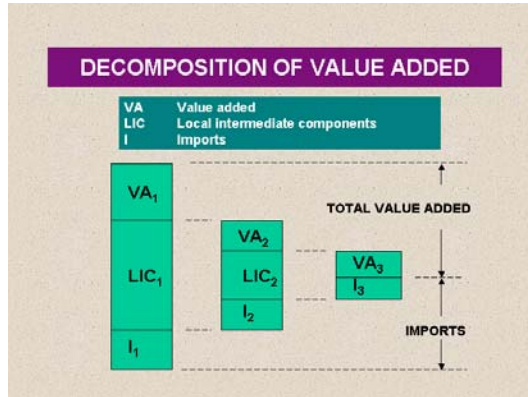
VA is created at each of the various stages of integration of a final product. In the illustration there are three stages of production for a consumer good fabricated of steel: the steel mill, the rolling mill (to produce sheet steel) and the consumer goods manufacturer. The steel mill produces ingots as its final output, with a contribution of VA to the economy. Ingots are an input to the rolling mill, which produces sheet steel with its VA contribution. The sheet steel, in turn, is an input to the producer of consumer goods,

with VA created at that level.

Each stage creates its own VA. Intermediate inputs from one stage to another stage are deducted from the higher stage in determining VA as it is attributable to the

lower stage. In this way the total of VA contributed by each producer of goods and services is equivalent to the national income.

DECOMPOSITION OF VALUE ADDED



What part of the value of output of an enterprise should be counted in its VA contribution? Decomposition of VA is a useful way to develop a more accurate estimate than simply deducting the value of intermediate inputs (including investment).

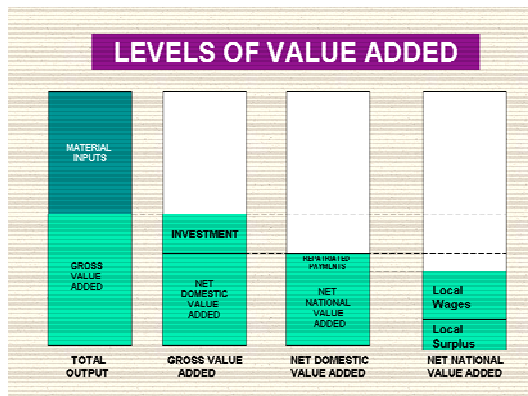
The value of output can initially be broken down into VA, local intermediates and imports. Imports clearly do not contribute to national income and so can be deducted directly. The local intermediates

can be further investigated for VA content by breaking them down into VA, local intermediates and imports. Once again the imported component of the intermediate can be deducted immediately.

If decomposition proceeds through several stages, ultimately local intermediate inputs will reduce to the vanishing point so that the value can be expressed in terms of VA and imports.

This is the approach of the 'Effects Method' of Chervel and Le Gal (see Value-Added).

LEVELS OF VALUE-ADDED



Gross value added (VA): Gross VA is the most inclusive form. It is the value of output with only intermediate inputs deducted. In the system of national accounting, intermediate inputs have their own VA content. As these inputs are produced externally, they can not be counted as part of the VA for the project. In addition, to include them as part of VA would amount to double counting at the national level.

Net domestic value added (NDVA): VA can be measured in terms that exclude both intermediate inputs and investment. The measure is Net Domestic VA, which is the Gross VA with investment deducted. Similar to the case of intermediate materials, investment goods are produced external to the project, so their consumption (in the form of depletion or physical depreciation) must be excluded from the VA created by the project.

Net national value added (NNVA): Any part of the value of output repatriated outside the borders does not contribute to the national economy and therefore should be excluded. The NNVA is the NDVA less any repatriated payments such as wages and salaries or profits.

PRICING OF VALUE ADDED COMPONENTS

PRICING OF VALUE ADDED COMPONENTS

- ❖ MARKET PRICES
- ❖ ACCOUNTING PRICES

Market prices: In the national accounts value-added is invariably calculated at market prices. The value of output is the domestic market price or the export price converted to domestic currency at the official exchange rate. The values for inputs are the domestic purchase price or the import price, as the case may be.

Accounting prices: When evaluating a project in regard to its impact on the national economy the situation is somewhat different. When markets are not free and open, as is the case in many developing countries, market prices may not reflect value in terms of income, which is the intrinsic numeraire in the value-added approach. There are several reasons for this: interactions of the project with other economic activities are not taken into account; market prices may be distorted by government interventions; the market structure may lead to pricing mechanisms that do not reflect economic value. Accounting prices take into account the above factors that reflect more accurately the impact on the numeraire (undifferentiated income in this case) of the generation or use of a unit of an output or input.

The most straightforward approach to determining value-added is to employ market prices. However, this approach may not provide the best assessment of a project's impact on national income. When significant price distortions exist (see Economic Pricing) it is best to use accounting prices for the purposes of project analysis.

NPV OF VALUE ADDED

NPV OF VALUE ADDED

- ❖ VALUE-ADDED FOR EACH PROJECT PERIOD DETERMINED
- ❖ DISCOUNT FACTOR APPLIED TO VA FOR EACH PROJECT PERIOD
- ❖ VA FOR ALL PERIODS TO PLANNING HORIZON AGGREGATED

Normally an investment project is prepared and appraised for a finite number of periods (e.g. years) to the planning horizon. In a manner very similar to financial analysis, net present value (NPV) of is a means of incorporating VA created over different periods of time into a single aggregate indicator. The process is as follows:

Value-added for each project period determined: The VA created in each project period to the planning horizon is determined.

Discounted factor applied to VA for each period: The discount factor is similar to that described in the section on Financial Analysis. A social discount rate (not necessarily the opportunity cost of capital - see Economic Cost Benefit Analysis) is used in calculating discount factors.

VA for all periods aggregated: The NPV of VA is determined by adding the VA for all periods from project inception to its termination. This should include phases of planning, construction, operation and decommissioning (when applicable).

The discounting approach can be applied to the total VA or to any or all of the components into which it is divided. In some of the indicators discussed subsequently, the discounting method would be applied separately to VA components, e.g. wages and salaries, distributions to profit earners.

SOCIAL RATE OF DISCOUNT (SRD)

SOCIAL RATE OF DISCOUNT (SRD)

$$SRD = r_w(1 - p_d) = r_w - p_d r_w$$

SRD	Social rate of discount
r_w	actual interest rate in world market
p_d	'premium' for domestic projects

Value added represents income generated by the project over its economic life. If the periodic values are to be aggregated in a meaningful way, the values for each period should be discounted at a rate that reflects the diminishing value of income in the future. The discount rate selected might be different from that used in ECBA analysis, which is based upon consumption rather than income.

The interest rate in international capital market can be taken as the base SRD.

This rate needs to be adjusted by the position of a country in regard to the international capital market, depending upon its position as net lender or net borrower.

If a country is a net lender it may wish to promote domestic projects by reducing the actual rate of interest in the world market by a premium encouraging domestic investment. Similarly, if the country is net borrower it may reduce demand for foreign capital by increasing the discount rate over the international rate. A country can apply different SRD's for special situations such as encouraging or discouraging investment in certain sectors or geographical regions.

One approach suggested is the formulation shown. The rate of return on capital in world markets is reduced by a 'premium' factor for domestic projects. The premium can be estimated on the basis of experience (perhaps using the bottom-up approach suggested in ECBA) after taking into account factors such as:

- Expected rate of growth in the national economy
- 'Steadiness' of world capital markets
- World political stability
- Expected long-term return on domestic projects
- Expected rate of inflation in the country and in world markets

Inflation is relevant only if it is reflected in the return on capital. A high-risk situation might justify a premium of 25%, so that the SRD is 75% of the market rate. For example, if the premium is 25% and the market rate is 10%, the SRD is $(.10-.25*.10)$ or 7.5%. If the country is a capital borrower, the SRD should not be below the market rate, adjusted for inflation when the analysis is conducted at constant prices.

The SRD should be uniformly applied to the analysis of all projects under consideration in the region, country or other economic unit.

The SRD is not necessarily the same as the CRI (Consumption Rate of Interest) applied in ECBA. The reason is that the numeraire (unit of account) is not exactly the same. In ECBA, according to the UNIDO approach, the numeraire is expressed in terms of consumption, whereas in the VA approach the numeraire is expressed in terms of undifferentiated income. If similar numeraires are employed in each of the approaches (e.g. if undifferentiated income is the basis for ECBA), then the same discount rate would be applied in both methods of analysis.

NET DOMESTIC VALUE ADDED

NET DOMESTIC VALUE ADDED

$$NDVA_j = O_j - (MI_j + I_j)$$

$$NDVA_j = O_j - (MI_j - D_j)$$

$$\sum_{j=1}^n NDVA_j = \sum_{j=1}^n NDVA_j \quad (\text{nominal value})$$

$$\sum_{j=1}^n NDVA_j = \sum_{j=1}^n NDVA_j \cdot df_j \quad (\text{present value})$$

$NDVA_j$	Net value added, period j
O_j	Output, period j
MI_j	Material input, period j
I_j	Investment, period j
D_j	Depreciation, period j
n	Economic life, periods
df_j	Discount factor, period j

Net Domestic Value-Added (NDVA) for each project period can be determined as the difference between the value of output and the sum of material inputs and investment. Output and material inputs can be valued at market prices or at accounting prices.

The formula is shown with investment expressed in terms of the actual investment in the period (I), or as depreciation (D). When determining NDVA over the economic life of the project, a

more accurate approach is to apply the actual investment in the period. The depreciation attributable to the investment would be applied if the NDVA is to be determined for a typical period.

NDVA can be determined in nominal terms, the summation of the value added in each period from project inception to the planning horizon. A more useful way to determine NDVA is to use the present value approach, with the NDVA for each period multiplied by the appropriate discount factor df . The present value is a more appropriate measure of the value added as future benefits are discounted.

NET NATIONAL VALUE ADDED (NNVA)

NET NATIONAL VALUE ADDED (NNVA)

$$\sum_{j=1}^n \text{NNVA} = \sum_{j=1}^n O_j - \sum_{j=1}^n (MI_j + I_j + RP_j)$$

$$\sum_{j=1}^n \text{NNVA} = \sum_{j=1}^n O_j - \sum_{j=1}^n (MI_j + I_j + RP_j) df_j$$

NNVA	Net national value added
O_j	Output, period j
MI_j	Material inputs, period j
I_j	Investment, period j
RP_j	Repatriated payments, period j
df_j	Discount factor, period j

NNVA is the value-added produced within the borders of the economic entity for which it is to be determined. This could be a region, a country or an economic block.

The difference between NDVA and NNVA is that repatriated payments are removed. Repatriated payments are the values of earnings, dividends or capital paid to foreigners who export the amounts. NNVA is a better reflection of the value of the project to the national economy.

NNVA can be determined at market prices or accounting prices. Accounting prices provide a better estimate of the contribution of a project to national objectives as distortions resulting from resource constraints and interventions are taken into account. In the case of labour, the accounting price is the algebraic complement of the shadow wage rate applied in ECBA; labour is a cost in ECBA but a benefit in VA analysis.

Another variation concerns the use of nominal or time-adjusted values. The nominal value of NNVA is the sum of the NNVA for each period to the planning horizon. The present value of NNVA is determined by multiplying the NNVA for each period by an appropriate discount rate. The SRD previously discussed can be applied.

The present value approach is a better reflection of the project's value-added contribution to the national economy.

MULTIPLE CRITERIA

MULTIPLE CRITERIA

- ❖ NET NATIONAL VALUE ADDED
- ❖ ABSOLUTE EFFICIENCY TEST
- ❖ RELATIVE EFFICIENCY TEST
- ❖ INCOME DISTRIBUTION
- ❖ NON-QUANTITATIVE IMPACTS

Instead of single aggregate criterion incorporating several multi-objective aspects of the development process, the net value added approach advocated by UNIDO consists of measuring several indicators that are compared with criteria of decision makers. The multiple criteria are as follows: .

Net National Value Added (NNVA): The aggregated VA produced by the project within national borders (expressed in terms of NPV).

Absolute Efficiency Test: This test measures the VA produced by the project in relation to the wages and salaries (both expressed in terms of NPV). NNVA should be at least equal to wages and salaries.

Relative Efficiency Test: The VA created by the product per unit of scarce resource is determined (e.g. skilled labour, foreign exchange).

Income Distribution: The proportion of NNVA distributed to various social groups is examined.

Non-quantitative impacts: These are effects than are not normally expressed quantitatively (e.g. implications for infrastructure, technical technical know-how and environment) that should be included in project assessment.

Other indicators that are applicable to both VA and ECBA methods are presented in Supplementary Indicators.

TESTS OF ACCEPTABILITY

TESTS OF ACCEPTABILITY OF PROJECTS FOR INVESTMENT

- ❖ ABSOLUTE EFFICIENCY TEST
- ❖ RELATIVE EFFICIENCY TEST

Acceptability of an investment project on the basis of value added created can be tested with absolute and relative efficiency tests.

The *absolute efficiency test* measures the value added in relation to wages. The criterion is that the project's value added should at least equal wages. If value added exceeds wages, social surplus is produced that is the source of increased present consumption and economic expansion. If not, the project is a consumer rather than a producer of social surplus and is unacceptable, unless the project confers compensating benefits such as compliance with the country's strategic goals. The indicator can be determined either on a static (for a single period) or dynamic basis (discounted values).

The static and dynamic formulas are as follows:

$$E_s = O - (MI + D) \geq w$$

$$E = \sum_{t=0}^{t=n} VA_t df_t \geq \sum_{t=0}^{t=n} w_t df_t$$

- E_s Static absolute efficiency criterion
- O Value of output for a specified period
- MI Value of material input for the period
- w Wages for the period
- E Dynamic absolute efficiency criterion
- VA_t Value added, period t
- df_t discount factor, period t
- w_t wages, period t

Because the results of the test vary from period to period, the dynamic test is the more useful, particularly if prices are adjusted to their economic accounting values.

The *relative efficiency test* is a measure of the generation of value added with respect to scarce resources. The indicators are relevant only in a relative sense – comparing two or more projects that are rivals for scarce investment resources.

$$E_x = \frac{P(VA)}{P(X)}$$

- E_x Relative efficiency indicator for scarce resource X
- $P(VA)$ Present value of value added, discounted at social discount rate
- $P(X)$ Present value of scarce resource, discounted at social discount rate

Scarce resources can be capital, foreign exchange, skilled labor, or any other resource consumed by the project with constrained availability.

ABSOLUTE EFFICIENCY TEST

ABSOLUTE EFFICIENCY TEST

$$E_s : NNVA \geq W$$

$$E : \sum_{j=1}^n NNVA_j df_j \geq \sum_{j=1}^n W_j df_j$$

E_s	Absolute efficiency test (static) for a particular period
E	Absolute efficiency test, dynamic
$NNVA_j$	Net national value added, period j
df_j	Discount factor, period j
W_j	Wages, period j

The absolute efficiency test is concerned with the degree to which the project generates social surplus, over and above wages and salaries. If NNVA is not at least equal to wages, it is not considered a good candidate for investment as no surplus is generated.

The test can be applied in three ways - for an operating period, from inception to the planning horizon at nominal values, or on a discounted basis.

If the test is applied to the first normal (full production) year's operation a positive result indicates that the project starts yielding a surplus from the early stages.

The test can be applied using market prices or accounting prices. The preferred approach is to use accounting prices as this better reflects the actual impact of the project on the economy.

The most meaningful application of the test is to find the sum of discounted (to the present) values of both NNVA generated and wages in each project period to obtain the net present value of each. The values of output, material inputs, investment and repatriated benefits could be discounted separately and then appropriately aggregated. The same is done with wages in each period. The discount rate should be the SRD. NNPV at present value is then compared with wages at present value. If the present value of NNVA is greater than the present value of wages, the project passes the absolute efficiency test. Discounted NNVA is less than discounted wages indicates that the project would not contribute positively to the national income and may be rejected.

RELATIVE EFFICIENCY TEST

RELATIVE EFFICIENCY TEST

$$E_c = \frac{P(VA)}{P(SR)}$$

E_{SR}	Relative efficiency of use of scarce resource
SR	Scarce resource
	Capital investment
	Foreign exchange
	Skilled labor
P(VA)	Present value of Value Added
P(SR)	Present value of scarce resource employed

The value-added created by a project can be compared with the value of scarce resources used in its production to provide a means of comparing the relative effectiveness of investment in alternative projects.

The numerator in the ratio should be NNVA discounted at the SRD. Similarly the value of the scarce resource should be the discounted value of the resource at the SRD. Accounting prices should be employed in determining each of the

values in the ratio as these prices reflect the impact of project more accurately than market prices.

Some of the resources that can form a basis for the ratio are capital investment, foreign exchange (net foreign exchange outflow) and skilled labor (total value of wages, salaries and fringe benefits paid to scarce labour). In the latter case, only the values (at accounting prices) of skilled labor would normally be included; wages for semi-skilled or unskilled labor should also be included if one or both is also scarce.

SUPPLEMENTARY INDICATORS

SUPPLEMENTARY INDICATORS

- ❖ EMPLOYMENT EFFECT
- ❖ DISTRIBUTION EFFECT
- ❖ NET FOREIGN EXCHANGE EFFECT
- ❖ INTERNATIONAL COMPETITIVENESS

In addition to basic criteria of the ECBA and VA methods of analysis, other indicators can be applied in project analysis that reflect the degree to which development objectives are fulfilled. These indicators are applicable for both the ECBA and VA approaches. Some of the indicators that can be developed are as follows:

- Employment effect
- Distribution effect

- Net foreign exchange effect
- International competitiveness

Basic criteria include the fundamental developmental objectives, but there may be other national objectives to be considered in assessing the acceptability of a project. Effects of a project on employment, distribution, foreign exchange and international competitiveness or other criteria can be weighed systematically (e.g. using a weighted point system), to arrive at a measure of a project's desirability in relation to other investment opportunities. The relative importance of these indicators vary from country to country and from time to time within the same country.

EMPLOYMENT EFFECT

EMPLOYMENT EFFECT

$$Z_e^x = \frac{JO^x}{I}$$

Z_e^x	Employment index, job opportunities per unit of investment
JO	Number of job opportunities
I	Investment
$x:$	
T	Total jobs
u	Unskilled jobs
d	Direct jobs
i	Indirect jobs

This indicator measures the jobs created per unit of investment. It is inherently a static indicator. Domestic direct and indirect employment should be considered.

Indirect employment is the sum of increases or decreases in employment for upstream- and downstream-linked projects, i.e. those whose existence is directly related to the project under consideration.

The numerator should be the total employment in the various categories indicated: Total employment, employment of unskilled workers, direct workers and indirect workers.

The denominator is the amount of investment in the project, the original investment in fixed assets, pre-production expenditures and working capital.

DISTRIBUTION EFFECT

DISTRIBUTION EFFECT

$$DB^x = \frac{VA^x}{VA}$$

x :	
w	wage earners
p	profit earners
g	government
u	undistributed

Value added generated by the project accrues to various groups and geographical regions. This is the pattern of value-added 'distribution' that is a characteristic of a project.

The analyst or decision-maker is concerned with the issue of how the distribution pattern accords with policy. Social groups are identified accordingly. The share of value added for each group would assist decision-makers in determining how the project compares with alternative investment opportunities in regard to priorities.

Some of the groups of interest may be wage earners, profit earners and government. Benefits for social groups may include the following:

- Wage earners - wages and salaries plus fringe benefits
- Domestic profit earners - dividends to domestic shareholders, interest on private capital, rents for private owners and fringe benefits
- Government - taxes paid to the treasury, interest on loans from public banks, profits paid to state-owned shares, rents and insurance received by the state

Distribution ratios can be determined for a representative period and for the entire economic life of the project at nominal values or on a discounted basis. They can be determined at market or accounting prices.

The most meaningful assessment of distribution is the employment of a numerator that is the discounted value of benefits (at accounting prices where applicable). The denominator should be the sum of NNVA at accounting prices for each period discounted at the SRD. One caveat is that when accounting prices are employed the value of distributed benefits could possibly exceed the value-added, particularly if the accounting value of output is less than its market value.

Similar distribution ratios can be developed for regions of the country, e.g less developed and more developed according to per capita income or another suitable criterion.

NET FOREIGN EXCHANGE (FE) EFFECT

NET FOREIGN EXCHANGE EFFECT

$$P(\text{FE}) = \sum_{j=1}^n (\text{FI} - \text{FO})_j \text{df}_j$$

P(FE) Present value of net foreign exchange flow
FI Foreign exchange inflow, period *j*
FO Foreign exchange outflow, period *j*
df_j Discount factor, period *j*

Foreign exchange is employed or generated by a project in the following ways: As part of the financing of the investment; as receipts for exports; or payments for imports. The effect is not always direct - there may be impacts from import substitution or export diversion.

The FE effect can be determined in nominal terms or at its discounted value. In either case the FE flow for each project period (inflows minus outflows) should be determined from project inception to the planning horizon. Direct and indirect (from linked projects) flows should be considered.

planning horizon. Direct and indirect considered.

If the discounted value of FE is to be considered, the net FE for each period should be discounted at the SRD or CRI, as the case may be, and then summed to determine its present value. A positive net FE flow indicates that a project contributes to the availability of FE, which is generally preferred by a developing country.

For a relatively small project the significance of a negative foreign exchange effect can be overestimated. Payments balance one way or another, either through official or unofficial channels.

INTERNATIONAL COMPETITIVENESS

INTERNATIONAL COMPETITIVENESS

$$\text{IC} = \frac{\sum_{j=1}^n (\text{FI} - \text{FO})_j \text{df}_j}{\sum_{j=1}^n \text{DR}_j \text{df}_j} \geq 1$$

IC Indicator of international competitiveness
FI Foreign exchange inflow, period *j*
FO Foreign exchange outflow, period *j*
DR_j Domestic resource inputs, period *j*
df_j Discount factor, period *j*

A useful indicator for assessing a project is its international competitiveness, measured as the amount of foreign exchange generated per unit of domestic resources used in production.

Flows from exports and imports (inputs and outputs, including capital and other foreign exchange flows such as repatriated payments) should be determined for each period.

Variables are as follows:

- IC - the measure of international competitiveness
- FI - foreign exchange inflow in each period
- FO - foreign exchange outflow in each period
- DR_j - domestic resource inputs (domestic components of investments, current material inputs and wages) in period *j*
- df_j - discount factor, period *j*

For the ratio to be meaningful, numerator and denominator must be expressed in the same units, either in foreign exchange or in domestic currency. In the former case foreign exchange flows should be converted to the equivalent domestic currency value. Should accounting prices be used for foreign exchange and domestic resources? The use of accounting prices will provide a better (more realistic) measure of competitiveness. Foreign exchange should be converted to local currency at the shadow exchange rate. Domestic resources should be priced at their respective accounting prices to reflect their real cost to the economy.

A project is considered internationally competitive if the ration is equal to or greater than 1 (unity). This means that the value of foreign exchange generated is at least equal to the value of domestic resources employed, i.e. each unit of domestic resource cost generates net foreign exchange that is higher in value than the prevailing exchange rate.

At times governments fix the cut off rate at less than one to provide incentives for exports. For ranking projects those with higher international competitiveness should be accorded priority.

RELATIVE EFFICIENCY

RELATIVE EFFICIENCY

$$E_{SR} = \frac{P(NB)}{P(SR)}$$

E_{SR}	Relative efficiency of use of scarce resource
SR	Scarce resource Capital investment Foreign exchange Skilled labor
$P(NB)$	Present value of Net Benefits
$P(SR)$	Present value of scarce resource employed

Relative efficiency is similar to a profitability indicator. It measures the amount of benefits produced per unit of scarce resource employed. It is generally applicable either to the ECBA or VA methods.

The numerator in the ratio is the present value of net benefits of the project, determined from the sum of net benefits in each period from inception to the planning horizon, discounted by the CRI or SRD as appropriate.

The denominator is the value of the scarce resource, e.g. capital, skilled labour, or foreign exchange.

For both numerator and denominator the most useful indicator is calculated at accounting prices.

EXTERNALITIES



Economic and social analysis requires consideration of impacts that are external to the project.

What is external to an investment project? Any impact that is not internal, i.e. that does not directly affect the flow of funds into and out of the project.

Externalities that have been considered traditionally in economic analysis of projects include effects that are linked economically or technologically.

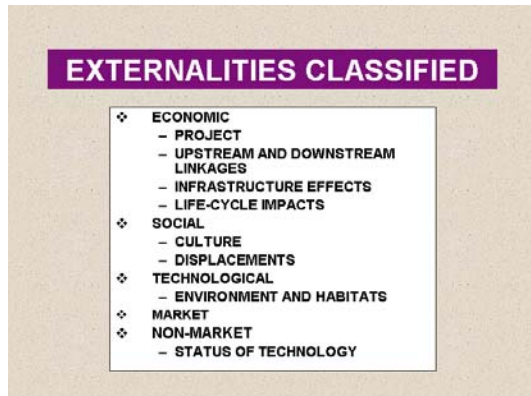
However, not a great deal of attention has been paid to the effect of externalities in regard to price distortions. Distortions in prices are discussed in Economic Pricing that are attributable to market interventions, market structure and resource constraints. Externalities are another source of price distortion. An item consumed or produced by the project can have other secondary impacts, e.g. the cost to society of ultimate disposal of an item when it is no longer considered usable. Such a cost that is attributable to the project is borne by society, and could be taken into account in arriving at the accounting price applicable to the output.

Non-market externalities are considered. These are impacts that do not have an intrinsic market value, but which can sometimes be converted to monetary equivalents. An example is the effect on property values resulting from environmental degradation.

As information concerning the consequences or resource applications becomes more widespread, the market will increasingly reflect impacts that are presently considered externalities.

It is incumbent upon analysts and decision-makers considering economic impacts of a project to take deal with externalities considering the interests of direct stakeholders and the broader community.

EXTERNALITIES CLASSIFIED



For a comprehensive approach to the consideration of externalities in the analysis of investment projects it is useful to consider their classifications.

Economic

Project: The project's contribution to economic development of the region is, in a narrow sense, an externality. In any case, a contribution to the economy of the country or region in the form of increased income can engender a positive image

that can only be helpful.

Upstream and downstream linkages: Upstream linkages include effects on suppliers of project inputs. For example, if increased production of an input is directly attributable to the project, the input can either be included in the determination of net benefits or internalised.

Downstream linkages include impacts on users of project output. If the project output makes possible more or better downstream production, such impacts should also be taken into account in the economic analysis.

Infrastructure effects: The project may require investment in new infrastructure, the cost borne by the government. If use of the infrastructure is limited to the needs of the project, it could be considered an economic cost. Some or all of the costs could be offset if there are benefits for other economic activities.

Life-cycle impacts: A good produced has a life cycle. It is first manufactured, then used, then either recycled or discarded. Some of the consequences of manufacturing, use and disposition may be external to the project that should be considered in its economic analysis. For example, its manufacture may require public security; its use - public regulation; its disposal - use of publicly supported facilities. Any or all of these, if significant, should be included in economic analysis.

Social

Culture: Some products may have impacts on local culture, for good or ill. The production and distribution of some products may disrupt local cultural patterns for the betterment or degradation of existing cultural norms. This is to a large extent subjective, but should be taken into account by analysts and decision-makers.

Displacements: A project may require displacement or dislocation of populations. Such costs should be included in the analysis, whether compensated by the project directly or borne by society.

Technological

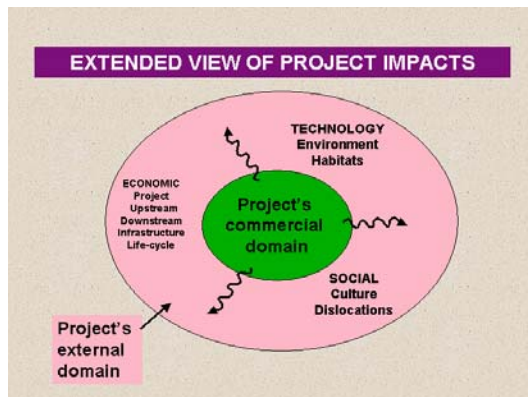
Environment and habitats: An Environmental Impact Study (EIS) is often required by government authorities considering a project for approval (see Technology, Environment). The consequences of a project on the physical, social and economic environments is the subject of such a study. Consideration is given to effects on humans and also on flora and fauna of the impacted area.

Some of the impacts can be related to market values and can then be included as part of the external economic impact. For example, the clearing of forest areas has a cost in terms of its sustainable yield.

Other impacts are either of a non-market nature, or otherwise non-quantifiable monetarily. Those not subject to monetary quantification can only be analysed qualitatively. Others can be converted to monetary equivalents by a variety of methods, some of which are discussed in Non-market Externalities. For example, many studies have been prepared on monetary values of health impacts.

Status of technology: The transfer of technology so that it is sustainable in the domestic environment is a benefit that should be considered in analysis of a project, particularly if it can be replicated and applied in other economic activities. For example, the benefits of training of personnel for a project with skills that are generally applicable and not of a proprietary nature - skills that can be replicated elsewhere in the economy with the project as a nucleus, should be included.

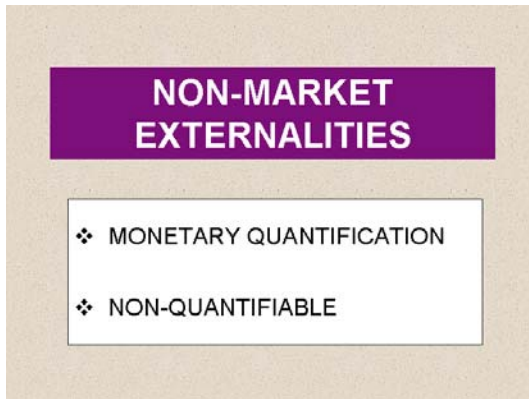
EXTENDED VIEW OF PROJECT IMPACTS



An investment project impacts upon its own *commercial domain* - clients, suppliers of goods and services, workers, financiers. However, the effects go beyond those limits and into the surrounding community. As a stone dropped into a pond creates ripples that move out radially from the center, an investment project creates 'ripples' beyond the confines of its commercial domain.

An issue for the analyst, stakeholders and decision-makers is to what extent and how far from the center should these external 'ripples' be considered, i.e. what are the limits of the project's relevant *external domain*. Prudence is the key. Investors, in particular, have to be concerned that external benefits attributable to the project are identified and acknowledged by the community and public officials. External effects that are regarded as 'costs' or dis-benefits by the larger community also have to be identified and their long-term consequences for the project taken into account. To do otherwise is to add to project risk. Better to account for these external impacts - derive the advantages of beneficial effects and protect against unanticipated consequences of undesirable impacts.

NON-MARKET EXTERNALITIES

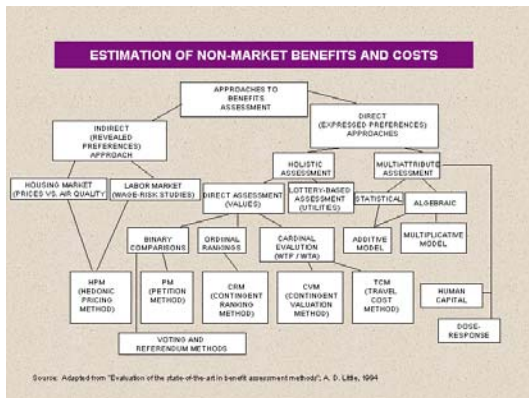


Some technologically-linked externalities, project impacts associated with the construction and operation of the physical plant that do not directly impact upon the financial flows of an investment project, can be related to markets. For example, the external impact of water consumption by the project that would otherwise be employed to irrigate farmland can be measured in terms of the market value of reduced crop yields.

Other impacts are not related to markets, but are subject to monetary quantification. Some of the methods of converting non-market impacts to their monetary equivalents are described herein. They can be categorized as direct or indirect approaches. The former methods generally involve either responses to surveys of impacted populations or models relating impacts to monetary equivalents. The latter methods rely on observations of behavior of individuals or systems that are subjected to the external impact.

Some impacts are non-quantifiable in terms of market values, but may be otherwise quantifiable. For example, displacement by the project of species of flora or fauna can be quantified, but in some cases it would be difficult if not impossible to place a monetary value on the loss. Attempts at monetary quantification can sometimes be carried to the point that the significance of the impact is obscured.

ESTIMATION OF NON-MONETARY BENEFITS AND COSTS



Techniques for estimating monetary values of non-monetary goods can be categorized as follows:

Indirect or revealed preferences: Observed behavior and choices - techniques relying on observed demand functions or cost functions, changes in prices of goods or factor inputs, or observed changes in some non-market activities, e.g. property value differentials, household expenditures for damage mitigation, travel costs for recreation

activities.

Direct or expressed preferences: Direct methods involve either responses to hypothetical situations posed to individuals by interview or questionnaire - gathering information from people about values, in willingness-to-pay (WTP) or willingness-to-avoid (WTA), bidding games and contingent valuations surveys; or models relating impacts to costs or benefits. Expressed preference approaches include techniques

asking people how their behavior (and monetary considerations) would change with environmental change, or to rank alternative scenarios, e.g. involving different environmental or other conditions (contingent ranking studies).

DIRECT MONETARY METHODS

DIRECT MONETARY MODELS

- ❖ DOSE - RESPONSE METHOD
- ❖ HUMAN CAPITAL APPROACH
- ❖ LABOR MARKET (WAGE-RISK) STUDIES
- ❖ COST SAVING OR COST IMPACT METHOD

Direct monetary methods attempt to place value on non-monetary goods by either measuring or modeling the consequences of a impacts attributable to the project. Some use models relating the change to a monetary equivalent. Others rely on statistical information.

Dose - response method: uses a function (model) to assess physical changes in receptor organisms (including humans) or materials, which is then used to assess the value of the change.

Human capital approach: assesses financial costs associated with health impacts, primarily cost of medical treatment and lost wages. The approach involves application of a model based upon statistical data.

Labor market (wage-risk) studies: uses risk - compensation data for occupations with varying levels of risk. A model based upon historical information can be developed and applied to the project under consideration. Alternatively, an indirect approach can be employed, using willingness-to-accept information from survey.

Cost saving or cost impact method: estimates changes in household expenditure and changes in production costs for other industries attributable to the project as a consequence of change in the environment.

HEDONIC PRICING METHOD (HPM)

HEDONIC PRICING METHOD

BASIS

- ❖ CHANGE IN MARKET PRICE OF GOODS

ASSUMPTION

- ❖ INDIVIDUALS COGNIZANT OF ATTRIBUTES OF MARKET GOODS

STRENGTH

- ❖ YIELDS MARKET EQUILIBRIUM VALUE OF PUBLIC GOOD

WEAKNESSES:

- ❖ DIFFERENCES IN PERCEPTIONS OF RESPONDENT
- ❖ RELATION BETWEEN VALUE OF ATTRIBUTES AND PUBLIC VALUE
- ❖ DATA ACQUISITION EXPENSIVE

Basis: HPM attempts to impute the value of non-monetary goods from observed market prices. If the level of a good such as 'safety', 'air or water pollution', 'non-congestion' varies geographically, the level of the good at different locations may be reflected in local housing prices, which then contains information about the 'implicit market value' of the good (impact). HPM attempts to extract such information from the geographic differences in housing prices as a function of housing attributes, including non-market attributes.

The method is carried out as follows:

1. Define the market commodity that includes as one of its attributes the non-market good in question.
2. Collect cross-sectional and time series data on market prices for the good and associated attribute values.
3. Conduct statistical analysis.

The output of HPM is a price function relating value and the level of provision of the non-monetary good (e.g. housing prices vs. air quality in area). The price function should provide the desired measure of social benefits attributable to the provision level of the non-market good.

Assumptions: Individuals are cognizant of, and optimize across the attributes of market goods.

Strengths: If successful, yields market equilibrium value of non-market good of interest.

Weaknesses: Model specifications, e.g. how are attributes weighted? Differences in perceptions of respondents and assumptions of HPM, e.g. widely spread, small improvements in water quality may not be perceivable by respondents. Not clear if value imputed to a non-market good is fully captured in the related market good; e.g. do property values for housing fully capture the value of clean air in the neighborhood? Data acquisition expensive.

PETITION METHOD (PM)

PETITION METHOD

SURVEYS - WILLINGNESS TO SIGN PETITION

- ❖ CHANGE IN LEVEL OF 'GOOD'
- ❖ WILLINGNESS TO PAY OR ACCEPT

ASSUMPTIONS:

- ❖ SIGNING INDICATIVE OF CONTINGENT INTENDED BEHAVIOR
- ❖ NOT INDICATION OF ATTITUDES
- ❖ SUBJECTS VIEW THE PETITION'S POTENTIAL EFFECT AS 'REAL'

STRENGTHS:

- ❖ RELIES ON ACTUAL PETITION THAT URGES ACTION

WEAKNESSES:

- ❖ RELATIVELY UNTRIED
- ❖ POTENTIAL FOR ATTITUDINAL RESPONSES

Surveys: PM also uses survey techniques. The survey includes an explanation of the petition-requested level of the good and that signed petitions call for action on the part of the government. The survey also includes a description of additional costs that households must bear if the good is provided.

The survey question is whether or not the respondent is willing to sign the petition (or vote for a referendum). There are also questions concerning demography and

attitudes.

Surveys are organized to provide information concerning varying levels of the good and associated costs. Regression and other statistical methods are used to infer WTP for alternative levels.

PM may be applicable to a wide range of public goods, although limited to those goods that could be affected by petition.

In the context of investment project appraisal, some examples of 'goods' for which petition signings would be sought are: Siting a project facility in one location rather

than another; use of a cooling tower instead of river water for the production process.

Assumptions:

The act of signing the petition is indicative of contingent intended behavior rather than an indication of attitudes.

Subjects view the petition's potential effect on policy as 'real' in regard to the provision of the good, and do not sign it merely as a convenience to the canvasser.

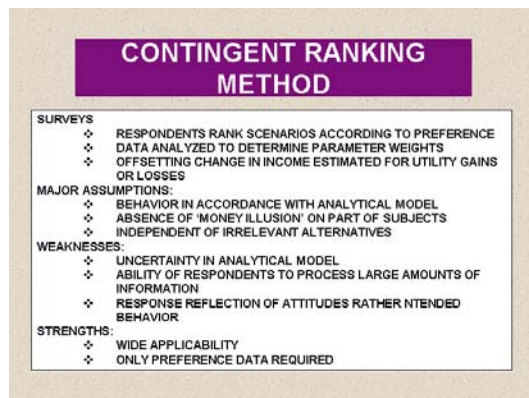
Strengths:

Rather than rely on hypothetical markets as in CVM, PM relies on actual petition that urges action. The petition might be directed at government officials or the project sponsors.

Weaknesses:

Relatively untried. Potential responses on basis of attitudes rather than contingent intended behavior.

CONTINGENT RANKING METHOD (CRM)



Surveys: CRM involves the use of surveys for obtaining data concerning estimates of non-monetary goods and services. Subjects are presented various scenarios concerning improved attributes of some aspect of the local environment and a fee for the improvements. Respondents are asked to rate the scenarios in order of preference. Data is then analysed using a utility model to provide a set of parameter weights on the attributes that maximises the likelihood of realising the rank ordering. The parameter

weights can then be used to determine the change in income that just offsets the utility gain or loss of the good (improvement or degradation).

CRM does not attempt to simulate the market, but requires subjects to rank the non-monetary good/payment combination, from which the researcher infers parameters for a random utility model from which the compensating WTA or WTP for changes in the level of provision of the good is calculated.

Major **assumptions** of the method are as follows:

Individual behavior as represented by a random utility model. Absence of 'money illusion' on the part of the subjects. Independence of irrelevant alternatives.

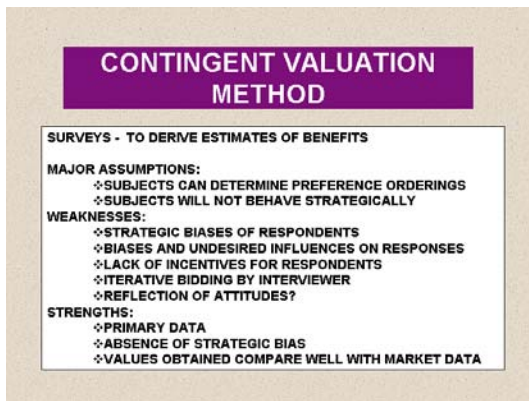
Weaknesses:

Uncertainty in specifications for random utility model. When the models are structured to reflect differences in individual determinants of utility, subjects' ability to mentally process large amounts of information implied by large number of ranking alternatives is questionable. Uncertainty concerning whether or not responses are a reflection of attitudes rather than actual intended behavior.

Strengths:

Applicable to wide range of projects, requires only order preference data.

CONTINGENT VALUATION METHOD (CVM)



Surveys: CVM employs a survey as a means of determining estimates of the social value of non-market goods or services. The survey is designed around a 'contingent' market, i.e. the subject has described a proposed change in the level at which a non-market good or service is provide, e.g. a reduction or increase in air pollution. The subject provides the maximum willingness-to-pay (WTP) for a benefit and willingness-to-accept (WTA) for a cost.

Assumptions:

Subjects can determine preference orderings between the non-monetary good and all others. Subjects will not behave strategically, i.e., will not try to bias the survey consistent with true preferences.

Weaknesses:

Strategic biases of respondents (see above). Biases and undesired influences on responses, e.g. survey design, subject-interviewer reactions. Lack of incentives for respondents to do introspective preference research - not actually paid. Iterative bidding by interviewer may bias results by coercing subjects toward higher bids. Reflection of attitudes rather than intended behavior?

Strengths:

Primary data, no need to rely on secondary data. Evidence does not support existence of strategic biases. Indications show values obtained from CVM compare well with market data.

TRAVEL COST METHOD (TCM)

TRAVEL COST METHOD

- ❖ ESTIMATES INDIVIDUAL DEMAND FOR INPUTS TO A HOUSEHOLD PRODUCTION FUNCTION
- ❖ RESPONDENTS ASKED ABOUT WTA TRAVEL COSTS FOR ACCESS TO PUBLIC GOOD OR SERVICE

Estimates individual demand for inputs to a household production function: TCM is used to estimate individual demand for inputs to a household production function (typically the household recreation function) i.e., a requirement for accessing, improving or creating a good or service at the level of the household. Respondents to a survey are asked about willingness to accept travel costs for access to a public good or service, e.g. a public park or resort area. TCM estimates demands for inputs to a household production function, the monetary value for accessing, improving or creating a good or service at the level of the household. For example, benefits attributable to a recreation site are derived from the consumer surplus indicated by the demand curve for use of the site.

Respondents asked about WTA (willingness to accept) travel costs for access to public good or service: The method of conducting such a survey is as follows:

1. The questionnaire includes place of residence, frequency of visits to the site in question, and frequency of visits to alternative sites, purposes of the trip, length of trip, nights in accommodations, travel paths, meals (i.e. all trip cost information).
2. Do the survey.
3. Estimate travel costs for individuals or 'distance zones' from the site.
4. Develop measures for site characteristics and for alternative sites.
5. Develop system of demand equations for TCM analysis.

TCM provides estimates of the demand curve for a particular recreation site (i.e. travel cost vs. level of demand for the good or service). Benefit estimates apply to the site, and not to outputs of the site (e.g. specific recreational experiences).

UTILITY-BASED METHODS

UTILITY - BASED METHODS

UTILITY – ABILITY TO SATISFY A HUMAN WANT OR DESIRE

UTILITY FUNCTION

DESIRABILITY OF PROPOSED SCENARIO

ADVANTAGES OVER DIRECT ASSESSMENT (VALUE) METHODS:

- ❖ MINIMIZE EFFECT OF STRATEGIC BEHAVIOR
- ❖ 'IDEALIZED' PREFERENCES DEFINED
- ❖ VALUE OF UNCERTAIN PROSPECTS MEASURED ON SAME SCALE AS ALTERNATIVES WITH KNOWN CONSEQUENCES

DISADVANTAGES:

- ❖ RISK ORIENTATION OF RESPONDENTS IS A FACTOR
- ❖ NO INTRINSIC VALUE IN UTILITY MEASURE

Utility - desire to satisfy a human want. It is a subjective appraisal depending upon the individual and the object (access to non-market good) considered. The utility function provides the relationship of utility (value in the perception of respondents) to changes in the provision of the non-market good.

Utility function: A utility function can be derived as follows:

- X** The proposed scenario in regard to provision of the good
- Y** Respondent's most preferred alternative
- Z** Respondent's least preferred alternative

The respondent is asked to consider a choice between:

Getting X for certain, or

Playing a lottery that gives Y with probability p and Z with probability $(1-p)$

As p increased from 0 to 1, p^* is the probability at which respondent is indifferent between getting X with certainty and the lottery. This is a measure of the utility of X, $u(X)$.

Desirability of proposed scenario:

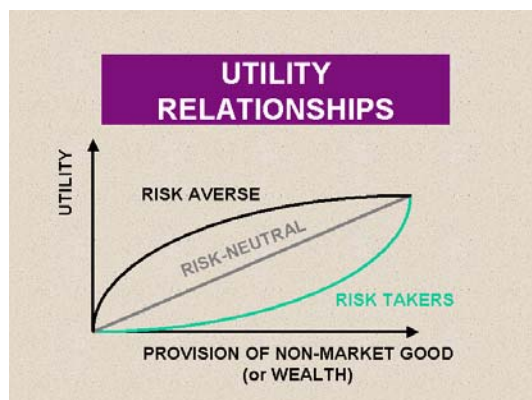
$u(X)$ close to 1 means that X is nearly as desirable as Y.

$u(X)$ close to 0 means that X is hardly better than Z.

Advantages over direct assessment (value) methods: Tends to minimize the effect of strategic behavior by respondents. Provides an approach to defining 'idealized' preferences. Individuals can be asked to evaluate uncertain prospects. Resulting values are measured on the same scale as alternatives with known consequences.

Disadvantages: Risk orientation of respondents is a factor. Utility values dependent on procedure - no intrinsic meaning in terms of value.

UTILITY RELATIONSHIPS



The utility concept can be applied to provision of a non-market good (or to wealth). The utility curve shows the relationship between the desirability of a level of provision of a good and the level of provision.

In regard to tolerance for risk, individuals can be classified as risk-seeking, risk-neutral and risk-averse. For a risk averse individual, the decline in utility from a loss of a given amount of the good (or wealth) is greater than the increase in utility from an equal increase in wealth. This individual would probably not accept a wager in which the chance of winning or losing a given sum was 50:50. A risk-neutral individual is as desirous of gaining a given amount of the good as averse to losing an equal amount.

A risk-taker accepts a decline in utility from a loss of a given amount that is greater than the gain in utility from an equal amount. The utility concept can be applied to project externalities. For example, if a project is to have an adverse affect on water purity for a community, using the projected water purity as a base, the utility relationship can show where the local population stands in regard to least desirable and most desirable scenarios.

**RELATED
DOCUMENTS**

ECONOMIC ADJUSTMENTS

A few examples of adjustments for price distortions and for foreign exchange distortions are shown. These are taken from the Guide (Guide to Practical Project Appraisal – Social Benefit Cost Analysis in Developing Countries, UNIDO 1984) and are elaborated here to enhance the clarity of presentation. The data are the non-discounted values for the entire life span of the project rather than a single year, but the principles elaborated herein apply nevertheless. The discussion of the case begins on p.56 and the associated tables on p.81.

Protected output: A tractor manufacturer is afforded protection by the government in the form of import duties of 20% to permit production in the face of foreign competition. With the import duties included, the domestic market price equals the import price, when expressed in nominal (official) exchange value (OER). However, the local currency is overvalued by 10%. The OER is 20LC per FC (not shown in original data).

The situation can be seen as follows:

Market price of output:	79,000 LC (3,850 FC at OER)
Adjustment factor (AF)	0.80 (1-0.2)
Import duties (20%)	-15,800 LC
Accounting price at OER	63,200 LC (MV*AF)
Foreign exchange foregone	63,200 LC (3,160 FC at OER)
Foreign exchange AF (SER/OER-1)	0.1
Foreign exchange premium	+6,320 LC
Accounting price including FD adjustment	69,520 LC
	(79,000 – 15,800 + 6320)

Distribution effects:

DISTORTION	LC	PROJECT	CONSUMERS
Import duty	15,800	+15,800	-15,800
Forex adjustment	6,320	- 6,320	+6,320
Net gain, loss		+ 9,480	-9,480

The project gains (receives a higher value that justified by the import price) and consumers lose the import premium (by paying a higher price than import), but the consumers gain by not paying the premium on foreign exchange (they pay the local value of 63,200 LC rather than 69,500 when calculated at the SER, a loss to the project as it is deprived of collecting the foreign exchange premium on the import substitution.

Shadow price of labour: The wages paid to unskilled labour amount to 5,900 LC. However, the net income foregone (before taking into account the distribution effects) is only 50% of wages.

Wages paid to unskilled labour	5,900 LC
Accounting price of labour	2,950 LC
Adjustment factor	0.5 (2,950/5,900)

Distribution effect:

DISTORTION	LC	PROJECT	WORKERS
Wage distortion	2,950	-2,950	+2,950

The project pays more than the economic price of labor by 2,950 while labour gains the same amount.

Dividend payments: Economic analysis is concerned essentially with the use and generation of real resources; financial flows are not included in estimates of benefits at the level of efficiency prices. However, financial flows are relevant to the distributional effects of the project.

In this case dividends in the amount of 900 LC are paid to the foreign partners of the project at the official exchange rate, 50% of which is repatriated. The foreign exchange premium is 10% of the LC value.

Dividends paid to foreign partners (market price)	900 LC (OER)
Amount paid in local currency	450 LC (OER)
Amount repatriated (50%)	450 LC (OER)
Foreign currency equivalent	405 FC (SER)
Foreign exchange premium (10%)	45 LC (OER)
Amount repatriated	405 LC (SER)
Accounting price of dividends	855 LC (900-45)

Distribution

	PROJECT	GOVERNMENT	FOREIGN PARTNER
Dividend	-900		900
Foreign currency premium	+45	-45	
Net distribution effect	-855	-45	900

The project pays the foreign partner 450 LC that is not repatriated and the equivalent of 450 LC in foreign exchange, which is 405 LC. So the project loses 900 LC in dividends, but gains 45 LC as the exchange premium. The government loses the 45 LC exchange premium. The foreign partner receives the equivalent of 900 LC (buys the equivalent of 450 LC at the OER, which is 405 LC).

THE EFFECTS METHOD

This summary of the effects method (EM) is based on the book of M. Chervel and M. Le Gall, Manual for Economic Evaluation of Projects, 1989 Paris, France.

1. INTRODUCTION

The purpose of EM is to assist in the selection of projects from the point of view of the national economy. The method consists of the valuation of incremental value-added (VA) that is realized due to the existence of a project.

There are two key points: Not only the direct VA is determined, or, that which is created by the project itself, but also the indirect VA. This consists of the content of VA in the intermediate inputs when their production can be attributed to the project and other new economic activity tied to the project. In addition, secondary effects are calculated for the supplementary income (incremental) corresponding to the categories of agents or households affected by the project.

2. PRIMARY EFFECTS

An enterprise is analyzed which produces lemon concentrate for export.

In Table 1 are shown the values of the inputs (intermediate goods) in lines 1 to 10. Some of these intermediates represent an increase in the local production, which can involve a contribution to VA. Others represent an increment in imports or reduction of exports, and for this reason do not form part of the VA. However, the duties on traded inputs do count as part of the VA.

The components that form part of the VA attributable to the project are found in the lines 11 to 14. The depreciation represents a consumption of capital, and consequently, is not included as part of the VA of the project unless these represent increments of capital goods produced locally due to the existence of the project.

All values are based on the value of production of 1,000.

The direct effects of the project are determined for a production value of 1,000:

Traded inputs	28	TI ₁
Increased local production	690	LIC ₁
Value added (261 + 21)	<u>282</u>	VA ₁
Total	1000	

Table 1 - Lemon Concentrate - Elements Included In Value

No.	Inputs	Value	Total Incremental Production	Increase In Imports Or Decrease In Exports	
				CIF/FOB	Duties
1	Raw materials	444	444		
2	Transport	63	63		
3	Combustibles	36		18	18
4	Energy	46	46		
5	Water	38	38		
6	Packaging	13		10	3
7	Transportation	2	2		
8	Maintenance	14	14		
9	General expenses	80	80		
10	Internal FOB	3	3		
Total		739	690	28	21
11	Salaries	46			
12	Worker benefits	9			
13	Export license	50			
14	Profit	156			
Total		261			
15	Production (FOB price)	1000 ¹			

1 Depreciation is not included as a part of the product value in this table. It can be considered in fact as an intermediate input. This depreciation can represent and increase in imports, decrease in exports, or increase in local production containing local VA.

When other projects are linked to the principle project, the statements of inputs and outputs, of each of the backward-linked projects are developed, so that their VA content attributable to the principal project is included. The intermediate components (LIC) and the VA content examined for possible addition to the VA attributable to the principle project. For example, in the case of the raw material for the concentrated lemon project, the statement of inputs and outputs are shown in Table 2 on the basis of the value of 444:

Table 2 - Content Of Value Of Lemon Fruits

No.	Component	Value
1	Plants	5
2	Fertilizers	152
11	Labor	168
14	Profit	119
	Production (Total)	444

These components can be integrated into the original table in which the lines above replace the 'raw material' line as is shown in Table 3:

Table 3 - Content of Lemon Concentrate - Decomposition of the raw material included

No.	Inputs	Value	Increase in local production	Increase in imports of decrease in exports	
				CIF/FOB	Duties
1	Plants	5	5		
2	Fertilizers	152		122	30
2	Transport	63	63		
3	Combustibles	36		18	18
4	Energy	46	46		
5	Water	38	38		
6	Packaging	13		10	3
7	Transport	2	2		
8	Maintenance	14	14		
9	General expensed	80	80		
10	Internal FOB	3	3		
Total		452	251	150	51
11 + 11'	Salaries	214			
12	Worker benefits	9			
13	Export licence	50			
14 + 14'	Profit	275			
Total		548			
15	Production (FOB price)	1000 ¹			

When the effects of the raw material are included, in the following table the direct effects of the project for a production equal to 1,000 is determined. The components of the raw materials contain elements of direct VA (11' - labor [168], 14' - profit [119]):

Traded inputs	150	TI ₁
Increased local production	251	LIC
Value Added (548 + 51)	<u>599</u>	VA ₁
Total	1000	

Two types of local intermediate components are recognized: those that represent an increase in local production and the others in fixed supply. The first can contribute to the total VA attributable to the principle project; the second is a cost for the whole economy and cannot be considered as part of the VA.

As indicated above, the investment is not included as an intermediate input in the model case. However, if this had been the case, the part of the investment that provides additional VA attributable to the principle project could have been included. An example of the decomposition of the investment is shown in Table 4:

Table 4 - Components Of Value Of The Investment

Component ¹	Increased local production	Increase in traded components		VA by the promoter
		CIF/FOB	Duties	
Buildings	10.0			
Stainless steel		5.0	1.0	
Mills		20.0	4.0	
Cooking vats		5.0	1.0	
Construction of foundations	9.5			
Installation of equipment	1.5			4.0
Hydraulic installations		2.0	0.5	
Electrical installations		2.0	1.0	
Accessories	0.5	1.2	0.3	
Installation expenditures		1.0	0.5	1.5
Totals	21.5	36.7	8.3	5.5

1 Land with a value of 3.0 is not included in the cost of investment because it is not depreciated. Neither is there the possibility of included VA. (ed note: However, there can be an opportunity cost of the land, which is the VA foregone when the land is dedicated to this project).

Regrouping the elements, the direct effects of investment are:

Traded inputs	36.7	TI ₁
Increase in local production	21.5	LIC ₁
Value added (8.3 + 5.5)	<u>13.8</u>	VA ₁
Total	72.0	

Without considering additional decomposition, the investment contains at this level 13.8 of VA. If it would have been considered as an intermediate input, 18.4% of the investment (13.8/75.0 [land included]) would have been added to the VA attributable to the principle project.

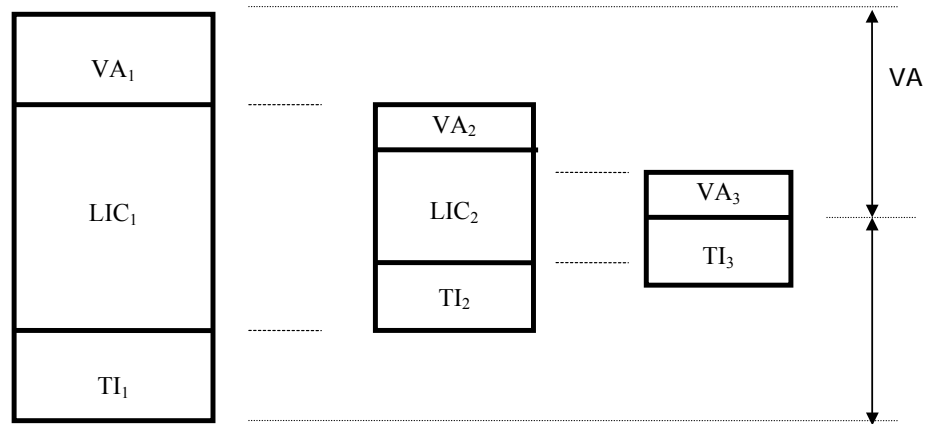
The VA is calculated in two ways, static and dynamic. When the first is applied, the value of the project assets can be accounted for in the form of annual depreciation. In this case for example, if the project life is 20 years, the depreciation per period would be 3.6 (72/20) and the VA would be 18.6% of this value, or 0.65 per year. In the second, the asset costs are counted at the time of purchase, and the system of present value is applied, using an appropriate discount rate.

3. INDIRECT EFFECTS

The backward-linked industries that supply inputs to the principle project and which increase the local production of goods and services can contribute to the VA attributable to the principle project.

For each of these industries, their production can be decomposed in a number of rounds until, theoretically, the LIC components disappear.

A scheme for the decomposition of intermediate inputs that conforms to the above criteria is shown as follows in three rounds (as an example):



The VA included is the total of VA in each round, or:

$$VA = VA_1 + VA_2 + VA_3$$

In practice there are two ways to disclose the VA generated in the components that represent and increase in local production in the backward-linked industries:

The development in the production chains, in which the structural components of the local enterprises are analyzed for which production is increased due to the existence of the principle project or group of projects. This is done, after transformation, in the input-output matrix.

Production Chain - Plants Necessary For The Production Of Raw Materials (Lemon)

An increase in the local production of lemon implies the new production of plants in the agricultural sector. For a production equal to 1,000 the decomposed content is analyzed in Table 5. When the elements are grouped the structure of the content of plants is:

			%
Traded inputs	140	TI ₂	14
Increase in local production	160	LIC ₂	16
Value added (650 + 50)	<u>700</u>	VA ₂	70
Total	1000		

Table 5 - Analysis Of The Content Of Plants

Component	Value	Increase In Local Production	Increase In Traded Components	
			CIF/FOB	Duties
Fertilizers	150		120	30
Fuels	40		20	20
Tools	60	60		
Maintenance	50	50		
General Expenses	50	50		
Total IC	350	160	140	50
Salaries	300			
Profit	350			
Total VA	650			
Total	1000			

The percentages of the total value of plants are calculated based upon the information in the table above (traded inputs - 14% [140/1000], increase in local production - 16%, VA 70% [(650+50)/1000]). Using the value base of the plants as 5, the value of the plants is decomposed as follows:

Traded inputs	0.7	TI ₂
Increase in local production	0.8	LIC ₂
Value added	<u>3.5</u>	VA ₂
Total	5.0	

The process can continue for an indeterminate number of rounds until the increased local production disappears, or reduces to an insignificant value.

In the final analysis, theoretically a situation is reached where only TI (Traded inputs) and VA (value added) remain (see diagram of VA decomposition above).

4. THE INPUT-OUTPUT MATRIX (IOM)

A matrix is developed for the inputs and outputs of the industrial sectors linked to the principle project. This matrix of industrial interchanges (IOM) is the document that supplies the accounts of the production-utilization in the different sectors.

For illustration an example of a simplified matrix is used in which only three sectors are included: Agriculture, Services and Industry.

The structure of the relations between the sectors and the activity for each is shown in Table 6. In each case the elements are valued in terms of market prices.

Table 6 - Values Of Inter-Sectoral Exchanges

Product	Sources			Uses					
	Prod'n local	Imports	Total	Intermediate inputs			Total inputs	Final demand	Total demand
				Agr	Ser	Ind			
Agr	100	34	134		4	16	20	114	134
Ser	40	7	47	10		6	16	31	47
Ind	60	64	124	29	17	20	66	58	124
Total	200	105	305	39	21	42	102	203	305
Salaries				55	8	6			
Other value added				6	11	12			
Total local production				100	40	60			

The intermediate inputs for each sector are shown in the part of Table 6 enclosed in the double line. The industrial sector, for example, utilizes intermediate inputs of (29), Ser (17) and the auto-input Ind (20).

It is necessary to distinguish between the intermediate inputs produced locally and the imported intermediate inputs, which are not shown in Table 6, but which are summarized in Table 7.

Table 7 - Inter-Sectoral Intermediate Inputs

Sector	Agriculture			Services			Industrial		
	Traded	Duties	Prod. local	Traded	Duties	Prod. local	Traded	Duties	Prod. local
	CIF/FOB			CIF/FOB			CIF/FOB		
Agr						4	3	1	12
Ser			10						6
Ind	10	4	15	4	1	12	15	5	

As seen in Table 6, to produce a value of 100, the Agriculture sector utilizes industrial inputs with a value of 29. This value is decomposed into the elements shown in Table 7 (enclosed by double line). The analysis of content is as follows:

*	Intermediate traded (imported) industrial content (CIF)	10
*	Duties and taxes	4
*	Locally produced intermediate content	<u>15</u>
	Total	29

A modified IOM is shown in Table 8 in which various changes are included with respect to the original IOM (Table 6):

Only the part of the intermediate inputs produced locally are included

A line is added corresponding to the imported intermediate inputs for each branch.

Duties are combined for the imported intermediate inputs in the line 'other value added' (for example, the 'other value added' of the Agriculture sector is determined

by the sum of the values in Table 6 (6) plus the content of duties in the industrial inputs (4), or a total of 10):

Table 8 - IOM Modified

Sector		Agriculture	Services	Industrial
Local intermediate inputs	Agriculture	0	4	12
	Services	10	0	6
	Industrial	15	12	0
Traded (imported) intermediates (CIF)		10	4	18
Salaries		55	8	6
Other value added		10	12	18
Total value added		65	20	24
Total production		100	40	60

In this way the value added content of each sector is determined. For example, a new production in Agriculture with a value of 10 million is translated into new locally produced intermediates, new imported intermediate inputs and new value added:

		Value, million
*	New Services inputs produced locally	1.0
*	New Industrial inputs produced locally	1.5
*	New imported intermediate inputs	1.0
*	Creation of new VA	<u>6.5</u>
	Total	10.0

The chain of decomposition

The new intermediate inputs can be decomposed additionally to determine the content of 10 million of Agriculture output with greater precision:

Table 9 - Composition of 10 Million of Agricultural demand decomposed

Sector		Round 1	Round 2		Round 3			Total
			Ser	Ind	Agr	Ser	Ind	
Intermediate local inputs	Agr		0.10	0.03		0.015	0.06	0.075
	Ser	1.0		0.15	0.04		0.03	0.070
	Ind	1.5	0.30		0.06	0.045		0.105
Imp. (CIF)		1.0	0.10	0.45	0.04	0.015	0.09	1.695
VA		6.5	0.50	0.60	0.26	0.075	0.12	8.055
Total		10.0	1.00	1.15	0.40	0.150	0.30	10.000

In each round the total value of the production in the sector equals the total of the value in the same sector in the previous round. While the content in intermediate inputs diminishes toward zero, the imported content and VA increase until they comprise almost all of the value of the new production in the Agricultural sector.

The matrix algebra approach

The values in the modified IOM (Table 8) are adjusted so that the values of the elements in each sector represent the percentage (in decimal form) of the total value. In the example, the modified IOM is transformed as shown in Table 10.

Table 10 - IOM Modified And Normalized

Sector		Agriculture	Services	Industrial
Intermediate local inputs	Agriculture	0.0	0.10	0.20
	Services	0.10	0.00	0.10
	Industrial	0.15	0.30	0.00
Imported intermediate inputs (CIF)		0.10	0.10	0.30
Salaries		0.55	8.20	0.10
Other value added		0.10	0.30	0.30
Total value added		0.65	0.50	0.40
Total production		1.00	1.00	1.00

* The section indicated with heavy line is the matrix of the technical coefficients, A. This matrix describes the direct intermediate inputs in each sector.

* The row entitled 'Imported intermediate inputs' is the vector of the direct imports:

$$i = (0.10, 0.10, 0.30)$$

* The row encircled in a double line is the vector of direct VA:

$$v = (0.65, 0.50, 0.40)$$

The relation describing the equilibrium of resources - uses as indicated in the modified IOM can be written as follows:

$$\begin{array}{rcc}
 X & = & AX + Y \\
 \text{Total local} & & \text{Local} & & \text{Final demand for} \\
 \text{production} & & \text{intermediate} & & \text{local production} \\
 & & \text{production} & &
 \end{array}$$

This relation can be stated as follows:

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

The matrix $(I - A)^{-1}$ is the inverse of the Leontif matrix, and I is the identity matrix (1 in the diagonal and 0 otherwise).

From the rates (proportions) of direct imports (vector i) and of direct VA in each sector (vector v) the increments of imports and direct VA can be deduced from the final demand Y.

$$iX = i(I - A)^{-1}Y \quad (2)$$

$$vX = v(I - A)^{-1}Y \quad (3)$$

It can be verified that the total value of Y (the increment of local demand in each sector) is related to the increment in imports of inputs and of VA.

Assume a vector u:

$$u = (1 \ 1 \ 1)$$

Then,

$$iX + vX = (i + v)X \quad (4)$$

Expression (1) is substituted in (4).

$$iX + vX = (i + v)(I - A)^{-1}Y \quad (5)$$

Writing the modified IOM whose sum of elements in each column is equal to 1 is as follows:

$$uA + i + v = u \quad [u = (1 \ 1 \ 1)]$$

$$i + v = u(I - A)$$

Replacing this in (5):

$$iX + vX = u(I - A)(I - A)^{-1}Y = uY = Y$$

In the previous case:

$$\begin{array}{rcl}
 A & = & \begin{array}{ccc} 0.00 & 0.10 & 0.20 \\ 0.10 & 0.00 & 0.10 \\ 0.15 & 0.30 & 0.00 \end{array} \\
 I - A & = & \begin{array}{ccc} 1.00 & -0.10 & -0.20 \\ -0.10 & 1.00 & -0.10 \\ -0.15 & -0.30 & 1.00 \end{array} \\
 (I - A)^{-1} & = & \begin{array}{ccc} 1.051 & 0.173 & 0.228 \\ 0.125 & 1.051 & 0.130 \\ 0.195 & 0.341 & 1.073 \end{array}
 \end{array}$$

The matrix $(I - A)^{-1}$ provides the quantity of new production in the local sectors necessary to satisfy a new final demand in each sector. The elements in the first column signify that to satisfy a new final demand of the products of the Agriculture of value equal to 1, the new local production necessary is as follows:

Agriculture	1.051
Services	0.125
Industrial	0.195

The imports of intermediate inputs and the incremental VA due to an increment in the demand of 1 in each sector [$Y = (1 \ 1 \ 1)$] can now be determined as follows:

$$i(I - A)^{-1} = (0.176 \quad 0.225 \quad 0.358)$$

$$v(I - A)^{-1} = (0.824 \quad 0.775 \quad 0.642)$$

For example, the corresponding increase in imports for the Agriculture sector is 0.176 and for VA is 0.824. This can be verified in the decomposition chain analysis above.

5. THE CONCEPT OF INCREMENTAL EFFECT

The evaluation of a project is performed relative to a base of reference, which is the situation without bringing the project to realization. The net effect is the situation 'with' the project less the situation 'without' the project.

Three types of projects are distinguished for which the value of imports (I) and of value added (VA) are forecasted for the situation with the project and for the corresponding values without the project:

Projects of Import Substitution

It is assumed that the import of a good corresponds in value to the projected production at the market price. The difference between the VA created by the project and the alternative solution is shown as follows:

Project	Imports
I_i	I_{cif}
VA_i	

VA_{td} is the taxes and duties contained in the imports.

The incremental VA due to the project is $Va_i - VA_{td}$.

Project Involving Technological Modernization

The alternative solution to the project is to produce the same product using the existing technology. This situation of reference (without the project) can be compared with the VA developed by the new technology:

Without	With
I_i	I'_i
VA_i	VA'_i

In the same way as above, the incremental VA due to the project is $Va_i - VA_{td}$.

Export Projects

The alternative solution is to do nothing (no exports). The value added included in the project is the incremental VA.

Project	Without project (no VA)				
<table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center; padding: 5px;">I_i</td> <td style="width: 50%;"></td> </tr> <tr> <td style="text-align: center; padding: 5px;">VA_i</td> <td></td> </tr> </table>	I_i		VA_i		
I_i					
VA_i					

System with non-constant prices

The calculation of the net effects of a project takes into account the supplemental income, or savings for the consumer, resulting from the reduction in prices for the good or service produced by the project (or the reduction in income for the consumer resulting from an increase in prices).

In the case of the paving of a highway (modernization project) the comparison of the situation without and with the project are shown as follows:

Paved highway	Unpaved highway						
<table border="1" style="width: 100%; height: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center; padding: 5px;">I_i</td> <td style="width: 50%;"></td> </tr> <tr> <td style="text-align: center; padding: 5px;">VA_i</td> <td style="text-align: center; padding: 5px;">I'_i</td> </tr> <tr> <td style="text-align: center; padding: 5px;">E</td> <td style="text-align: center; padding: 5px;">VA'_i</td> </tr> </table>	I_i		VA_i	I'_i	E	VA'_i	
I_i							
VA_i	I'_i						
E	VA'_i						

In this case E represents the consumer surplus and the incremental VA is calculated as:

$$VA_i - VA'_i + E$$

6. SECONDARY EFFECTS

To perform an analysis of the secondary effects it is necessary to have a great deal of information available about the distribution of supplementary income to various social classes. Also it is necessary to understand how each class uses its supplementary income.

In practice, the following categories of income classes can be included in the analysis:

- Households with wage income:
 - Traditional nationals
 - Modern national
 - Expatriates

State, collective and public entities that receive taxes and diverse duties

Entrepreneurs and investors that receive profits:

- Traditional national companies
- Enterprises with expatriate capital operating in the country
- Enterprises with expatriate capital that operate abroad

The distributions of the budget coefficients for each household class are defined in terms of:

- Saving rate
- Direct tax rate
- Rate of transfers to exterior
- Structure of consumption in local products and imports

"In reality, in a framework of such a restrictive hypothesis, it is only possible to realize approximate calculations; consequently, the results can not be used except in an illustrative sense (it is seen in chapter 5 that these calculation are not used for the economic evaluation of projects)". [Chervel, Le Gall p 111]

To determine the distribution of VA between the categories of households the vector v (direct included VA) from the IOM is employed. This vector is decomposed to:

$$v = v_1 + v_2 + v_3$$

- v_1 Direct salaries
- v_2 Taxes and duties
- v_3 Direct profits of entrepreneurs

To develop the distribution of the vector v according to the definition of the various household classes above, the vector would have to be decomposed more precisely. For example,

$$v_1 = v_{1T} + v_{1M} + v_{1E}$$

- v_{1T} Salaries - traditional households
- v_{1M} Salaries - modern households
- v_{1E} Salaries - expatriate households

The indices for each element of the vector v are determined by multiplying by the inverse of the Leontif matrix (remember that the vector v contains only the direct VA). For example, the indices of traditional households v'_{1T} in each productive sector can be calculated as follows:

$$v'_{1T} = v_{1T} (I - A)^{-1}$$

and the salary increment s_T of the traditional households due to the new local production Y , is calculated by:

$$s_T = v_{1T} (I - A)^{-1} Y$$

This analysis deals with the question of the secondary impact on the economy of the VA distributed to each household class. Chervel and le Gall discuss this matter in their chapter 4 p. 111-117 but is not included in this paper.

7. EVALUATION OF PROJECTS

Up to this point the analysis has taken into account primarily the impacts of a project relative to development objectives (growth and distribution of national income) and the type of restriction that bear on the economy (e.g. availability of financial resources). However, there are other effects not measured by the previous analysis, which would have to be taken into account in the evaluation of a project:

- Impact on the economy
- Social structures
- Economic dependency
- Human factors
- Physical environment

In relation to the VA analysis the standard practice is to take into account the time panorama considering the time value of resources. An internal rate of return can be determined and compared with a social cutoff rate, or the net present value using a social challenge (hurdle) rate.

$$\sum_{t=1}^n \frac{-I_t + a_t}{(1+r)^t} = 0$$

The calculation of the internal rate of return is as follows:

- I_t Total investment, period t
- I_p Project investment, period t
- I_c Complementary investments, period t
- $I_t = I_p + I_c$
- a_t Supplementary VA, period t
- r Internal rate of return
- n Number of periods in the planning horizon

If VA is contained in the investment, the formula is modified as follows for the calculation of internal rate of return:

$$\sum_{t=1}^n \frac{-I_t + I_{nt} + a_t}{(1+r)^t} = 0$$

- I_{nt} VA included in the investment I_t

Another alternative is to calculate the Net Present Value by which the effect of the project is measured using a challenge (hurdle) rate of discount. A rate r is assigned which varies according to the state of the political economy. A more impenetrable barrier is imposed when the rate increases (perhaps because of the scarcity of investment capital) to reduce the number of acceptable projects. The barrier is reduced with a lower discount rate when there is an excess of available capital.

- 1** Overview
- 2** Market Analysis and Marketing
- 3** Technical Analysis
- 4** Financial Analysis
- 5** Economic Analysis
- 6** Expansion/Modernization Projects
- 7** Project Appraisal



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