CHAPTER III

SOCIAL COST BENEFIT ANALYSIS
In the last chapter a detailed description of the Idukki Project was given. Here an attempt is made to make a social cost benefit analysis.

3.1 INTRODUCTION

Projects are agents of change in an economy. A project can produce economic and social effects of many kinds. A project requires different inputs like capital, land, labour, raw material, foreign exchange etc. The Project Agency (which is government in the case of public investment for infrastructure development projects) supplies these inputs. This may affect the existing pattern of resource allocation and thereby deprive some of the existing users of the inputs that are now directed towards the project under discussion. If this existing pattern is not disturbed and the inputs are provided through imports or assistance from external agencies then an array of economic and social changes may occur. Same is the case when the project starts production. For example, consumption of existing consumers may increase. New consumers may start to use the product. It may change the international trade pattern either by providing more to export or by acting as a substitute for imports.

The impacts of a project may be divided into those that are tangible or intangible. Benefits that are tangible are those that can be quantified and to which some monetary value can be ascribed, e.g. greater safety, reduced risks, increased reliability, reduced pollution, improvements in comfort, reduction of anxiety, pain and grief. But attempts are being made in recent times to
measure the intangible impacts and the basis of quantification reflect the society's attitude and value system.

The impacts of projects can also be divided into those that are direct and those that are indirect. Direct impacts are those that are forthcoming as a direct consequence of the investment. The indirect benefits are those that result from the knock-on effects in the economy or environment resulting from the changes in economy caused by the investment project. A project may have secondary indirect effects, tertiary indirect effects, fourth order indirect effects or higher order indirect effects.

Direct benefits can occur in two ways: as increase in the value of benefits and as reduction in costs. Increase in benefits can occur in different ways – increased sales, improvement in quality, changes in timing and location of production, changes in the marketed form of the product or service, changes in the consumer surplus manifested in changes in the willingness to pay. Changes in the human capital etc. Reduction of costs can occur in different ways – loss avoidance, import substitution, lowering costs of marketing etc.

These are due to activities – usually service, trade and industry activities – stemming from the project e.g. increased transportation, new approach roads, increase in processing units due to additional agricultural produce resulting from an irrigation project etc. These indirect effects of a project might produce a secondary round series of effects on the society and the economy concerned. This secondary round of indirect effects of a project might set up a tertiary round
series of effects on the society and economy concerned. These rounds of effects might produce several tertiary and other effects. They may be termed as Linkage effects, Multiplier effects and Externalities.

The Linkage effects may be forward or backward or forward and backward. Forward linkage occurs when the additional output of an intermediate input will increase the output of the industries, which use that input. A forward linkage also occurs when the output of a project creates additional demand from transporting services, brokering and forwarding services, shipping services, port handling services etc. A project will have backward linkages if there are linkage effects back to the producers of the inputs for the project or these are effects on the services to reach the inputs into the project.

Multiplier effects are produced through other economic activities stimulated by the investment project. Power projects may stimulate economic activities like new industries and tourism projects. Irrigation projects can stimulate the setting up of agro processing units. Tourism projects are claimed to have multiplier effect through creating jobs that yield salaries which when spent will stimulate other commercial activities. Better quality housing can stimulate increased productivity.

A project can produce external effects. They are neither deliberately produced nor absorbed, but nevertheless, will influence the welfare of the people who often do not have control over these effects. These effects are imposed by a project on a group of people who are not beneficiaries of the
and benefits are the same. But the questions are asked more searchingly and widely from the point of view of the entire economy. The analysis will thus have to transcend the narrow boundary of the project. Mere financial Cost Benefit Analysis will not be sufficient. But Social Cost Benefit Analysis will have to be performed.

"Social Cost Benefit analysis is a technique of identifying, investigating and quantifying in a single summary measure the total impact—the costs as well as the benefits of a project on the whole of society (not merely a part or parts of society), so the economy or its decision makers are enabled to select only the socially most remunerative projects for implementation."

In SCBA, there are two aspects—Economic Analysis and Social Analysis. In Economic Analysis resources and benefits are valued at opportunity costs and their economic values are worked out as shadow prices. In Social Analysis, the distributional considerations are taken into account.

### 3.2 THE NEED FOR SOCIAL COST BENEFIT ANALYSIS

Unless the economy is centralized, the decision to select investment is dispersed in the hands of many individualized units. These investors select their projects based only on the financial analysis. They are little bothered about SCBA. The question that can naturally arise is: If in an economy each project selected for implementation is financially profitable, then it should mean
that all the projects together will be socially profitable. Adam Smith speaks about the invisible hand, which directs the self-seeking proclivities of the business world that confers benefits on society as whole. But in real world this is not the case. The selection and implementation of projects solely on the basis of financial profitability is not likely to result in a socially profitable allocation of resources. The reasons are:

1. What is good for a person or a section of society need not be beneficial to the entire society. Optimisation at subsystem level need not result in the optimisation at system level. Our concern is economy as a whole, not any smaller part of it. Private sector is driven by profit motive. A financially profitable project may have certain (good as well as bad) effects in the society which do not register in the financial accounts. Such effects are external to a project. These effects are called externalities.

(a) These externalities whether good or bad do not figure up in the financial analysis. Some goods, which have beneficial spillover effects, are unpriced, while some goods which have noxious spillover effects are overpriced.

(b) Then there are linkage effects of a project – backward linkages and forward linkages. Financial analysis does not take these into consideration. So financial profitability is no indication of social profitability. We need SCBA in which the boundary of the project is extended to accommodate and account for all these effects.
2. The financial market valuation of inputs (costs) and outputs (benefits) often fail to reflect their relative worth on the society's value scale. The valuation of a resource must reflect its output or consumption value that it is capable of yielding in its next best alternative use. This value is referred to in Economic terminology as its opportunity cost.

In the process of producing outputs a project consumes resources. But these resources are scarce. Many competing claims exist for the use of resources in different ways. Investment projects usually absorb large amounts of resources. These resources are usually irrevocably committed to the specific use, making them unavailable for alternative uses. In conducting SCBA, the inputs and outputs are to be valued. The basis of valuation is the efficiency with which these resources are used. The basis of efficiency is the relative growth promoting and income generating capacity of the resources in alternative uses. The approach adopted to the valuation of inputs and outputs is the Opportunity Cost Approach. From the input side, the question to be answered is: What is the cost that would arise from not using the resource in the best alternative use? From the output side, the question to be answered is: What is the value of the extra output to be obtained from this particular product, which often could be obtained in another way. In short, both inputs and outputs are to be valued on the basis of alternative opportunities. These prices for inputs and outputs based on their opportunity costs are called economic prices, shadow prices or efficiency prices. The above discussed facts are of great significance as far as the entire economy is considered. But these factors are not considered in the financial CBA, but captured in SCBA or Extended Cost Benefit Analysis.
(3). As already indicated, a project has both costs and benefits. Many times it happens that the section of the society, which incurs costs does not get the benefits and the section, which enjoys the benefits, does not incur the costs. The gainers of the project are usually powerful and organized. The losers might be non-powerful and scattered and not organized. SCBA will analyze the costs and benefits of the entire society. In SCBA, the question to be asked is not only “Is B>C?”, but also “Benefits for whom and costs for whom?”. There are provisions to give weights to the people belonging to various economic and social strata.

(4). In the real world we might be manufacturing goods which do not have economic justification. We might not be manufacturing goods which have economic justification. What is good for the individual investor may not be good for the society. SCBA has provision for scrutinising this aspect of the projects.

(a) The financial value or market value of a good is determined by some other factors - the type of organisation of production i.e. whether it is oligopoly, monopoly imperfect competition etc. This is also determined by the nature of the good: whether it is a public good or a private good. If it is a public good like roads, no market may exist for it.

(b) Discrepancy between financial value and economic value also depends on tariffs, taxes and subsidies levied on the goods and the regulation of the quantity produced and price charged. In a developing country, public policy
measures like taxes, duties and direct controls tend to aggravate the distortions in market prices, induced in the first place, by monopolistic organisation of production, foreign exchange controls and disguised unemployment. When this is the case, market prices have little, if any relation to social prices. Therefore SCBA has acquired much importance in developing countries.

(5) "In a highly developed economy where the natural resources are more or less well known, marginal productivity is approximately the same in all sectors and hence wages for the same levels of skill and degrees of effort are also approximately equal. In an economy of that type, the social productivity of an investment should approximate to its productivity from the point of view of the firm, that is, of the return on the capital. In that case, the price mechanism alone may be regarded as a safe guide to investment. This does not apply to an economy in its early stages of development. There we find a marked disparity in the development. There we find a marked disparity in the degree of utilisation of the factors of production or the introduction of new combinations thereof may bring about a substantial increase in social productivity. This increase, however need not necessarily be reflected in the profitability of the firm." : Celso Furtado, Capital Formation and Economic Development, International Economic Papers, No. 4

3.3 EVOLUTION OF SCBA

In 1884, a French man Jules Dupuit, Inspector of roads and bridges, published an article titled "On measurement of the utility of Public Works". In the
article he proposed that the benefits to the community of public enterprise such as bridges and roads are not the revenues generated by the public treasury i.e. the actual payments of the public, but the public's willingness to pay for the service. He observed that the public's willingness to pay would be something larger than the actual payments. In 1936, in United States, attempts were made to through the enactment of Food Control Act 1936. In United States, attempts were made through the enactment of Food Control Act 1936, to set forth standard evaluation procedures to ensure that the benefits to whomsoever it may accrue should be in excess of estimated costs. AC Pigou in his work "Public Finance(1928) had explained the concepts of social benefits\costs. But all these works had not mentioned how to measure costs and benefits. Various public agencies developed various criteria. But in 50s, SCBA remained merely the means of justifying projects rather than the tool for project planning. In 1960, in UK, CBA was applied to M1 Motorway. The applications were mainly to transport projects. The Roskill Commission Report on the London Airport (1970) and CBA of the Channel Tunnel are well known applications of CBA in UK.

In 1969, OECD published the "Manual of Industrial Projects Analysis in Developing Countries, Vol.11: Social Cost Benefit Analysis" by JMD Little and JA Mirriees. The authors were the first to lay a complete theoretical foundation for practical Cost Benefit Analysis. Their approach is called Little Mirriees Approach.
In 1972, came the UNIDO publication, "Guidelines for Project Evaluation". This contained guidelines to apply CBA analysis to projects in several developing countries. The authors are S Marglin, AK Sen and P Dasgupta. Their approach is different from OECD approach.

In 1973, UK's Ministry of Overseas Development brought out "A Guide to Economic Appraisal of Projects in Developing Countries". This provided a practical basis for the economic appraisal of projects as per the methodology developed in OECD Manual.

In 1974, "Project Appraisal and Planning in Developing Countries" by IMD Little and JA Mirrlees was published as an enlarged and revised edition of the Manual.

In 1975, World Bank published "Economic Appraisal of Projects" by Lyn Squire HG van der Tak. This in many ways is a synthesis of the LM and the UNIDO approaches.

NOTE:

WELFARE ECONOMICS AND SCBA

Welfare Economics is the study of the contribution, which Economics can make to advance the social welfare. A theory of Welfare Economics might be developed from the democratic process. If we assume that in the democratic
process, we reach an agreement through informed debate, then there is the likelihood of the emergence of a methodology of Decision-Making on such issues. Therefore it is likely that a common set of criteria will emerge. Once criteria is there the process of reaching a consensus will be easier. If the welfare economist conceptualizes a virtual constitution, the two criteria, which will qualify for inclusion in such a constitution, will be a Pareto improvement and a distributional improvement.

A Pareto improvement takes place if some economic rearrangement makes one or more people better off without making anyone worse off. A distributional improvement takes place if there is near unanimity that the distribution resulting from the economic rearrangement is an improvement. If Pareto improvement has a utilitarian base, the distributional improvement has an ethical base. SCBA methodologies try to fuse both criteria while selecting a project.

A project brings about some economic changes in the society. There will be many economic rearrangements. There will be gainers and losers. Gainers are those who will be better off and losers are those will be worse off because of the project.

In Pareto improvement, some people are made better off and no one is made worse off i.e. the Pareto improvement does good to some and apparently no harm to others. In Potential Pareto improvement, a great number of people
are made actually worse off and some people are made better off. It is quite possible that those who are made worse off belong to the lower income group.

SCBA is linked to but not raised upon actual Pareto improvement. Potential Pareto improvement is defined as an economic rearrangement in which the gains can be so distributed as to make everyone in the community better off. Pareto improvement can be recognized by welfare test: the gainers will be able to more than compensate the losers.

Potential Pareto improvement has less appeal. But in a democracy the electoral power is substantial. There is tax structure. So there is likelihood that Potential Pareto improvement can bring about Pareto improvement or something close to it. Redistributive transfers like subsidies can transform every Potential Pareto improvement into Pareto improvement. Once Potential Pareto improvement is brought about, we can make costless redistributions and bring about Pareto improvement.

In the analysis on the above lines the concept of compensating variation is brought about. Compensating Variation (CV) is the sum of money which if received or paid after the economic change in question, would make the individual no better off or worse off than before the change. That is, after the gainers and losers have respectively paid and received their CVs, the welfare of the gainers and losers will be restored to the original level. CV of a gainer is the largest sum that the gainer will pay and the CV of a loser will be the smallest amount the loser will receive after the economic change to restore their welfare.
to the original level. If the sum of CVs of gainers > sum of the CVs of losers, the gainers can more than compensate the losers, and the change will realize a Potential Pareto improvement. If the CVs of gainers < the sum of CVs of losers, it indicates that there is potential reduction of welfare. The more the difference the more is the reduction in total welfare.

CV is a strong theoretical concept. But when it comes to application, there are difficulties. The CV of gainer is constrained by his/her income. A gainer cannot pay beyond his/her income, however much is the gain from the project. CV varies with the levels of income. A very high-income group will be willing to pay a high amount for a clean environment. But those who are at subsistence level of existence will not be

Interested to pay a high amount and will not be able to pay a very high amount for a clean environment. On the other hand, the CV of the receiver does not have any such constraints. The receiver can quote any high amount as CV.

In a project, if particular hardships occur to certain groups, the economist should think of adequate compensation.

In SCBA, the concept of willingness to pay is very important whether it is in the case of CV or in the price of inputs, price of outputs, cost of capital, cost of land, cost of machinery etc. When the price paid < the price willing to be paid,
The payer has a surplus which is called consumer's surplus. This is a gain. When the price paid > the price willing to be paid, there is a loss for the payer.

The willingness to pay is a very important concept especially in UNIDO method of SCBA.²

3.4 RATE OF DISCOUNT

Project effects – both costs and benefits occur in different years. The collective valuation of effects occurring at different times requires a discount rate, for use in adjusting the value of different effects according to when they will occur. We have to arrive at the correct rate of discount to use in the project analysis for calculating discounted values, or in assessing the acceptability of an IRR.

In Economic Analysis we seek to reflect all effects in units of constant value. This unit of constant value is called Numeraire. Different methodologies have different Numeraire. For LM method, the Numeraire is a rupee today converted into foreign exchange to buy imports. For UNIDO method, numeraire is the rupee spent now on the consumer goods purchased by a family at the average income level in what we might call average consumption expenditure. The discount rate for use in project analysis is the rate at which the value of the numeraire falls over time.
Several different types of discount rates can be distinguished which differ in principle from each other regarding the point of view from which they are derived.

3.4.1 CONSUMPTION RATES OF DISCOUNT (CRI)

The consumption rate of interest reflects the way in which additional consumption over time may be valued. Future consumption will be regarded as less valuable than present consumption, because – (1) The future is uncertain. Discounting for this is called Time Preference. (2) In an economy if the growth exceeds the rate of population increase, the average level of consumption will climb i.e. future people will be better off. The law of diminishing marginal utility of income will come into operation. So if we assume growth, the future income will have to be discounted. John D Macarthur distinguishes between social rate of discount and consumption rate of discount. But EJ Mishan uses both the terms interchangeably.

If a person's CRI is 8%, it means that he is indifferent as between Rs 1 today and Rs 1.08 in a year's time. If therefore, Rs 1 worth of consumption is removed from him today and he is returned Rs 1.09 worth of goods next year, he can be considered to be better off. But if one returns Rs 1.07 worth of goods after 1 year's time in return for removing Rs 1 worth of consumption today, he is deemed to be worse off. Suppose the person has only two options regarding his resources – investing a resource today in a specific project or consuming the resource today. The investment project will be chosen if its IRR exceeds...
8%. It is ultimately the foregoing of consumption today for consumption tomorrow.

3.4.2 THE SOCIAL VIEWPOINT

If A's CRI is 10% and B's CRI is 20% and if A is called upon to finance 30% and B is called upon to finance 70% of a given project, the CRI for this two person economy is \( .3 \times 10\% + .7 \times 20\% = 17\% \). If the return on this project is greater than 17%, then both A and B be can be better off by undertaking the project. Questions of the valuation are very subjective. Temperament, age, information available will affect people's views.

It will not be proper to use the CRI of a specific group for general use. The CRI used in SCBA should reflect the wider view. The CRI reflecting the wider viewpoint is called Social Rate of Discount (SRI). This rate is not arrived at by considering the viewpoints of individuals but by the government taking the welfare of future generation also into consideration.

Since individuals are supposed to suffer from absence of telescopic faculties, they tend to discount their future wants very heavily. They would tend to save less than they would if they were not afflicted with this defective vision. Since government is the custodian of future generation, the rates fixed by government will be less than the rates fixed by individuals. The government will have to consider the interests of the Distant future, not just the near future and allow a high value to future consumption by discounting it at lower rates.
Different authors use different terminology for the discount rates. John Macarthur uses the term Social Consumption Rate of Discount, Little and Mirrlees and Squire and van der Tak use the term the Consumption Rate of Discount. UNIDO uses the term Social Rate of Discount. Margin uses the term Social Rate of Time Preference. Whatever be the terms used. The discount rate is seen to have two elements – (1) the value of incremental income as income grows and (2) pure time preference. The simple equation for this rate is:

\[ i = ng + p \]

where \( i \) is the social rate of discount, \( g \) is the expected annual growth in per capita income, \( n \) is the elasticity value that reflects the weight given to extra income at different income levels and \( p \) is pure time preference. Since \( n \) and \( p \) are subjective values that cannot be observed or estimated empirically, the value of \( i \) if it is to estimated at all has to be estimated by the government. L and M call this rate an ‘ethereal’ concept. UNIDO authors agree that it would not ever be systematically estimated. But they suggest that it could be revealed through a set of project selection decisions that were unconsciously systematic. The SCR of interest set by the government will be lower than any observed private CR discount rate of interest. It would be high only if high values of \( n \) and \( g \) were assumed.
3.4.3 INTEREST RATES

3.4.3.1 DISCOUNT RATES FROM EVALUATION STUDIES

A number of projects could be evaluated at shadow prices to find out their economic rate of return. A rough estimate of the opportunity cost of capital might be obtained by using the lower end range of the rates of return. The last project is the project, which just exhausted the amount of investible resources available to the agency making the investment choice decision. In another way, this is the IRR of the project, which is the first to be excluded because of exhaustion of funds. This rate is very difficult to measure, because IRRs of projects selected for implementation is often not known. The rate of return on the marginal project reflects a very valuable discounting measure – the opportunity cost of capital.

If a country is in a position to invest abroad, the real rate of interest actually or potentially earned outside measures the opportunity that new projects must exceed.

3.4.3.2 DISCOUNT RATES FROM INTEREST

Interest rates are the price paid for borrowing from individuals and agencies that have surplus funds. A proportion of borrowed funds is largely used to finance new investments. So interest rates are obviously relevant to the estimation of discount rates. The real cost of borrowing from outside is another
measure if these are fixed competitively so that they reflect investor's willingness to pay for funds for new investments.

Let us envisage a perfectly competitive capital markets. It implies that every person is able to borrow for any purpose and for any length of time, or exactly the same terms as any other person, since we want a rate that is consistent with full employment of capital and price stability, such a rate of interest could be taken to reflect the interaction between a fully employed society's current saving schedule and it's current investment opportunities. No matter what a person's individual rate of time preference is, he is able to borrow and lend at this rate.

3.4.3.3 DEPOSITOR’S RATE

Depositor’s rate is the rates paid to the users of funds when they lend it to financial institutions. These rates are a reflection of the value that marginal savers put on a future consumption. Some people and agencies will deposit funds at almost any depositor's rate, even when it is negative in real terms (real terms here means the rate of return on interest earning funds after inflation has been taken into account). Because of 'social' considerations involve factors in the valuation of consumption beyond those the private individuals would take into account, depositor rates are not usable as an indication of what the social consumption rate should be.
When we consider both these rates, the lending rates will always be higher than the depositor rates, because of margins that financial institutions must impose to cover their costs. However when expressed in real terms, lending rates can provide a minimum estimate of opportunity cost. Revenue earning projects financed from loans must at least be able to cover the cost of lending. If interest rates are allowed to fluctuate in an open competitive market and if financial institutions are an important source of investment finance, real lending rates can provide a minimum value for the opportunity cost of capital. Often government, not determined by market forces controls the interest rates charged by banks, which invalidates approach.

Often the rates are politically determined. However if borrowing from abroad at non-concessional rates is a means of financing investment, the real cost of this borrowing can be a valid indication of a minimum estimate of the rate of return on projects financed in this way.

Investment rate at which banks borrow from banks and other financial institutions

Additional borrowings of this kind is the means by which governments raise marginal funds and additional investment is often seen as the marginal use of government funds. Hence, marginal project in the public sector ought to have a rate of interest at least equal to the real cost of borrowing by government.
Note

Since LM system measures project costs and benefits in terms of foreign savings, it is only natural that the social discount rate reflects the time value of savings. That is the Accounting Rate of Interest (ARI) ought to reflect the rate at which the value of savings declines over time. This rate used will then allow only as many projects as will just exhaust the resources available for investment in the economy. Little and Mirrlees suggest that an initial estimate of the ARI to be computed and used. The initial estimate should be modified later on in the light of experience.

3.5 OPPORTUNITY COSTS AND SHADOW PRICES

Opportunity Cost is defined as the next best alternative foregone in undertaking a course of action. The economic values of resources and benefits are based on the opportunity costs. Whenever the opportunity cost of an item is not equal to its price, there is an argument for using shadow prices. The essence of economic analysis is to prepare a set of prices – shadow prices – which do not exist, but which are used in the place of market prices. Shadow prices reflect the economic values. These are called shadow prices because they are non-existent and nobody buys or sells anything at shadow prices.

In SCBA, the shadow prices of land, labour, capital, goods and services are calculated.
3.5.1 OPPORTUNITY COST OF LAND

The opportunity cost of land can be investigated by asking what the alternative uses of land might be. If it is urban land it can be used for homes, offices, shops and factories. Rural land is normally used for crops, pastures or forestry.

Often the financial analyst of a project will put the cost of land as a single capital item (land purchase cost) or as an annual payment (annual rental). From the point of view of the landowner, its opportunity cost is the market value of the surplus produced by that land in its next most profitable use.

The opportunity cost of land can be looked at from at least two perspectives – that of the landholder and that of the national economy. The landholder may conceive opportunity cost as the market value of the foregone rent. But from the point of view of the national economy, it is the value of the surplus produced from the land to the economy as a whole. The rent to the landlord would then be regarded as a transfer payment from one group to another and the value of the land would be defined as the production derived from the land net of the cost of production.

The opportunity cost of land in any case is really the surplus foregone in altering land use eg. if the land now used up for the project was previously used to cultivate paddy, the shadow price of land will be the present value of the paddy output lost annually during the life of the project, say 20 years. The
estimation of the annual output of paddy during the life of the project will require
the estimation of the rise in yield of paddy as a result of improved farming
practices, which might happen. We have to project what the alternative uses of
the land will be in the “Without – Project” situation. The “Without – Project” is not
likely to be the same as the “Before – Project” position. If during the life of the
project we can reasonably forecast a change in the land use pattern, this also
has to be taken into account, while estimating the shadow price of land.8

3.5.2 OPPORTUNITY COST OF LABOUR

The opportunity cost of labour is based on what the workers concerned
would have contributed if they had not been employed on the particular project.
To do this one calculates the Marginal Value Product (MVP) which is often
called the Marginal Product of Labour (MPL). The other component of the
shadow price of labour is the Necessary Extra Consumption (NEC) that must
arise to allow the worker adequately to fulfill the required role in the project. The
Shadow Wage Rate (SWR) is the sum of the shadow prices of MPL and NEC.

If farm surveys indicate that an average landless labourer is earning an
average wage of RS 100 per day and if that there are 200 days in a year, the
annual earnings are Rs 20000. Every person who switches jobs will lose Rs
20000 per year. Suppose in the rural area 40% of the cultivation is wheat
whose shadow price is .81 and suppose 60% of the cultivation is sugarcane
whose shadow price is 1.03, then the MVP lost due to the switching of the
labour is RS 20000. The shadow wage is 20000 x 40% x 81 + 20000
x60% \times 1.03 = 18840. The shadow wage rate is 18840 divided by 20000 i.e. 0.942

Ideas about the opportunity cost of formal sector unskilled labour stem from theories of migration. Unskilled workers migrate from the rural areas and the informal sector to the urban areas and the formal sector in search of higher earnings. This has happened in the course of the development of almost all countries in the world and occurs most readily when there is a significant gap between urban and rural wage levels.

3.5.2.1 A SIMPLE EQUILIBRIUM MODEL OF WAGE DETERMINATION

In a static perfect competition equilibrium, the employers go on employing workers up to the point at which the cost of employing one more worker is approximately equal to the value of the extra net benefit (i.e. the profit). If all workers were in employment, the net value of additional production by the marginal worker (i.e. the last one employed) would be the same in all employments. If the employer found that he needed more labour because he estimates (because of the market expansion, seasonal factors or a new technology), that return to him from employing additional labour was higher than the going wage, then he would try to arrange for workers to move him from other occupations. This he would do by offering higher wages. Some workers would move from other employments to this one. Then the general wage level would increase. Some employees would cut their labour force and a new equilibrium would be reached at which every worker was paid the new wage.
and this would be equal to the value of the net output of the marginal worker in every occupation. If this simplistic ideal condition existed, then the actual wage would be determined through the individual action in a free labour market of individual employers and workers each adjusting to opportunities and external conditions so as to maximize income with selling labour (workers) or by hiring it (employers). This freely determined variable would accurately determine just what our economic analysis seeks to have - a measure of the loss in production that would arise when workers switch from another occupation to the project. The SWR would be equal to the market wage and adjustment of labour costs would not be needed. But in practice, there is a divergence between the MVP and wages.

The nature and extent of divergence between the MVP and wages depend on the type of workers who earn the wages - according to whether they are skilled, unskilled or family labour. Among the unskilled workers distinction has to be made between the rural and urban and also between formal and informal workers. The wages and also the MVPs are different for these separate classes and hence the shadow wage rates will also be different. The shadow wage rates are project specific and region specific and hence have to be separately calculated for each project. The MVPs are difficult to define, measure and value.

Skilled workers are those who require special training or experience to carry out their functions. Unskilled workers on the other hand are those who either need no skills or those who need no training or else who can acquire
training fairly quickly on their job. In many developing countries, unskilled workers are plentiful while skilled workers are limited in supply.

3.5.2.2 DIVERGENCE BETWEEN MVP AND WAGES IN THE FORMAL SECTOR

The wage rates in the large-scale projects or in government services are frequently higher than the MVP. Higher wages occur if a government decides for social, political or economic reasons to intervene in labour markets and to institute and enforce a minimum wage, which is a wage higher than that which some workers (for lack of opportunities else where) may be prepared to accept. Large firms (or governments) may decide to pay more than a minimal wage to obtain a satisfied and stable labour force. Also many governments not only permit but also encourage trade unions, one of whose main activities is to use the monopoly power of collective bargaining to try to get wages higher than market forces. Because of these distortions, the wages cannot be used directly in the economic analysis.

3.5.2.3 DIVERGENCE BETWEEN MVP AND WAGES OF THE SKILLED WORKERS

Since skilled labour is scarce, what they do is valuable. Hence these workers receive wages well above the minimum levels set in the formal employment situations. It is generally taken that their wages are negotiated with their employers and that the employers compete with each other to get
them by pushing wages up. So it is assumed that the costs of skilled workers are equal to their MVP. Hence their market price is equal to their opportunity cost.

In certain situations, the wages paid to the skilled workers is less than its true MVP. This can happen on 3 occasions – First, when much of the economy is in public sector, there may be little or no free market in which the true price for workers of this kind could be set. The governments frequently arrange salary structures where the gap between the lowest and the highest paid employees are small by holding down the salaries of the skilled workers. Hence the lost MVP of a single skilled worker shifting jobs may be far more than his wage W. The second case is when a skilled worker with unique knowledge and experience, say a manager, a vet or a metallurgist is moved from where these skills are specially needed. In this case the MVP lost is much more than the wages paid to them. The third case is when in some countries certain categories of skilled workers are in excess supply in relation to the existing economic conditions eg. skilled steel workers in Britain, certain types of graduates in India. A premium of .25 to 1 is applied on the wages of the skilled workers to arrive at their MVPs.⁹
3.5.2.4 DIVERGENCE BETWEEN MVP AND WAGES OF UNSKILLED LABOURER

3.5.2.4.1 Unskilled labourer in informal sector in the rural areas

Rural unskilled labourer usually constitute people with little or no land, seeking work where they can get it on daily or piecework rates. Their wages reflect their market value. For a full year, the MVP is the weighted sum of daily or piecework rates. Their wages reflect their market value. For a full year, the MVP is the weighted sum of daily earnings - the sum of the number of days worked at a particular wage multiplied by the respective daily wage (including non-cash payments like food or a share of output if this is the practice). This market price sum has to be revalued to efficiency prices by applying a CF appropriate to either specific farm products or for agriculture in general. The CFs are generally 1 or more than 1. The shadow price of informal unskilled workers in agriculture may be greater the market price. In poor countries it can seldom be less.

3.5.2.4.2 Family workers

Family workers usually occur in farm sector. They are not paid wages. Their labor does not have actual market price. But when such people are drawn into the project, the work in their family farm might be suffering unless somebody is substituting them in the family farm. Even if they do not receive formal payment, their work has its own value. The MVP of such workers must
be at least equal to the earnings of the informal unskilled landless worker in the rural areas.

3.5.2.4.3 Unskilled workers in formal urban sector

To estimate the relevant MVP, we need to identify the labour-losing sector. When a labourer moves to a new occupation in urban formal sector, the movement is usually from the urban informal sector, but it is ultimately from the rural informal sector. The chain is: Rural informal to urban informal to urban formal. The chain of worker shifts can be very long and complex and may include a period of urban unemployment. Whether this is true or not, the effects of increasing formal employment by one person will be to reduce employment of the rural unemployed person by one. Whenever this is true, the relevant MVP for the SWR calculation will be that in the informal rural sector. However there can be many exceptions – (1). The labour losing sector could easily be mining, domestic service, fishing etc. (2). There may be several labour losing sectors say 80% informal agriculture and 20% informal fishing. (3). MVP of workers in agriculture may be very low, especially if migration workers are mainly from family farms

Where there is surplus labour and they did not work for hire elsewhere. (4). Frequently, specific farm outputs cannot be specified for reevaluating the MVP into efficiency prices. In this case, a general CF for agriculture must be used. This will be an 'average' for all farm output in the country or in the region concerned. (5). It is possible that more than one worker leaves the rural
informal sector when one urban formal job is created. Sometimes an urban formal worker brings his family members who had been

Contributing in rural production. (6). The contribution of women has to be considered which are often in the informal sectors. Again their wages for equivalent work is less compared to the wages of men. Quite possibly, their MVP in urban areas may be low, as their being in the city is not associated with giving up work elsewhere. Valuation of women's labour in urban areas based on their MVP will figure out to be quite low as their being in the city is not associated with giving up work elsewhere. Valuation of women's labour must be handled individually. Some projects employ the rural informal workers in their projects during offseason in the farm. Then the marginal MVP of the workers would be zero or thereabouts.

There are no universal rules that can be applied to estimate the relevant MVP for formal unskilled labour. The MVP is project specific and region specific. The project analyst has to study each situation separately for every project or new type of project in a particular area or region. The task is very complex. 10

3.5.2.4.4 Necessary Extra Costs (NEC) when new jobs are created

In many situations, requirements for new resources arise when additional workers are engaged. Some of the NECs can be borne by the workers out of their wages – extra food required to sustain the physical effort
the job requires, special clothing needed for work, transport costs of getting to work each day. What is available for consumption by the worker is only net of these. Employers bear some NEC – housing for staff, meals, special clothing, social facilities like health care, crèches, schools, transport of employees etc. Some other NECs are borne by the public authorities – public health provision, educational facilities, refuse and waste handling, social welfare services, transport, roads, street lighting, public housing, communal buildings, utilities like water and electricity. These costs can not be ignored. The project analyst will have to identify, quantify and value the relevant expenses.

3.6 OPPORTUNITY COSTS AND FOREIGN EXCHANGE

Shortage of foreign exchange is a significant constraint in many countries. Forex is mainly obtained in the long term by selling goods and services from one country to another through exports, while it is used to pay for imports. An exchange rate is the price of a foreign currency. Foreign exchange has value because it can be used to buy products and services that foreigners will supply. In a free currency market, the exchange rate would be the price that equates the supply of and demand for dollars. Since the demand and supply vary over time, the free exchange rate would change. When there is a steady increase in the demand for foreign exchange relative to the supply, the exchange rate would change so that more rupees would be needed to buy one dollar i.e. the rupee would fall in value against the dollar.
Government intervenes in the foreign exchange market because of the following reasons – (1) if left alone, exchange rates will fluctuate and uncertainty generated by fluctuations is detrimental to development and economic stability. (2) Foreign trade is a splendid source of revenue for government. Hence government intervenes with taxes. The government sometimes fixes import rates to protect home industries.

The taxes make the foreign goods more expensive to the individuals and if individuals are willing to pay this higher amount for the foreign goods, it means that the consumption value they attach to foreign exchange is more than that is indicated by the official exchange rate. So a shadow exchange rate (SER) is required reflect this ‘true’ opportunity cost value of a dollar. The SER can be interpreted as the relationship between the value of imports no longer available for local consumption and the amount of foreign exchange spent. Or SER can be interpreted as the relationship between the value of additional exports required and therefore not available for local consumption and the amount of foreign exchange spent. Or SER can be interpreted as the relationship between the foreign exchange spent and the sum of the consumption value of imports and the consumption value of exports no longer available.

There are different approaches to estimate the opportunity cost of foreign exchange.
3.6.1

**Approach 1**

\[
\frac{\text{SER/OER ratio}}{\text{Value of all imports excluding import taxes}} = \frac{l + Ti}{1} = \frac{l (1+i)}{1}
\]

- \(I\) = c.i.f. value of total imports
- \(T\) = total value of taxes on imports
- \(i\) = average rate of all taxes on imports

The basic assumption behind the approach is that the effect of a change in dollar availability is only to increase imports.

**Approach 2**

If one class of imports can be identified as dominant in this circumstance, the SER should be estimated by reference only to the before and after tax value of the types of good in question, not imports as a whole.

**Approach 3**

If it is assumed that the changes in dollar available also affect exports, the formula must be expanded to

\[
\text{with tax value of imports} + \text{with tax value of exports} \quad \text{Without tax value of imports} + \text{without tax value of}
\]
SER/OER ratio =

\[ Ti = \text{total value of taxes on imports} \]

\[ I = \text{total value of imports} \]

\[ E = \text{total value of exports} \]

\[ Te = \text{total value of tax on exports} \]

\[ i = \text{average levels taxes on imports} \]

\[ e = \text{average level of taxes on exports (not of subsidies)} \]

**Approach 4**

When there are import quotas, the imports will be limited. Import items subject to quota would still be in demand at the prevailing domestic price and so more would be imported. In these cases the permitted additional imports lost or made possible will be higher than the with tax price – by how much the average value is larger is difficult to say, but where quotas and other physical limitations on imports exist, there is case for rounding upwards the SER estimated from the formulae, generally by a small amount.
Approach 5

A still further refinement is to take the SER/OER ratio with different goods in the import basket and to take the SER/OER ratio with different goods in the import basket and to take the final SER/OER as the weighted average SER/OER, weighted according to the proportion of the different imported items.11

3.7 TAXES AND OTHER TRANSFER PAYMENTS

In opportunity cost determination, generally, taxes in the cost of items are identified and excluded from the resource costs. Taxes have no resource cost implications. The exclusion of taxes are done on the assumption that government will make no new expenditure because of the small amount of additional tax revenue it may receive if a particular project goes ahead.

In all marginal cost shadow pricing, there is the assumption that the particular project is a marginal activity in the context of the entire economy.

The marginality assumption is also the basis for saying that the small changes in government revenue attributable to a project are not the cause of any change in government's expenditure pattern and hence there is no change in resource utilisation through government expenditure. Taxes paid by project agencies (or subsidies paid to them) will be reflected only in an imperceptible change in the budget deficit or surplus. However as projects become large in
relation to the regional or the national economy, the assumption becomes less and less realistic. Account need to be taken of the price changes that a project may give rise to (labor, transport and cement are possible examples on the cost side) which affect all other users of those inputs. Excluding tax and subsidy payments from costs implies treating them as neither benefits nor costs, because no change in government expenditure arises because of the flows associated with any project. In the case of some governments which have great difficulty in generating funds for maintaining the operation of essential services, tax revenues are likely to be spent immediately in valuable ways. Hence tax payments associated with a project should be counted as benefits with a positive value of their own.

Taxes and subsidy payments associated with a project are called transfer payments. In a trading transaction, seller transfers goods or services to the buyer and the buyer transfers money. When taxes are paid by the project or when subsidies are received by the project, the transfer is a one way business. In these transfers no goods or services are exchanged. "Transfer Payments not associated with the use of resources" would be a more accurate description.

When we speak about transfer payments, the reference is often to taxes and subsidies. But any payment made by a project (generally as a component of the price that it actually pays for a good or service) that is not associated with a corresponding commitment of resources should be treated in the same way. excess profits, interest, rents beyond the opportunity cost of land etc. will fall in
the category. Additional surplus income to the receivers of these payments from project expenditures would be so small that they would have no resource implications. They are also normally so small as a proportion of project expenditure that they can be ignored in economic analysis. Therefore price adjustments for non-tax transfer payments are seldom seen. Perhaps the main area where they may be looked for are where substantial economies of scale arise in services and utilities used by a project where the price basis for the service is average costs, not marginal costs. Railway and electricity charges might be looked at in this light where they are large items in project costs or output values.

Transfer payments usually occur in cases where government provides services at subsidized rate. The rates at which we get those services are usually at rate less than the resource costs. In the case of some projects, it can be an important part of appraisal. 12

3.8 OPPORTUNITY COST OF GOODS

When opportunity cost estimate of goods are attempted, first, we have to determine whether the good in question is traded or non-traded. Next, we have to determine whether the good is used as input or produced as an output. The ‘trade’ in question is international trade – imports and exports. The distinction to be made is whether the input or output is either imported or exported in basically the form that the project uses or produces it or whether the input to the
project or the output from it is produced or consumed within the country concerned.

A good is fully is traded if the impact of any increased consumption will result in more imports or fewer exports. For such goods there is no change in the level of domestic production if domestic demand increases. All additional demand will be met by imports. Conversely, any additional domestic production will be exported and will not affect either consumption or domestic market. A fully traded good need not necessarily be a freely traded good. There could be government's interferences by way of taxes, subsidies and quotas. The basis of opportunity cost is the opportunity to trade i.e. the opportunity for international trade.

There are goods which are non-tradable. Goods like domestic transport, construction, distribution, electricity, utilities like water, Post and Telegraph, telephones, bulky and low quality subsistence foods and vegetables, unprocessed milk, drought animals, port operation, inland water ways, commodity storage, domestic unskilled workers, domestic skilled workers etc are non tradable i.e. they can not be imported or exported. Because of the physical nature they can not enter into international trade. Hence they are non-traded. Sometimes the government policies prevent the import and export of certain tradable items. If there is no likelihood that the government will change its policies, there is no point in regarding trade as a possible opportunity. Such goods also come under non traded items. In other cases, the quality of the internally produced goods is very low rendering them unexportable. Such
goods become non-traded. When a non-traded item is produced or consumed by a project, the imports or exports are not at all affected. Only the domestic consumption and production are affected. The basis for opportunity cost is the impact the production or consumption of a non-traded good can have in the domestic economy.

We can also split up the non-traded item into their traded component, labor component and local resources component. Then the opportunity cost of each of the components could be worked out.

3.8.1 OPPORTUNITY COST OF TRADED GOODS

The basic assumptions behind treating a good as traded

If the case of an imported input is considered, we take the case of an imported input, the domestic changes in demand and supply should affect just the level of imports and exports leaving the market price and domestic production unchanged. If this has to happen, the following conditions have to be fulfilled – (1) If the goods are subjected to an import quota, the available quantity is at present only partially taken up or that the quota will be expanded to accommodate additional demand. (2) The import supply tends towards perfect elasticity over the relevant range of import values. (3) There is no excess capacity in the domestic industry and that all additional supply must come from abroad. (4) If the additional demand occurs, transport
costs from port to project will not raise the cost of imported goods above the marginal cost of local production (5) the import price of goods including taxes will be less than the domestic marginal cost of purchase (including taxes. Profit margins etc). Similar conditions should hold for exportable inputs, and exportable outputs. But in practice it is probably best to assume that tradable inputs and outputs are not met perfectly.

3.8.2 CATEGORIES OF TRADED GOODS

Traded inputs fall into two categories – direct imports and diverted exports.

In the case of direct imports, the need for imports are met by new or additional imports. In the case of diverted exports, the inputs are the products of other activities that would have been exported if the project did not use them up.

Traded outputs fall inputs fall into two categories – exports and imports substitutes.

In the case of exports some or all of the products of the projects are sold to foreign buyers. In the case of import substitutes, because of the extra production by the project, only a lower value of imports will be required.

Some project outputs though not exported or imported, may be close substitutes for traded outputs. Such goods can be treated as indirectly traded.\textsuperscript{14}
3.8.3 BORDER PARITY PRICES

If an import is delivered unaltered to a project and if all markets were perfect. The cost at the project of such an imported item would be the import price (usually c.i.f. which is the cost of providing the goods and supplying them in a ship to the port of unloading) plus the cost of all those individual processes involved in getting them from the ship to the project which represent payment for use of resources. The port to the project costs include elements for unloading the ship, port charges, storage, insurance. Finance charges, overhead costs for the organization of port clearance, wholesaling, retailing and other forms of 'merchanting' business of arranging the whole set of activities and transactions. All these processes use real resources whose costs should be recognized in economic analysis.

The resource cost of the imported good = CIF price + port to project costs = Border Parity price at the Project (BPP).

The resource cost of an exported good = fob price, the export value - project to port cost = BPP

For an import substitute, the BPP = c.i.f. value + all costs from port to project– project to point of substitution costs.
If there are taxes and subsidies we have to take these into consideration while calculating BPP. When the final shadow price is worked out, the subsidies and duties will be excluded.

BPP of an exported good = fob – project to port cost + export subsidy – export duty

BPP of an imported good = c.i.f. + port to project cost + import duty

Some commodities are partially traded and partially non-traded. For valuation, the proportion of traded and non-traded disposals must be estimated and each valued separately.

Thus the BPP of a good is project specific. BPP is not a full shadow price. The individual factors adding up to BPPs have to be shadow priced. Taxes and subsidies will have to be excluded from calculation. Only then we will be able to get the full shadow prices.

But commodities are seldom produced or sold at Border Parity Prices. Government frequently intervenes with export subsidies and import duties.14

3.8.4 OPPORTUNITY COST OF NON TRADED GOODS

Some goods are non-traded because of government policies. Others may be non-traded because trade is either impossible or pointless eg.
electricity, transport, building materials. The basis of opportunity cost depends on whether the use of the item in question will cause more units of that item to be produced or whether it will deprive another person of its use. If more items are produced, the opportunity cost is the cost of producing the extra items.

If an alternative user is deprived of the use of that item, the opportunity cost is the price that the alternative user would have been willing to pay. In the case of perishable items like milk, the item is sold in free markets where the prices received reflect the buyer's valuations of the item through their willingness to pay. Since buyer's willingness to pay is the ultimate measure of value that lies behind opportunity cost valuation, the free market prices require no adjustment to bring them to opportunity cost valuations. Broadly, we can say that sale prices equal economic values.

When the effect of an output or input is to stimulate production, the production cost avoided and the production cost incurred will be the basis for calculating the shadow price. It is usually assumed that over the life of the project, the production of most non traded goods meet additional demand and that the relevant opportunity cost is therefore the long run marginal cost of production. But if the producer prices are the same in all parts of the country, the buying price may not reflect the value of increased production at the project location. A Project Parity value will have to be calculated along the lines of calculating BPP for a traded item. However, with a non traded item, the starting point will not be the border value, but the consumer willingness to pay value at the place (city or region) where it is felt the project's output will be consumed.
Deductions from that value for the usual items—transport, handling expenses etc.—will allow the derivation of a specific project level value for the output which will vary from place to place, mainly through the differential effects of transport costs. In short, for a product sold in free market, the basis for the shadow price of the non-traded good is equal to the market price less project to market costs where appropriate. In the case of a fully non traded good which is sold at controlled prices there are two cases—(1) market price or market price plus a premium for 'consumer surplus' where there are shortages. (2) Project parity values where uniform prices apply i.e. consumer prices at consumption point minus project to market costs.

The basis for calculating the shadow price of a non tradable item.  

<table>
<thead>
<tr>
<th>The nature of the non traded item</th>
<th>The effect of producing or consuming the non traded item</th>
<th>The basis for calculating the shadow price</th>
</tr>
</thead>
</table>
| A non traded output is produced by the project | (a) consumption of the output increases within the country  
(b) production of the output replaces other production within the economy | Marginal willingness to pay  
Alternate production cost avoided |
| A non tradable input is consumed by the project | (a) other producers will have only reduced availability  
(b) additional domestic production of the input is generated | Willingness to pay for this input by other consumers  
Production cost of this non traded input |
3.9 CRITERIA FOR ECONOMIC AND FINANCIAL APPRAISAL

The main criteria/techniques used for appraisal of a project are (1) pay back, or pay out or recoupment period (2) the rate of return on investment (3) discounting techniques – internal rate of return (IRR) and net present value (NPV) and (4 ) the benefit cost ratio and/or its variants.

3.9.1 PAY BACK PERIOD

Payback period is the length of time it would take the project to generate profits required to realise the initial investment. If the enterprise has established a maximum acceptable payback period in terms of years, then the decision rule would be to undertake the project if the acceptable payback period is more. This technique cannot measure the full worth of the project, as it does not take cognizance of the other aspects of the project, other than the period needed to repay the original investment. This is, however, widely used in business particularly where there is a great deal of risk and uncertainty in the project or in the economic outlook as a whole and the emphasis has to be on recouping the capital expenditure as quickly as possible.

3.9.2 THE RATE OF RETURN

The rate of return is a straightforward accounting concept, which expresses profit as a percentage of the capital employed. It relates the average annual expected income to total initial investment. Since accounts are usually prepared yearly, it is calculated on an annual basis. A distinction should be made between the initial years when the project is still experiencing teething
problems and the years when the plant is fully commissioned. Some variants of this criterion much less frequently used are (1) annual return of average investment (2) average return on average investment and (3) average book return on investment. In private industry, however, the criteria – pay back period and the annual returns of total initial investment are popular. This is mainly because of their simplicity. These two techniques however do not take into consideration the time value of money.

3.9.3 THE DISCOUNTING TECHNIQUES

The discounting technique of appraisal attempts to overcome the major drawback relating to ignoring time value of money of the above mentioned two methods viz. pay back period and rate of return. These two methods treat a rupee spent or received today in the same way as a rupee spent or received in future. The discounting techniques discount the future streams of costs and benefits of project and prepare net cash flows. Its two alternative expressions/method are: (1) the Net Present Value (NPV) and (2) the Internal Rate of Return (IRR).

3.9.3.1 THE NET PRESENT VALUE (NPV)

This method assumes that each project must attain a minimum rate of return generally known as test discount rate before it can be accepted for implementation. The project’s annual net cash flows are discounted at this rate to see whether the total discounted value is positive or negative. This test discount rate is required to be estimated by the central planning agency and
cannot be fixed by the individual project appraiser. The simplest method in use for fixing the test discount rate is to take the rate at which the Government (or whoever the sponsors may be) can borrow funds for long-term projects. If, over its life, the project can yield a return which more than covers the capital cost, the operational cost and the given rate of interest, then it will be found in discounting to have a positive total NPV. In fact, the surplus over and above the costs and rate of interest mentioned is the Net Present Value. The NPV can be calculated either by discounting separately the annual revenue or income streams and cost streams and subtracting one from the other or by subtracting the costs from revenue from each year and discounting the net annual figure.

3.9.3.2 THE INTERNAL RATE OF RETURN (IRR)

The Internal Rate of Return is the value of the interest or discount rate $r$ at which the total present value of benefits become equal to the total present value of costs (both capital costs and actual operating and maintenance cost). IRR can also be defined as that value of $r$ at which the total present value of net annual cashflows equals the initial investment. I.e. it is the rate $r$ which makes the following equation true.

$$\sum_{t=1}^{n} \frac{R_t}{(1+r)^t} - C = 0$$

Where $n$ is the total number of years, $t$ is the ordinal number of the year $r$ is the discount rate $C$ is the capital expenditure and $R_t$ is the net cash flow.
Annual cash flows equals the initial investment. How to find this rate presents a practical problem. The approach is the same as that for calculating the NPV. But in IRR method discount rate is not given. The appraisal takes the annual cost and revenue values and attempts various discount rates until the resultant figure is zero. The rate can be derived in this way by trial and error or by interpolation. The arithmetic rule for interpolation between two discount rates, one of which gives a positive NPV and the other negative NPV is:

\[
\text{IRR} = \text{Lower Discount Rate} + \text{Rate} \times \frac{(\text{NPV at lower discount rate}) - (\text{NPV at higher and lower rates})}{(\text{Difference between NPV at lower and higher rates})}
\]

It may be mentioned that interpolation at best produces only an approximately accurate result and is useful where the difference in discount rates used is small. The IRR method is generally preferred because it is felt to be similar to the simpler rate of return and takes into consideration the time value of money. It also allows comparison between projects on the basis of the most efficient use of capital more easily than the NPV, which is an absolute measure that could be influenced by project size.

3.9.3.3 BENEFIT COST RATIO (B/C RATIO)

The benefit cost ratio method is the ratio between benefits and costs over the life of the project. The ratio can be arrived at in either of two ways (a)
by converting the costs into total annual amounts by replacing the investment cost with an annual equivalent cost, adding this to the annual operating costs and getting the ratio between the annual benefits and the total annual costs. benefits and the total annual cost or (b) getting the ratio between the total present values of benefits and the total present values of costs including investment cost. In the case of developmental infrastructure projects, the conversion of capital cost into equivalent annual cost is generally based on the assumption that the total investment is borrowed and that repayment will be spread over the total life of the project or the considerable proportion of the total life. This equivalent annual capital cost is obtained by assuming the investment to be replaced annually by a uniform annual amount equal to the capital recovery factor, for a given rate $r$ multiplied by the amount invested.

The capital recovery factor $\text{crf} = \frac{r(1 + r)^n}{(1 + r)^n - 1}$

where $r = \text{rate of interest}$ and $n = \text{number of years of project's life}$.

It may be mentioned that the financial viability of private sector projects are generally assessed with the help of payback period and rate of
return methods whereas for assessing the economic viability of public investment projects, criteria generally used are NPV, IRR and B/C ratio.

3.9.4 SHADOW PRICE OF INVESTMENT

Social cost benefit analysis could be divided into economic analysis and social analysis. Economic analysis is concerned with valuation of resources at their opportunity cost. Social analysis is concerned with the distribution of the costs and benefits.

In social analysis two aspects of the problem of income distribution might be identified. The first is the distribution of benefits between different uses. Benefits gained (or lost) can either be saved or consumed (or savings or consumption may be foregone). If there is a shortage of saving for use in investment, it could be argued that savings are more valuable than consumption. The second aspect is the distribution of consumption between different income groups. Where there is maldistribution of income, it could be argued that extra consumption by a poor man is more valuable than extra consumption by a rich man. In calculating the shadow price of investment we are concerned with the distribution of costs and benefits between savings and consumption. The steps involved are outlined below:

3.9.4.1 IDENTIFYING THE SAVINGS EFFECT OF THE PROJECT

This is the most important and also the most difficult step. First of all we need a statement showing the distribution of benefits between the various
groups affected by the project. Such a statement can be obtained from a carefully constructed economic analysis. The next step is to find out the proportion of additional income that is saved by each group, sometimes called their marginal propensity to save (MPS). Such information can sometimes be obtained from household expenditure surveys. Often such data is lacking and relatively crude assumptions have to be made. Two common assumptions are:

i) The government uses all additional income for purposes of equivalent value to savings. Since the analysis is being conducted from the viewpoint of the government, to assume anything else would carry an implicit assumption of irrational behavior by the government. The MPS for the government is therefore deemed to be 100%.

ii) Poor people and particularly unskilled workers are assumed to save nothing out of their additional income. Their MPS is therefore assumed to be 0%. This assumption is often used but may not be correct for many countries.

For other groups, generalization is not so easy and assumptions may be rather arbitrary unless backed by survey data.  

3.9.4.2 ESTIMATING THE SHADOW PRICE OF INVESTMENT

This is a formidable task and no one has suggested that the individual project analyst should do it. If such a parameter is used, it should be calculated centrally.
The logic behind the use of this parameter goes as follows:

i) A shortage of savings implies that the opportunity cost of capital (q) is higher than the rate of discount we would use in the absence of savings shortage.

ii) In the absence of a savings shortage (or a shortage of investment funds), the only reasons why we would discount future benefits would be:

   a) We expect to be richer in the future, and extra benefits are less valuable the richer we are.

   b) The future is uncertain – the world might end or expected events might never happen. Society may therefore have an absolute preference for benefits now rather than later. This is known as pure time preference.

In the absence of a savings shortage, the social rate of discount (i) would therefore depend on the rate of growth of per capita income and the rate of pure time preference. We might expect i to be less than q.

iii) An extra unit of investment can be expected to yield an IRR of q%. This is equivalent to one hundred units of investment yielding a return of q every
year forever. If we discounted a return of q units in each year for ever at the
social discount rate i, where i < q, the present value of the return on 100 units of
investment would exceed 100. An extra hundred units of investment would give
a return of more than 100 units of consumption. The present value of the return
on an additional unit of investment discounted at the social discount rate is
equal to the shadow price of investment (v).

For example, if q = 10%, i = 5%

\[ V = \sum_{t=0}^{\infty} \frac{0.10}{(1+0.05)^t} \]

By virtue of the formula, for a geometric progression, \( v = \frac{q}{i} = 2.0 \).

The greater the differences between q and i, the higher the value of v.

\[ \text{v) Some of the return, q, from the investment of 100 units will}
\text{probably be saved. The proportion of the return on additional investment, which}
\text{is saved, can be assumed to be the marginal propensity to save for the}
\text{economy as a whole (s). This extra saving will also generate additional benefits.}
\text{A formula is often given which takes account of the value of s.}^{17}
\]

This formula is:

\[ V = \frac{(1-s)q}{i-sq} \]
v) Unfortunately the values for \( v \) derived from the above equation are very sensitive to small changes in \( s \), \( q \) and \( i \). It is therefore advisable to do consistency checks for the value obtained. One possible check is outlined in the next section.

### 3.9.4.3 APPLICATION OF THE SHADOW PRICE OF INVESTMENT

The shadow price of investment measures the value of a unit of investment in terms of units of consumption i.e. \( v \) is the present value of consumption that can be generated by that one unit of investment. If we have a statement of the distribution of the costs and benefits of a project divided up into savings effects and consumption effects, it is possible to adopt one of two approaches:

- **either**
  
  Multiply all savings effects by \( v \) and leave consumption effects unchanged.

- **or**
  
  Leave all savings effects unchanged and divide all consumption effects by \( v \).

If the former approach is used, all costs and benefits are measured in terms of units of consumption. If the latter method is used, all costs and benefits are measured in terms of units of savings.
3.9.4.4 THE DISCOUNT RATE IN SOCIAL ANALYSIS

The procedure outlined above will have the following effects:

Using the first approach, all savings effects will be increased. Since most projects use investment funds in early years to produce consumption benefits in later years, this approach will tend to increase the valuation of the investment costs and hence reduce the IRR of the project.

With the second approach, all consumption effects are decreased. In this approach initial investment costs may be unchanged but the value of later benefits is reduced. Once again the IRR will be reduced.

Use of shadow price of investment will make nearly all projects look worse. We must therefore expect to use a lower discount rate for social analysis than for economic analysis. In fact, if q, s and i are assumed to be constant over time, the appropriate discount rate is 1, the social discount rate. The shadow price of investment adjustment will tend to encourage projects, which increase the rate of savings.

3.9.4.5 WHY USE THE SHADOW PRICE OF INVESTMENT?

The shadow price of investment rests on value judgements because, the value of i is based on value judgements. It is difficult to estimate and is very sensitive to small changes in i, q and s. But even then it is used. The reason is:
The economic analysis would lead to the selection of labour intensive projects that might need to be subsidized. If all the benefits go to unskilled workers and are consumed, the rate of savings and therefore the rate of growth in the economy will go down. Subsidization might take up all available government income thereby removing future investment funds and causing low economic growth. The shadow price of investment is designed to discriminate against those projects, which are a continuous drain on government resources, and in favour of those which, while giving greater employment, also give increased savings.18

3.10 NUMERAIRE AND DIFFERENT METHODS OF SCBA

A Numeraire is simply a French word for numerator or unit of account. In any system of measurement there must be a unit of account. For example, weight can be measured in kilograms or pounds. Whatever be the units used to measure weight, the weight remains the same. There is a constant relationship between the weight measured in kilograms and the weight measured in pounds. In SCBA we arrive at a single summary figure relating costs and benefits. We have to assess a wide variety of costs. We have to assess a wide variety of benefits.

Among the existing procedures of SCBA, there are systems using a World Price numeraire and there are systems using Domestic Price Numeraire.
3.10.1 METHODS USING WORLD PRICE NUMERAIRE

An approach was originally set out in the OECD Manuel by Little and Mirrlees (LM). Later Squire and Van der Tak (SVT) expanded this approach. In these methods the costs and benefits are measured in world price equivalent terms i.e. in border price equivalent terms. This means that benefits and costs are counted not in units of domestic currency of average purchasing power but in units of foreign exchange translated into domestic currency at the official exchange rate. This is called border rupee. The Numeraire is: income in the hands of the government measured in world prices. (1) The OECD approach is to leave the world prices of tradable commodities unadjusted (of course we take into account the transportation, handling etc and exclude items like taxes and subsidies to arrive at Border Parity Price at the project site). (2) In OECD approach, the prices of non-traded goods and domestic resources are adjusted into world price equivalent terms. The foreign exchange effect of projects are taken into account by treating all domestic resources as less valuable than foreign resources. All domestically produced non-traded items are reduced in value, below their market prices to reflect the fact that they are less valuable than traded goods. LM/ OECD system would apply a conversion factor of less than 1 say .8, to the domestic resources costs. (3) All the additional consumption going to workers as a result of the employment effect of project is translated into a value in terms of government income. Therefore, where incremental consumption is c the value of this extra consumption in terms of the Numeraire will be divided by v where v is the present value of the extra consumption stream, that is equal to one unit of government income at world
prices. (4) The income distribution effect of a project is introduced by relating all the benefits to a particular group of consumers to government income. In terms of consumption benefits, one can think of a range of values for \( v \) for different income groups. For the rich \( v \) would be high enough and for the poor \( v \) will be less. \( v<1 \) means that the income going to the group concerned is more valuable than income going to the government. The work of two world bank economists, Squire and van der Tak does not add anything new to the literature apart from a clearer form of exposition and a slightly different formulation of the income distribution weighting system. Firstly, an extra consumption going to a particular group is valued in terms of consumption to the average consumer. A weight \( d_i \) is used for the group \( i \), \( d_i >1 \), where the consumption level of group \( i \) is below the average. \( d_i <1 \), when it is above. Use of value \( d_i >1 \) means that the consumption (income) going to that group is worth more than consumption (income) going to the average consumer. The second stage in the analysis is to express this consumption to group \( i \), valued by weight \( d_i \) in terms of government income. This is done through the parameter which expresses the value of one unit of consumption going to average consumer in terms of the unit of government income. In terms of the overall unit, for group \( I \), the social value is \( d_i c/ v \). SVT method is a combination of LM method and UNIDO method. The S-T numeraire is simply LM numeraire i.e. uncommitted public income measured in convertible foreign currency. The value of the numeraire should remain constant over time, i.e. the free exchange should be redefined to represent constant purchasing power. This requires the selection of a particular bundle of goods and services over which the numeraire is to retain constant purchasing power. The bundle of goods and services chosen
for this purpose is one that is bought at the margin of consumption, at the critical income level where the 'critical income level' is suitably defined. The critical income group is defined as the group with that level of income for which the social value of a unit of consumption is as valuable as a unit of public income or numeraire. A set of distributional weights are defined which indicate the marginal social value of consumption of any defined income group to that of the 'critical' income group. (5) The conversion factor for skilled labor is calculated as follows: \[ CF = \frac{ma + b(c-m) - bd/v (c-m) + c-c'}{m} \]

where,

- \( m \) = opportunity cost of labor/ market price i.e. marginal product lost in the sector from which labor is drawn when a wage of Rs 1 is being paid
- \( a \) = SCF
- \( b \) = SCF, sometimes a specific consumption factor.
- \( d \) = consumption weight for unskilled labor
- \( v \) = the value of a unit of investment in terms of units of consumption
- \( c \) = market wage
- \( c-c' \) = amount that the society has to spend on providing social overheads to labor
  - \( \text{i.e. } c' \) is the cost of overheads + wages paid.

\( Ma \) represents the marginal product lost in the sector from which the labor is withdrawn, i.e. an output of \( ma \) is lost elsewhere, because labor is employed in the project.
b(c-m) represents the additional consumption in the society because labor was employed in the project, expressed in terms of the Numeraire. Since there is additional consumption there is loss in savings resulting from this employment.

\[ \text{bd/v (c - m)} \] represents that part of the additional consumption which is equivalent to the savings effect and hence can be treated as a benefit. This gives the distribution effect.

The process of calculating all the conversion factors is an extremely complex operation. Wide spectrum of information is required for the compilation of these prices. No project level evaluator can possibly have such a breadth of data. The central planners will be supplying estimates of Economic and social conversion factors and this suggests the existence of a powerful Central Office of Project Evaluation (COPE) with a well-equipped research team. The set up suggested is 3 tier – Ministry at the policy formulation level, Central Office of Project Evaluation at the middle level and the Project Evaluator at the project level. British Overseas Development Administration, International Development Association, World Bank, Industrial Credit and Investment Corporation of India and Project Appraisal Division of the Planning Commission, follow LM method.

LM method has the advantage that for different items are known all that is required is simple multiplication. If the CFs are provided, all that the project
analyst has to do is the multiplication. A rough estimate for a CF is obtained simply by dividing the world prices by market prices to be strictly correct although account should be taken of local transportation and handling costs. This method does not require estimation of an SER although its inverse (SCF) is required. LM method has disadvantages also. Once everything is centrally determined, CFs mean that project analyst apply shadow prices without understanding what he is doing. Composite CFs do not allow ready access to information on distribution effects or the impact on foreign exchange, tax revenue and employment. The use of world price Numeraire can lead to the misunderstanding – particularly the mistaken view that the LMIST method means advocating of free trade.

3.11 METHODS USING DOMESTIC PRICE NUMERAIRE – UNIDO

METHOD

The UNIDO method uses as its unit private consumption in the hands of the average consumer measured in domestic prices. This implies a double difference from OECD method – the units are private consumption, not government income, and they are valued in domestic prices and not world prices. Because of this difference the steps in the UNIDO analysis are (1) all the output effects of investment proposals are measured in terms of domestic prices and the (2) additional consumption resulting from the project is not revalued in terms of government income. It treats all savings whether public or private, as equivalent to government income. All additional savings are revalued in terms of consumption, since consumption is the UNIDO unit. If S is
the additional savings resulting from the project, and if \( v \) is the symbol used to express the value of one unit of savings in terms of units of average consumption, then the value of the extra savings created by the project is \( S_v \). The total benefit of the project would then be the extra consumption created plus the consumption equivalent of saving = \( C + S_v \). (3) The foreign exchange effect of a project is treated in a reverse way from OECD method. In order to express the extra value of foreign resources in terms of domestic resources, OECD method reduced the value of the domestic resources. This was because the analysis was in terms of world prices. The UNIDO system has a similar adjustment, but in the opposite direction, the value of foreign resources is increased in terms of domestic resources. A shadow exchange rate greater than the official rate is used to revalue the foreign exchange effect of the project.

Suppose that a project produced a traded output valued at Rs 100 at the official exchange rate, produced by domestic resources valued at Rs 100, the UNIDO analysis increases the value of the foreign exchange earned. A shadow exchange rate greater than the official rate is used to revalue the foreign exchange effect of the project. If shadow exchange rate is 25% greater than the official exchange rate, the net benefit from the project will be \( 100 \times 1.25 - 100 = \text{Rs} .25 \). Thus shadow exchange rate is 1.25 while the corresponding OECD conversion factor is 0.8 which is equal to \( 1/1.25 \). (4) The income distribution effects can be incorporated into UNIDO analysis by relating benefits to a group or class of consumers who consume at the average level of consumption. (5) Shadow wage rate can be calculated as follows:
SWR = Z + c S v + (1 - S) c - c -----(1)

Where,

\( Z \) = loss of the aggregate consumption value of labor's marginal product in the sector from which the labor is withdrawn

\( S \) = marginal propensity of the capitalist to save.

\( v \) = Present value of investment

\( c \) = market wage rate.

\( c S v \) is the loss of equivalent consumption by the capitalist, because he has to give out \( c \) as wages to the labor. If he had not given out \( c \) as wages, he would have saved \( cs \). The consumption equivalent of this foregone consumption is \( cSv \)

\((1 - S) c \) is the actual consumption loss by the capitalist. If the capitalist had not paid out a wage \( C \), he would have consumed \((1 - S) C \).

\( C \) is the consumption gained by the labor, because the project came into existence.

\( (1) \) works out to be,

\[
\text{SWR} = Z + CSv + C - CS - C \\
= Z + CSv - CS
\]
The most well known expositions of domestic price Numeraire approach are the two publications commissioned by UNIDO – the original "Guidelines for Project Evaluation" by Das Gupta, Margiin and the more recent "Guide to Practical Project Appraisal " by JR Hansen.

Guide pays much attention to the relationship between economic analysis and financial analysis. The Guide uses what it calls an 'integrated documentation system'. Net cash Flow Financial shows the financing of the project and the distribution benefits. The 'The Net Cash Flow Real' is concerned with the resource costs and benefits. Shadow Price adjustments are made to the resource costs and benefits. 21

Stage 1:

NPV is worked out at market prices after taking account of linkages and externalities.

Stage 2:

Adjustments are done for 'market price distortions'. Traded goods are valued at border prices thereby eliminating tariffs and other transfer payments. Labor is valued using an opportunity cost shadow wage adjustment.
Stage 3

Shadow exchange rate adjustment is done. The Adjustment Factor for foreign exchange is applied to the foreign exchange component of each cost and benefit item.

Stage 4

Adjustment is done for the shadow price of investment

Stage 5

Adjustment is done for the distribution of consumption.

Stages 4 and 5 can be combined.

\[ CF = \text{shadow rate/market rate}. \text{ CF is a ratio. Is 0.8. It is multiplicative.} \]

If CF for rice is 0.8, and the market price of rice is \( M \), the shadow price of rice is

\[ \text{Market Price for rice} \times CF \text{ i.e. } M \times 0.8. \text{ Adjustment Factor is additive.} \]

\[ AF = (1 - 0.8). \text{ Shadow market price of rice is } M + (CF - 1) M \text{ i.e. } 0.8M. \]

The procedure in the Guide is additive. The final NPV of the project is the stage one NPV + transfer payment and labor adjustment + foreign exchange adjustment + shadow price of investment adjustment + consumption
distribution adjustment. Of course, it may not be necessary to include all stages in the analysis. In particular economic analysis would include only stages one, two and three.

3.11.1 ADVANTAGES OF USING UNIDO GUIDE APPROACH

The main advantage of the 'Guide' approach is:

1) The approach is flexible and can be taken to whatever degree of complexity is felt advisable.

2) The shows the link between financial and economic analysis — although the 'integrated documentation system' not as clear as it might be.

3) The procedures are designed to allow easy use of sensitivity analysis where shadow price estimates are uncertain.

4) The approach can be adjusted to show clearly the income distribution effects of the project as well as the effects on foreign exchange, employment and tax revenue.

5) The approach relates more closely to the sort of approximate shadow pricing that is more commonly used than elaborate systems i.e. (rough adjustment of foreign exchange, labor and taxes).

The guide approach works in stages.
3.11.2 DISADVANTAGES OF USING THE 'GUIDE' APPROACH

(1) The use of present values obscures information on the timing of different effects. The use of present values however is not an essential part of the approach.

(2) The 'Guide' approach has not been so extensively used as the LMSVT approach and is not backed up by so many published case studies. It is also not used by major international donor agencies, although its use would probably be acceptable to these agencies.22

3.12 WHICH NUMERAIRE TO USE?

If SCBA is used to select projects, all projects must be assessed using the same Numeraire. The choice must be done at the national level.

The two approaches are equivalent in principle, given a unique set of data and an identical set of assumptions. L and M base their approach on the assumption that future tariff and subsidy policies would tend towards the optimal. They treat 'potentially traded goods' as tradable since they believe that the government, following an optimal policy would import (or allow imports, by removing / reducing tariffs) those goods which, due to some reason, are now being produced at home, at a comparative disadvantage and that by the same token, those goods which are produced at a comparative advantage but wholly consumed domestically would in future be exported. The UNIDO theorists explicitly assume that the existing commercial policies and none other would be followed during the life of a project. Thus the relevant 'marginal trade bill' used
to compute SER is that which is consistent with the existing system of tariff/subsidies and none other. Bela Balassa, Deepak Lal and Squire and van der Tak say that the two approaches can be expected to give the same accept/reject decisions provided the same policy assumptions are made. But in practice, the two methods might not give the same rankings because the 'marginal trade bill' in reality consists of a collection of items different from that used to compute SCF. Hence the strict reciprocity between SCF and SER would no longer hold.

Domestic Prices Numeraire has the advantage that the bases for revaluation are simple to understand. Recognising that foreign exchange is scarce and valuable, it can be stated intuitively that foreign exchange can be valued upwards rather than speaking about revaluing domestic prices downward. However this upward revaluation requires a reliable estimate of the shadow exchange Rate (SER) – the CF for foreign exchange.

Using a World Prices Numeraire requires an estimate of the SCF. Neither SER nor SCF is easy to forecast reliably. Due to the possibility of making the adjustment incorrectly, it is better to apply it to the smallest portion of figures to be revalued. When investment projects have a high foreign exchange content of inputs and products, the world prices basis could be preferred because it minimizes the risk of making an incorrect adjustment in respect of foreign exchange. In such projects, it can be said that the use of world price numerate highlights the importance of the foreign exchange factor.
and the need to pay particular attention to the opportunities for trade and the valuation of Traded Goods.\textsuperscript{23}

However most projects consist of both traded and non-traded items. The choice of between the L-M or UNIDO approach depends on how far one is able to (or wants to) decompose non- - traded goods into traded goods and labor. Where non- - tradable constitute a comparatively insignificant proportion; application of a single conversion factor (L M) or a single SER (UNIDO) will suffice. Under such circumstances the two alternatives can be considered equivalent. If one go to the full length of decomposing all non-tradable into their tradable and labor components, the LM approach is preferable. The issue then narrows down to the availability of data.

3.13 MUTILATIONS AND LOSS OF LIFE

Attempts have been made to estimate the loss of life, which happened consequent to the project. One approach is to find out the value of expected future earnings and to subtract from this the discounted value of his future consumption. The economist's finesse had gone far into the extent of considering also the cost of premature burial - the idea being that the present discounted value of the funeral expenses is higher if they are incurred the sooner owing to an untimely death. This method seems to consider man's life only in economic terms. If man is viewed only in economic terms, would it not be a benefit if the project induces the death of the elderly and the frail who no longer have any economic value? Actually there is a high psychic cost to the
relatives of the dead person it is very difficult to provide for these costs in the SCBA calculations.

When there are diseases and disablements caused by the new project, these too have to be considered and the costs have to be worked out in terms of the loss in productivity.

Another approach is to use the insurance premium; a man is willing to pay for the probability of his being killed as a result of engaging in some specific activity. This method has superficial plausibility. The demerit of this method is: the amount of insurance a man takes out may be interpreted as a reflection of his concern for his family and dependents, but hardly as an index of the value he sets on his own life. If a bachelor with no dependents does not take a flight insurance, it can not mean that the value he places on his life is 0.

If in ordinary circumstances, we face a person with the choice of continuing his life in the usual way or of ending it at noon or tomorrow, a finite sum large enough to persuade him to choose the latter course of action may not exist.

In certain projects ex ground and air traffic, the number of deaths can be reasonably predicted. But if the value of life is accounted for (if at all we can account for it) such projects will never become feasible. No sum of money is large enough to compensate a man for the loss of his life.\textsuperscript{24}
3.14 ENVIRONMENTAL SPILLOVERS

Till the advent of environment movements, the public had been accepting physical environment as it has been accepting the weather, as if it is a phenomenon outside one's control. Clean air, quiet and attractive surroundings all critically affect his well being. But some projects rob the citizen of these natural amenities.

Suppose a project's outputs cause adverse spillovers to the citizens. Suppose in a community the law does not prohibit environment pollution. If we want the project owner to curtail his output for environmental reasons, the community or the government may have to compensate him, say, through subsidies. On the other hand if the law prohibits environmental pollution, the manufacturer might have to bribe the citizens for permitting him to go on with his activities. The government may impose taxes on the manufacturer. Thus the question of who compensates who depends on the existing laws – whether the existing laws are permissive of environmental spillover or prohibitive regarding environment pollution. The amount of compensation has to be settled through negotiation. Negotiation itself is a costly affair. Sometimes negotiating costs exceed the sum total of the benefits to the manufacturer and the community.

There is a practical problem in using CVs. The value or rather the priority attached to clean environment will be higher for the higher income groups than for the lower income groups. The lower income groups in their struggle for subsistence is likely to attach fewer premiums for environmental considerations.
But the story is different for the poor people who interact with environment for their livelihood. If the livelihood of the forest based tribals will be threatened if the forests are destroyed.

In SCBA, we discount the future benefits. Beyond 50 years the discounting factor becomes negligible whatever may be the rate of discount and hence cost benefit enumeration is not done beyond 50 years. But this discounting can not be said to operate in the case of natural amenities. Perhaps, it is the opposite of discounting which will be more suitable, because, clean water, natural beauty, fresh air etc in all probability will become more scarce and more valuable to the future generation living beyond 50 years than for the present day population. In SCBA, we have to take into consideration intergenerational equity.

### 3.15 PRACTICAL ISSUES IN THE EFFICIENCY ANALYSIS OF PROJECTS

There are 4 areas where we confront issues in using efficiency shadow pricing – (1) getting usable values for National Parameters (2) estimating shadow prices at project level (3) setting priorities and limits in undertaking efficiency analysis (4) how to proceed in situations of minimal availability of data and resources.

Not only the CFs for basic resources, but also the CFs for certain non traded items like road transport, rail transport, power, water etc should ideally
be estimated by a national level body, published by it and made available for use to project level analysis.

One basic value that must be checked and calculated afresh for each project is the CF for unskilled labor, especially for the unskilled urban workers. This is because there can be significant variation in value between regions in all but the very smallest countries. The analyst of the individual project may also have to estimate SER\SCF though often a usable or conventional value will be made known. Making crude estimates, need not be very difficult. However, the shadow prices for the main outputs and inputs to the project will have to be estimated individually. No item in the economic analysis is more important than the value of the output and getting accurate market price and efficiency values for this must have first priority. This is especially true in the agricultural projects, where taxes, subsidies and other aspects of 'administered prices' so often mean that the farm or project level price is not a good estimate of the Border Parity Price of traded goods and its equivalent for non traded output, the Market Parity Price.

Next priority should be given to estimating CFs for the two or three most prominent inputs. For example, in agricultural projects this may mean studying the price of land, labor, and water perhaps and probably fertilizer.26

3.15.1 LIMITS TO SHADOW PRICING FOR INDIVIDUAL PROJECTS

Use of world prices as opportunity costs assumes that such prices can be discovered and that they are sufficiently stable to be used in a medium term
project analysis. For many primary commodities, world prices are unstable and
difficult to predict, while many capital goods are specific to particular projects
and do not have widely known world prices.

There are many operational limitations for SCBA. The single major
problem is lack of data. Trade statistics are necessary to get the relevant c.i.f.
or fob prices of specific goods, the categories of traded and non-traded goods
and to know the proportionate share of various categories of goods in trade bill.
But trade statistics are published in highly aggregate forms. We have to spend
a lot of effort to compile them in a form suitable for drawing inferences. Many
items fall both in export and import lists. We have to find out the relevant items
for which our country is net importer or a net exporter. We will find it difficult to
assess the domestic capability to produce certain items. We also need
information on the state of utilization of capacity before deciding whether the
proposed inputs will be produced or imported. We need to refer to Customs
and Excise schedules to determine the tariff rates (Rs\kg). We will have to
discriminate between the different range of quality of the same commodity.
Breakdown of goods and services into their various cost components is a very
formidable task. We will have to choose a typical firm from a range of firms with
varying sizes and scale. To compute the social value of labor's consumption,
we will require household survey. We can obtain this information from census
publication.

The data needs for deriving shadow prices are substantial, especially for
estimating the cost composition of project level prices for inputs and outputs
and to find out the relevant MVP for labor and for valuing land. But secondary sources may be found and used. Even if various existing sources may be explored, the

Analysis of most projects will call for some new research to allow satisfactory estimates to be obtained for shadow prices. The main outputs and two or three main inputs will have to be shadow priced. NPV and IRR will have to be worked out at shadow prices. The alternative estimates of these will have to be worked out using different values of important technical or price parameters. The numerical results should be accompanied by some discussions of the reliability of the estimates, omissions from there and the risk implications of relying on them.

Shadow Pricing needs to be done only on those items, which are likely to affect the overall measures, NPV and IRR. Complete treatment will not be required in the operational context.

Although SCBA is a very interesting theoretical concept, it is an operational tool. We may not be be able to use it in a fully rigorous way. Although we may not be able to estimate the exact magnitude of the shadow prices, it is possible to predict the direction in which it varies.

- Taxed exports will have a CF well above 1
- Subsidized import substitutes will have a CF well above 1
- Heavily taxed items like fuel will have a CF well below 1
• Imports that are not taxed will have a CF greater than 1, if they are taxed, the CF will decline as the rate of taxes rise.
• Non-traded outputs will have a CF 1 or close to it
• Non-traded inputs sold at unsubsidized prices are likely to have a CF below 1

Sometimes, an economic analysis at market prices and consideration of the types of inputs and outputs involved will allow a fair qualitative judgement to be made for some projects, not all important inputs and outputs can be fully handled. Hence it is quite often necessary to do only partial shadow pricing. Sometimes, it may be found that the NPV is safely positive and that the effect of further revaluation will only increase the net benefits. In such cases, the project can be recommended without further work on shadow pricing. The same approach might be followed with regard to project effects that have not taken into account intangibles and unmeasured externalities. Estimates may be made without them and a qualitative assessment made of whether on balance they will in aggregate have a positive or negative effect.

References:

2. Ibid


7. D Aruna, op.cit.


14. David Potts, op.cit.
15. Parth Das Gupta, op. cit.


25. Ibid
