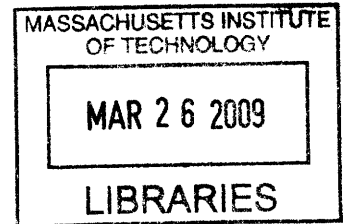


**Project Identification and Evaluation Techniques for Transportation
Infrastructure: Assessing their Role in Metropolitan Areas of
Developing Countries**

by

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Bachelor of Technology in Civil Engineering
Indian Institute of Technology, 2001



Submitted to the Department of Civil and Environmental Engineering
in Partial Fulfillment of the Requirements for the Degree of
Master of Science in Transportation

at the

Massachusetts Institute of Technology

February 2009

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Abstract

Project identification and evaluation of transportation infrastructure play a vital role in shaping and sustaining the forms of cities all over the world. These cities differ substantially in character and urban form and have different transport systems and transport related problems. Most large cities in the developing world face major problems as a result of rapid population growth, extensive urbanization, market uncertainties, scarcity of resources and inadequate planning capabilities. Transport policies and procedures that worked reasonably well when cities were smaller start failing as they expand, while environmental and social problems become more pressing. The traditional methodologies for evaluating urban transportation infrastructure projects are unable to address issues of most concern in developing countries.

The thesis outlines a framework for assessing the role of various planning and evaluation methodologies for transportation infrastructure projects. The framework developed for project identification and evaluation serves as a useful tool to structure and assess the gaps identified from a literature review and case studies. The major gaps identified can be listed as:

- Lack of integrated approach for transportation infrastructure and land-use planning;
- Inadequate provision for maintenance and monitoring of transport facilities;
- Unequal distribution of benefits of transport for women;
- Limited rural transport infrastructure; and
- Lack of suitable financing arrangements and no incorporation of sustainable development measures.

The overall transportation planning and evaluation process can be improved by incorporating certain steps and requirements that address these gaps and make transportation infrastructure more accessible, safer, reliable, and efficient.

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Acknowledgements

I would like to thank my advisor, Carl Martland, for his continuous guidance, advice and encouragement throughout my stay at MIT. His valuable support, suggestions and comments have been very essential to the completion of this thesis. It is my tremendous privilege and honor to have had the opportunity of working with him.

I would also like to convey my thanks to Prof. Joseph Sussman with whom I had the opportunity to work during my first year at MIT.

I am grateful to all the faculties, students and administrative staffs at the Department of Civil and Environmental Engineering for making my education a valuable learning experience. My sincere thanks to all the fellow class mates in the MST and MEng. Program, whose friendship I shall always treasure.

As always, I am very grateful to my family-for their never-ending patience, love and support.

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Chapter 1

Introduction

1.1 General

Transportation has always played an important role in influencing the economic and social development of cities. An efficient transport system has always been fundamental for economic development and has become increasingly more important with the globalization and integration of industrial processes. There is no doubt that as cities begin to expand both in terms of space and population and reach a scale beyond that of reasonable walking distance, the available transportation technologies and planning and evaluation methodologies become very vital in shaping and sustaining their forms. It is well known that the urban population of the whole world is growing at a very fast pace while a large portion of it is widely spread among the various cities in the developed world, it is much more heavily concentrated in the metropolitan areas and mega cities of the developing world. The provision of new infrastructure is relatively slow and costly to put in place and, particularly in the more acute areas where population density is high, demand may be impossible to satisfy fully. The fast-growing population coupled with geographic and resource constraints is one of the reasons why a large number of transportation infrastructure projects in these developing countries face several problems. These include cost over views, time over runs, delays, inadequacy, insolvency, labor problems, supply-chain deficiencies, lack of equipment and poor maintenance etc. The congestion that occurs results in loss of productivity and resources as well as impacting negatively on human health and generally degrade the environment locally and globally.

Typically, the projects in the developing world result in or are aimed towards the creation of new transport infrastructure facilities or modifications in existing ones. These projects also include works of construction of several transport networks or alternate transport modes in conjunction with the existing infrastructure. Public and private sectors of several countries make a huge capital investment into these infrastructure development

projects. The rising construction costs and the ever increasing tightening of project development funds foster a need for obtaining the full value of every unit of capital spent on these large-scale projects. A wide variety of situations in terms of size, complexity and technical requirements and other factors (for example, location, environment, user characteristics, politics etc) may be involved. If these are not taken care of in a proper manner in the transport project planning and implementation process, they may result in further problematic situations that can affect the outcome and the performance of the whole project. So it is very important to take into account such factors and situations of variable character in a comprehensive manner and evaluate the project in terms of its performance and impacts it will make on the economy, the society and the environment. The conduct of this project evaluation and appraisal is a long and complex process that depends partly upon the use of various techniques and procedures and partly upon skill that can only be learnt by practice and prior experience.

Project evaluation as suggested from several World Bank sustainability studies and reports, is also important in the sense that the variable nature of the factors can sometimes result in inappropriately or inadequately designed and planned transport strategies, programs and projects that can aggravate the conditions of the poor people, harm the surrounding environment, ignore the changing needs and characteristics of the users, exceed the capacity of the public finances and thus fail to meet most of the transport objectives.

These studies also describe that since there are wide diversity of problems and constraints particularly in the context of developing countries, no single strategy or solution or methodology of project evaluation fits all of them. But there are some common situations, factors and principles despite the disarray created by the variety of transport infrastructure projects that can be identified and lessons learnt from past experiences of transport projects. These lessons can serve as a useful basis for the policy or methodology of evaluation towards more viable and sustainable transport development in future. For example, one of the lessons that can be learnt from past experiences of transport projects is that infrastructure and basic mobility and accessibility deficiency tends to be a more

dominant problem in poorer and developing countries while service quality issues tend to be forefront in the developed countries.

1.2 Problem Description and Hypothesis

The cities in developing countries differ substantially in character and urban form and they all have different transport systems and transport related problems. But what they have in common is that as they grow bigger (urban population increases) or richer (per-capita income rises), their transport situations and problems get worse. But in response to these problems, little or no corresponding changes or developments are made in the existing methodologies or procedures of evaluation in these developing countries. Thus the transport policies and procedures that work reasonably well when cities are small fail as they grow big and therefore environmental and social problems become more pressing. They seem to neglect some of the most important areas and thus are increasingly unable to address the issues of most concern to decision makers and policy planners. This implies that these techniques and procedures have not yet evolved significantly to deal with the current observed transport problems and sustainability issues particularly in developing countries.

This leads to a need for the whole project evaluation process to identify and tackle more critical and complex situations. This is because as a nation's economy and the transportation system matures and the intensification of the competition for project funds takes place, the issue is not simply where to build another segment of highway or which airport needs to be expanded; other more complex issues need to be addressed. For example, there can occur a dilemma on whether it is better to invest in building an additional transportation infrastructure facility or expanding the existing one to accommodate greater growth in a given region or whether it is better to invest more capital in monitoring and maintenance of transport infrastructure after its construction over a period of time or re-build it without adequate investments in those areas.

Growing capabilities and investments in the engineering, science and technological sectors have made it possible to design, conceive, implement and monitor large-scale infrastructure projects. Transportation planning processes are usually very sensitive to public needs and other factors and inputs and usually in such value improvement projects, a number of alternative solutions to satisfy the given objective are prepared and formulated. The overall decision process usually becomes very complex if the various alternatives differ with respect to the multiplicity of attributes such as functional performance, cost, reliability, durability, appearance, maintainability, safety, financing options and so on. This calls for the need of suitable transportation project evaluation /appraisal techniques and procedures incorporated in the overall process that can lead to proper development of transportation infrastructure not only from the conception phase to the implementation phase but also to efficient monitoring and sustainability in the post-implementation phase.

Whereas there is no doubt that transportation is essential to the operation of the economy of the country, much still needs to be understood about the ways in which an efficient transportation system can operate and improve the productivity of the country's economy and at the same time promote sustainability. This is important because the low-income or developing countries may be best provided the option of provision of adequate transport infrastructure to improve economic performance but the attempt to provide for unlimited private mobility as cities expand and get richer will almost certainly begin to create conflicts with the environmental quality and the society that will generate different relative priorities for the planning organizations. Therefore there is a need for project evaluation methods and procedures to account not only for sustainability but several other areas of development that are normally neglected and to improve the overall performance of the project.

The neglected areas can be identified by studying various case examples from developing countries and reviewing them to find out certain 'gaps' in the evaluation methodologies of transportation infrastructure projects. This would then help to propose certain ways of how these 'gaps' can be overcome to enhance the overall economic and social

development in a country. Another major purpose of the research will be to assess the role of project evaluation methodologies of transportation infrastructure in developing countries. This will help to identify and develop questions and methods that can be used by transportation officials, planning agencies and other stakeholders to develop a broader and better understanding of the existing situation and the various alternatives available in order to implement the most effective infrastructure development project option in the given scenarios.

1.3 Thesis Objectives, Methodology and Approach

It can be understood that Transport Project Evaluation and Analysis are essential activities in Transportation Planning and may be defined as the activity or process that examines the potential of future actions to guide a transport system or network towards a desired direction. They provide the basic framework for estimating the future needs and accommodating the new trends for transportation infrastructure facilities. A Framework for Project Evaluation is a challenging task because of the great diversity of projects and different country environments entailed in it. In order to be effective, an evaluation framework must therefore take into account, respect and respond to the diverse situations in the developing countries. At the same time, it must also provide a consistent and common process that applies to a wide range of projects and produces evidence-based results. This will promote learning about what contributes to successful and better transportation projects in the metropolitan areas for the developing countries. But it is very difficult to do so since these countries have their own transport related problems and differ substantially in cultures and character.

As discussed before, the purpose of this thesis will be: -

- To assess the role of transportation planning processes and project identification and evaluation methodologies in metropolitan areas of developing countries

- Identify major “gaps” (general or specific) in the current evaluation and appraisal methodologies of transportation infrastructure projects in the developing countries and
- Develop and outline a framework for project identification and evaluation and then structure and assess the gaps identified from above according to the framework and then finally
- To suggest better steps/methods of evaluation and the requirements or improvements that can be incorporated in project evaluation and analysis methodologies

The research will first assess the existing project evaluation methodologies based on a literature review, discussion of relevant case studies from different websites and development of a project identification and evaluation framework.

The literature available on project evaluation is abundant. A comprehensive literature review illustrates the rationale behind various project evaluation and analysis methods, shows their applications to transportation systems, and discusses their shortcomings. Also various case studies and examples and evaluation/performance reports of major transportation infrastructure projects in developing countries from different sources such as the World Bank Website or the Asian Development Bank Website etc. have been undertaken, studied and categorized in detail in support of those methodologies. The case studies indicate how well these procedures worked in line with the overall objectives or rationale of the projects and what was missing in the evaluation process. The different issues, ideas and requirements behind the concepts have been brought out and the challenges faced by these developing countries have been identified. This is important because the strategies that these countries need to adopt and confront the new trends and situations and promote sustainable transport development can then be easily identified and built upon.

Some of the issues of project evaluation will be concerned with the overall transport objectives and increased emphasis will be placed on economic, environmental and social

sustainability. Others will consider the relationship of urban transport policy and procedures of evaluation to the more general issues of urban forms and functions. Thus the identification of certain gaps in the existing methodologies of project evaluation will help us to gain further insight into the matter of these cases. The generally applicable principles and procedures and the best available practices will then provide us with several opportunities to form a basis of coming up with better requirements and ways to overcome those 'gaps' in the evaluation processes. Also the degree to which the application of modern means of technology or likely technological developments in transportation planning models can resolve the problems identified and enhance the performance will be considered in the project evaluation and analysis processes.

The analysis of the case examples and matching the outcomes of those transport projects with the initially defined goals will also help us to identify some of the key questions that need to be asked while conducting project evaluation as a part of the Project Planning and Implementation Process.

These questions will include: -

- Was the project selected the best available alternative?
- Were the given projects able to achieve their established objectives or not?
- If not then why not?
- What specific areas of the project need more attention?
- What are the guidelines laid out for its successful implementation and monitoring?

This evaluation process can then help to enhance the whole project by integrating the answers of these critical questions into the action plan. The whole idea is to focus on the results or performance of the project and to guide the project in the desired direction on a timely basis to achieve the desired outcomes. A systematic approach towards project evaluation can then help in early analysis of outcomes from the concurrent activities and allow for various processes and actions to be adapted in light of the emerging outcomes.

The evaluation can be a very important tool and serve as basis for integrating the whole project. It can also help in assessing the effectiveness of the project in undertaking the proposed actions to measure the impact of the project in terms of its stated goals and to determine its sustainability in its entirety. In addition, this can also help to monitor the feedback and identify different issues for further transport development in similar context and background situations. As part of the evaluation process, it is thus important to formulate certain key questions to analyze the effectiveness, impact and sustainability of the whole project and also to focus on the process as well as the inputs and the outcomes of the project.

Review of several project descriptions in developing countries and evaluation of current and past initiatives will help us to identify the key activities and the stakeholders, understand the various assumptions which form the basis of the projects and also allow for comparison between characteristics of different infrastructure projects. A careful study and analysis of these projects can then help us in making appropriate recommendations to the planning organizations in the country which they can duplicate in the supply mechanisms or successful strategies employed and also learn from the past experiences to guide the future transport infrastructure development.

In short, the approach will be to first of all formulate some questions to consider project evaluation as an important process in the overall planning and implementation of transport infrastructure projects in developing countries. Efforts will be made to go through several case studies or examples from credible sources and websites to find out what are the mistakes that have been made, identify what gaps (in some general as well as specific areas) exist in the current evaluation methodologies and what areas need more focus in terms of infrastructure investment. After going through their assessment and analyzing their impacts on various fronts, they will be structured according to the framework developed for project identification and evaluation. Suitable steps and requirements will be then suggested so that they can be incorporated in current evaluation practices to promote efficient and sustainable transport development.

For this purpose, various performance evaluation studies and audit reports from the World Bank and the Asian Development Bank and useful cases from other sources will be studied in order to study the viewpoints of different stakeholders and come up with several useful ideas on project evaluation and assessment. Then some major gaps that are evident from the case studies will be identified using the framework developed for project evaluation, prioritized and build upon in detail. Also other gaps that are not clearly understood and visible but result from other sources will be listed. The impacts on economy, society and environment will be identified and some important questions will be formulated that should be asked while evaluating major transportation infrastructure projects in developing countries. After analyzing and reviewing the major infrastructure projects for the weaknesses and shortcomings in the evaluation procedures, suitable ideas and actions will be suggested in order to overcome those “gaps” in the evaluation methodologies.

1.4 Approach Used for Assessing and Reviewing the Websites

The advent of the Internet and the World Wide Web has made available vast amounts of information on virtually any topic of interest to us. The Internet can thus serve as a useful medium to search for various case studies and examples that can then be selected for review and analysis for the purpose of research. Organizations such as the World Bank, the Asian Development Bank and many others make their cases, reports and papers available on their corresponding websites and therefore it is possible to find excellent and relevant information. Some of the local agencies, developers, planning officials and advocates from several countries may also publish on the Internet; and some of this information can serve to be quite useful.

With the huge quantity of information that is contained here on world wide web, the users at the same time must also be aware and careful whether the particular website or the subject matter presented therein is authentic, authorized and applicable in the chosen field. This is because the online sources today are becoming one of the prominent sources of information both for teachers and students. The users must know what type of

information from a particular website will be useful to them (pertaining to a particular topic) and also the process of finding and evaluating such information from a diverse array of sources available on the web in a critical sense.

One of the ways is conducting searches on familiar topics in various search engines and then listing those websites related to that particular search. Users must then be able to critically evaluate the website found, examine its technical aspects as well as the authority of the presenter and the validity of the website.

The criteria that can be used to determine whether the website is good and useful for evaluation of transportation infrastructure projects can be identified as:

- 1) Purpose: What is the purpose of the website mentioned? And the reason for presenting that information there on the website? Who can gain from the website?
- 2) Authorship of the website- This implies whether the author of the website is clear from the information presented or well recognized? Does the document presented therein contain a biography or contact address of the author in the end or the beginning? Does the website has been linked from a trustworthy website? Does it have a copyright or trademark? For example, websites such as World Bank, Asian Development Bank, TRB etc. are well authored and considered authentic.
- 3) Credibility/Authenticity: Is the information authentic and trustworthy? Does it actually come from the mentioned author/agency/group? Are the sources of the facts and figures presented in the document clearly listed and dated?
- 4) Timing/Dates of the website or the information presented: Does the web page (or information presented) have dates listed about when it was first written or placed on the web or last revised? Is the information presented current or outdated?
- 5) Citations and References: Does the author/group give a full bibliography and the list of sources or citations at the end of the document or about the topic presented? That is - Where does the information come from?

- 6) Information Content: Does the website have relevant information pertaining to a topic and is it error free? Is the information presented in a fairly comprehensive manner or just overview given or is it out of context and misleading? Why is the information presented there is useful and appropriate for use? Is the information presented of good quality? Is it easy to find pertinent information on that website?

It will not be uncommon that a particular website given will not meet all of the above-mentioned criteria and there may be several such cases. But it may happen then that website may offer a good amount of information to the related topic of research and serve as a useful source of information. In general, some of these websites will not be useful; some will just be promotional and some will be very useful and relevant.

1.5 Organization of Chapters and Contents

The thesis is organized into five chapters in total.

The first chapter has described the role of transportation systems for the economic and social well being of a country and also given a brief introduction to the sustainability issues and challenges faced by current transport systems. It highlighted some of the issues regarding inefficient transport infrastructure development and then introduced the problems of current project evaluation methodologies in developing countries. It then also established the need of assessing the role of suitable project identification evaluation of large-scale transportation infrastructure projects in metropolitan areas of developing countries. Finally it presented the methodology and approach that will be used to assess the roles and identify the gaps in the existent project evaluation methodologies through the study of several case examples from different developing countries and come up with better project evaluation techniques and procedures to improve the overall performance of the project. In the end it describes the approach for reviewing information from the websites and the organization of the contents of the various chapters for the thesis.

The second chapter reviews the literature on project evaluation and appraisal methods for transportation projects in general. It then describes the different criteria used for project evaluation and the strategic considerations taken during the project implementation process. The viewpoints of various authors and many of the important details regarding the project evaluation methods in different contexts are also presented.

The third chapter presents a brief overview of the transportation planning process in general. It then reviews various case studies and examples from different sources in order to identify major 'gaps' and issues in project evaluation methodologies for transportation infrastructure projects in developing countries. The chapter then presents a discussion on some of the key gaps identified and ultimately concludes with a set of project evaluation questions identified from different organizations that need to be considered in the project evaluation process.

The fourth chapter presents an outline of framework for the project identification and evaluation process as a useful means of understanding and prioritizing the gaps identified in general. The chapter then analyzes, discusses and categorizes the previous findings on various gaps and issues from the literature review and the case studies according to the developed framework. . It then comes up with better ways or options of dealing with those issues and problems in metropolitan areas of developing countries by using the framework and ideas developed in the prior chapters. Experiences from several cases will also help to develop and implement solutions from one country for problems identified in another country with similar background scenarios.

The fifth chapter summarizes the whole research and comes up with several useful conclusions from the previous chapters. It presents useful suggestions and recommendations for overcoming the identified gaps and shortcomings in the project evaluation methodologies and assessing their role in transportation infrastructure development. It also presents some ideas for further research in this field.

Chapter 2

Literature Review

2.1 Overview

The purpose of this chapter is to review the literature and other credible sources of information regarding the role of project identification and evaluation of transportation infrastructure in metropolitan areas of developing countries. The literature review will address four areas:

- Information regarding the importance of transportation infrastructure development and its appraisal and evaluation process in several third world countries,
- The definitions of impacts and project evaluation and different methodologies of Project Planning, Design, Evaluation and Implementation for transportation infrastructure,
- The different types of project evaluation procedures and criteria used for them and
- The weaknesses, viewpoints and critical reviews of these methodologies projected from several authors and transportation planning officials in developing countries.

This review will then help to identify the needs of current evaluation practices and establish a framework to search for gaps in the case studies and examples undertaken for further study.

2.2 General

This section of the chapter presents views from different sources and identifies the need for transport infrastructure development in developing countries in particular. It looks at different planning and evaluation techniques and the theory behind them. It also tries to establish the need for assessing the role of project evaluation methods for transportation infrastructure development and to improve the overall evaluation and appraisal process.

A *World Bank paper*¹ on sustainable transport clearly indicates that the transportation infrastructure is a central key to development for any country and plays a major role in improving its economic performance and the well being of its population. It can also be well understood from the paper that there needs to be an efficient provision of physical access to jobs, education, health and other amenities and services, otherwise not only the quality of life of people suffers in general but also without physical access to various markets and resources, the overall growth eventually goes into the stagnation mode and the poverty reduction is very difficult to be sustained in the country. Transport therefore helps to build an economy of a country in two basic ways. First, it provides an access to places to the general population where people can engage in suitable income generating activities and opportunities, consume other goods and services and also travel and enjoy leisure or social activities. Second, transport plays either a direct or a complementary role of a very important mediating factor input into production with other factors of the economy in the country. This can also be seen from World Bank reviews as in Box 2.1.

Box 2.1

Why is the Transport Sector so important?

- *“Value added by transport is estimated to account for 3 to 5 percent of GDP.*
- *Public investment in transport typically accounts for between 2.0 and 2.5 percent of GDP and may rise as high as 3.5 percent in countries modernizing outdated transport infrastructure or building new transport infrastructure.*
- *Transport likewise commonly accounts for 5 to 8 percent of total paid employment.*
- *Demand for freight and passenger transport in most developing and transition countries is growing 1.5 to 2.0 times faster than GDP -the bulk of this increase is for road transport.*
- *Although demand for freight transport in industrialized countries grows less rapidly than GDP, in developing and transition countries the growth rate is closer to that for passenger transport.*
- *In 1994 foreign aid accounted for 12 percent of total infrastructure financing in developing countries (including transport), while private financing of infrastructure accounted for 7 percent and was rising. In 1996 private sector lending to emerging markets peaked at \$196 billion. Since then it has fallen sharply and estimates for 1999 are just over \$17 billion.”*

Source: The Transport Sector Overview, The World Bank Group²

¹ The World Bank Report (1996), “*Sustainable Transport: Priorities for Policy Reform*”, Development in Practice Series, Washington D.C., URL: http://www.worldbank.org/transport/pol_econ/tsr.htm

² *The Transport Sector Overview*, The World Bank Group, URL: <http://www.worldbank.org/html/fpd/transport/whytimp.htm>

Creightney³ on behalf of the World Bank Group did a study of developing countries and reviewed the existing literature on the various linkages between transport and economic performance of a country in general. The study done by him basically concludes that in order to design suitable policy interventions, instruments and procedures, it is necessary to fully understand the way the interaction occurs between the transport infrastructure and the economy, the society as well as with the environment. This is particularly important in the cities that are thought of as major growth centers in the developing country. He also mentions that the transportation infrastructure investments in the real world usually involve great uncertainties and risks but some generally applicable principles, procedures, methodologies and best practices can be identified from previous experiences of the World Bank and other examples of large-scale transportation infrastructure projects in developing countries. The ideas developed and the lessons learnt from these experiences can then serve as a basis for the policy for future planning and evaluation towards more

Box 2.2

Transport Sector Issues at a Glance

- ***“Globalization of trade.*** *Advances in international logistics (for example, multi-modal transport technology, electronic documentation, streamlined customs procedures, etc.) have greatly expanded the scope for international trade in goods and services*
- ***Congestion and pollution:*** *Growing road congestion, particularly in cities, generates pollution and increases road accidents (about 500,000 persons per annum are killed in road accidents in the Bank’s developing member countries and about 70 percent of these fatalities are pedestrians)*
- ***Transport sector deficits:*** *Poorly managed public transport services impose a heavy burden on public finance (for example, until recently, the transport sector deficit in Zambia absorbed 12 percent of the government’s total current revenues)*
- ***Expenditure needs:*** *Large sums of money are required to maintain and modernize existing transport infrastructure (for example, road spending alone often accounts for 10 percent to 20 percent of the government’s development budget)*
- ***Private capital flows:*** *In 1996, lending to emerging markets by private sector creditors totaled \$196 billion (about 15 percent of this went to the transport sector). The current global financial crisis has sharply reduced these private capital flows which are estimated to have fallen to \$17 billion in 1998.”*

Source: The Transport Sector Overview, The World Bank Group⁴

³ Creightney, Cavelle D. (1993), “*Transport and Economic Performance: A Survey of Developing Countries*”, Technical Paper No. 232, Africa Technical Department Series, Washington D.C., The World Bank.
URL: <http://www.worldbank.org/afr/findings/english/find14.htm>

⁴ *The Transport Sector Overview*, The World Bank Group, URL: <http://www.worldbank.org/html/fpd/transport/whysimp.htm>

viable and sustainable transport development. Some of the major issues in the transport sector are also shown in Box 2.2.

This is important in the sense that one of the current goals of the World Bank and other Development Bodies and Organizations in various countries is to work towards the simultaneous achievement of long-term economic, environmental and social sustainability that is the major key to meeting these challenges from a global perspective. But what still remain to be formulated are the ideas and steps on how to tackle and overcome these challenges and develop better solutions. For this, a comprehensive analysis and evaluation of the potential impact of the transportation plans, strategies, programs and projects undertaken by the transportation and city planners in the past needs to be studied, and at the same time whether the aspirations and concerns of the society that these plans and programs serve were addressed to the optimum levels need to be analyzed. The transportation planners thus first need to study and examine the past, present and prospective trends and issues associated with the movement of people, goods and information at local, rural, metropolitan, statewide, national and international levels and also between these intermediate levels. *Eberts*⁵ suggests and describes how the policy makers need to be equipped with the best information and analysis possible about the interactions among the various factor inputs and levels in order to make quick and better quality decisions. The policy makers now need to tackle more critical and complex questions than they did in the past times. For example, some of the questions presented by Eberts in his paper that need to be addressed suitably are:

- *“What mode of transportation will be most cost-effective in meeting the region’s transportation needs?”*
- *“What is the trade-off between additional growth in an urban area and the cost of expanding transportation systems to accommodate greater growth”*
- *“What effect does the expansion of transportation system have on the need to invest in other types of infrastructure?”*

⁵ Eberts, Randall (2000), *“Understanding the Impact of Transportation on the Economic Development”*, TRB Paper for Transportation in the New Millenium, URL: <http://gulliver.trb.org/publications/millennium/00138.pdf>

- *“How should a country prioritize its spending power to maximize economic growth?”*

The goal of efficient transportation planning therefore involves identifying the transportation strategies, programs, projects and methods that are recommended for advancement of the community during a specified period of time, prioritizing these projects in order of importance, and including realistic estimates of costs and revenues for that period. This enables the transportation planning organizations to prepare annual recommendations and a planned program of transportation improvements drawn from the long-range transportation plans. The World Bank from its past experiences also recommends that,

*“For the transport policies and project evaluation and analysis methods to be effective, they must satisfy some essential requirements. First they must ensure that a continuing capability exists to support an improved standard of living. This corresponds to the concept of economic and financial sustainability. Second they must generate the greatest possible improvement in the general quality of life of the people. This relates to environmental and ecological sustainability. Third, the benefits that transport produces must be equitably shared by all sections of the community. This is called social sustainability. All the three requirements are mutually reinforcing”.*⁶

The weight placed on the various components of the general quality of life varies between different cultures; hence countries must define their own path and strategy of development. This also varies between various stages of development. It is therefore critical to the accomplishment of goals and achievement of successful outcomes that the objectives must be realistic and carefully planned for. The paper also describes that long-term maintenance of capital assets requires adequate sustainability of the various facilities and the cost of constructing and maintaining excessively ambitious highways and other large-scale transport networks or attempts to provide transport as a subsidized

⁶ The World Bank Report (1996), *“Sustainable Transport: Priorities for Policy Reform”*, Development in Practice Series, Washington D.C., URL: http://www.worldbank.org/transport/pol_econ/tsr.htm

social service frequently impose unsustainable fiscal burdens on the economy, particularly in the low-income developing countries. Therefore arises the need for suitable project evaluation and analysis methods to account for sustainability of large-scale transportation infrastructure projects, particularly in these low-income developing countries. Some of the questions specifically illustrated by *Belli et al*⁷ while performing transport project appraisal and evaluation are of the following nature:

- *“What is the objective of the project?”*
- *“What will happen if it is implemented, and what if it is not? Is it really worthwhile?”*
- *“Is the project the best alternative?”*
- *“Are there any separable components, and how good are they separately?”*
- *“Who are the different stakeholders and the winners and the losers?”*
- *“Is the project financially and ecologically sustainable?”*
- *“What is the project’s fiscal and environmental impact?”*
- *“What is missing in these project evaluation and analysis methods?”*
- *“What changes could be made to current evaluations to attain the overall transport objectives etc.?”*

Eberts also states in his paper,

“The interface between transportation investment and economic development has broad ramifications that go beyond transportation’s basic purpose of moving goods and people from one point to another”.⁸

It has thus broader purpose in shaping the development and the surrounding environment. Policies and Investments that affect the cost, quality or availability of freight and passenger transport not only benefit the immediate users of those services but have secondary impacts as well. He also describes that any given improvement or development

⁷ Belli, P., J. Anderson, H. Barnum, J. Dixon and J-P Teng (1998), *Handbook on Economic Analysis of Investment Operations*, The World Bank.

⁸ Eberts, Randall (2000), *“Understanding the Impact of Transportation on the Economic Development”*, TRB Paper for Transportation in the New Millennium, URL: <http://gulliver.trb.org/publications/millennium/00138.pdf>

in transportation may change land use patterns and land value, displace the urban poor, allow more women or rural population to participate in the labor market, and lower production costs of landowners, manufacturers and transportation firms- not to mention the potential impacts it can have on the environment. Therefore any transportation system or infrastructure project before its implementation must be thoroughly evaluated of its impacts not only on the population but on the economy of the country and its environment as well.

*Schutte*⁹ states in his paper that project evaluation is a prerequisite for informed decision-making, where project worth is expressed in terms of the degree of the alignment of project impacts with policy goals and objectives at national, regional and local level. Investment decisions involving transport infrastructure are critical not only because of the long-term and diverse nature of the impacts of such investments, but also because of the magnitude of such investments.

A *World Bank* definition of impact is as follows:

Positive or negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended.

Potential impacts of transport infrastructure projects can include:

- Total transport cost
- Vehicle operating cost
- Travel time cost
- Road collision cost
- Economic growth
- Job creation
- Income levels
- Fiscal impacts
- Investment

⁹ Schutte, I. C. (2005), "The Appraisal of Transport Infrastructure Projects: Potential Role of State-of-the-Art Decision Support Tools", Proceedings of the 24th Southern African Transport Conference (SATC), Pretoria, South Africa

- Income distribution
- Economic development
- Traffic levels and composition
- Responsibilities of relevant authorities
- Land and property values
- Access to business and retail centers
- Affordability of other “necessary” projects
- Policies, strategies and priorities
- Other initiatives and projects
- Land use and urban form
- Crime
- Increased accessibility

As suggested by *Schutte* in his paper, it is important to note the following dimensions of impacts during project evaluation and appraisal:

- *Temporal (time) dimension*, i.e. it is important to keep in mind that the analysis period of the infrastructure projects should be over a number of years and it should ideally coincide with the economic life of facility.
- *Spatial (space) dimension*, i.e. it is important to keep in mind the specific area within the region that will be impacted because different sub-areas within the region bear different socio-economic attributes and have different socio-economic development objectives and priorities.
- *Affected parties and stakeholders*, e.g. what kind of age and income groups will be affected by the transport infrastructure investments. This is important to keep in mind since public sector investments are more geared towards benefiting certain groups within the community.

Also adequate consideration should be taken to identify overlapping and contradictory impacts during project evaluation since they might have different units of measurement and certain times they might be expressed in qualitative terms only.

2.2.1 Evaluation

Evaluation has different meanings for different bodies and organizations and its definition depends on the background situation in which or for which it is conducted.

As described in the *General Evaluation Handbook for NSF*¹⁰,

“The notion of evaluation has been around for a long time. Not only does the idea of evaluation have a long history, but it also has varied definitions. Evaluation means different things to different people and takes place in different contexts. Thus evaluation can be synonymous with tests, descriptions, documentation or management. Many definitions have been developed and a comprehensive definitionis - systematic investigation of the worth or merit of an object.”

This definition as it seems focuses on the goal of using evaluation for a definite purpose and therefore it should be conducted for action and performance related reasons and the information provided should help in deciding a future course of action. There seem to be very diverse ideas and perspectives for evaluation and it is very difficult to have a precise definition for it. Nowadays evaluation is being used as a tool that not only measures the success or worth of a project but also as a major contributor towards its overall success.

2.2.2 Different Levels of Evaluation

The evaluation process of an entity or a project can occur at various levels in the process and these levels can be described as:

- Strategy or Plan itself or the
- Program or the
- Project or its
- Components

The hierarchy and organization of these levels is depicted in Fig. 2.1 below.

¹⁰National Science Foundation (1992), *User-friendly Handbook on Project Evaluation: Science, Engineering, Mathematics, Technology and Education*, URL: <http://www.ehr.nsf.gov/RED/EVAL/handbook/handbook.htm>

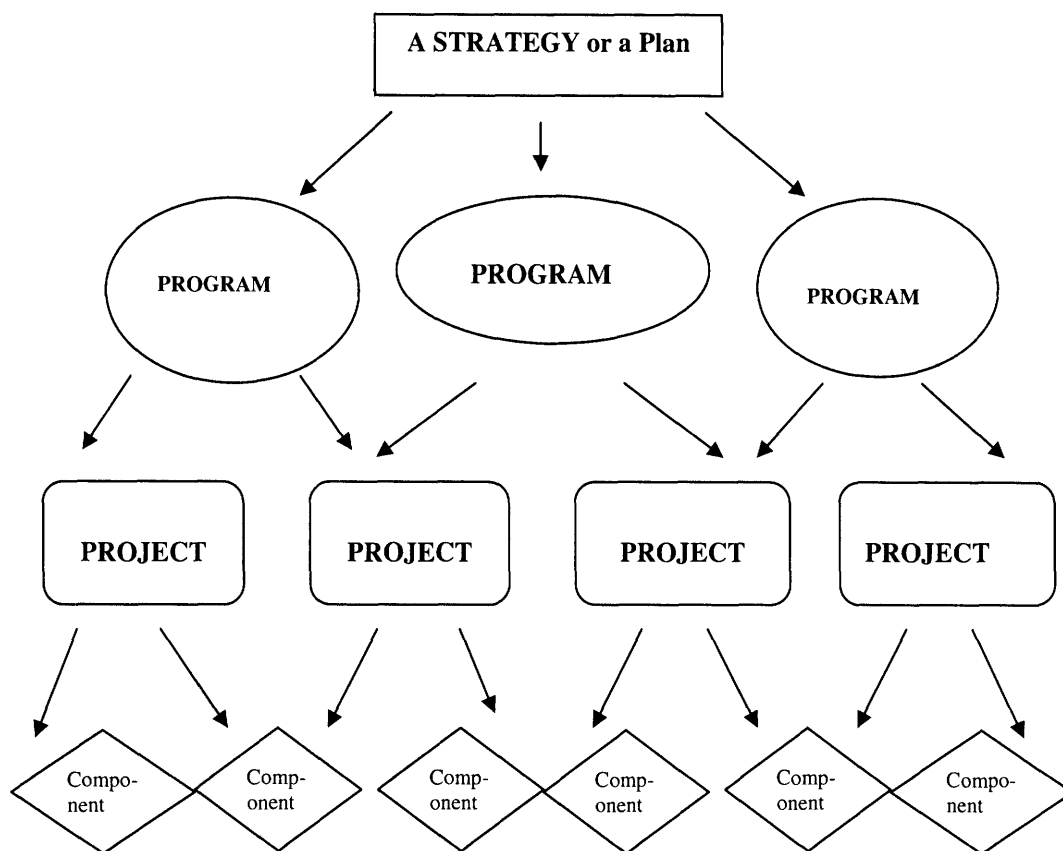


Fig. 2.1: The Various Levels of Evaluation [Source: Inspired from General Evaluation Handbook for National Science Foundation]¹¹

The handbook clearly describes the different levels of evaluation and the major roles entailed in each level of evaluation. The ideas about the following definitions are taken from the General Evaluation Handbook for NSF: –

“Strategy: The action plan or recommended way designed to accomplish certain goals or objectives within a specified period of time.”

“Program: A coordinated and organized approach to implement a particular strategy in a particular area.”

“Project: It is particular developmental activity as an important part of the overall Program.”

“Component of a Project: The several activities or methods that need to be done as a part of the project to meet a defined set of goals and objectives.”

¹¹ National Science Foundation (1992), *User-friendly Handbook on Project Evaluation: Science, Engineering, Mathematics, Technology and Education*, URL: <http://www.ehr.nsf.gov/RED/EVAL/handbook/handbook.htm>

The evaluation process thus starts from the strategic and the program level and then goes up to the project and the component level but each level has a very important role to play in the overall process. It must be noted that the actual evaluation and implementation process starts at the basic component level first. Their importance as described in NSF as follows:

A *Strategic Evaluation* determines the value of the collection of programs a strategy is composed of.

A *Program Evaluation* determines the value of the collection of projects a program is composed of. It looks across the different projects examining the quality of the various activities in light of the overall development objectives. It is carried to the completion after the projects have become fully operational and adequate time has passed for the expected outcomes to be achieved.

Project Evaluation on the other hand focuses specifically on an individual project operated under the umbrella of a program. The evaluation process provides information to improve the project as it develops and progresses. The project evaluation procedures may also include examination and evaluation of specific components.

A *Component* of a project may be a particular approach, participant, stakeholder, locale, resource, practice or a methodology and its evaluation looks to see the extent to which its goals (sub set of the overall project goals) have been met and to clarify the extent to which the component contributes to the success of the overall project, program and strategy.

Once the objectives and the evaluation criteria are set, policies, programs and projects can be selected. Evaluation can therefore be a useful and an important knowledge development tool to help in the overall process of conception, development, implementation and monitoring of a transportation infrastructure project. Some of the key

components that may be relevant in evaluating and examining the relationship between transportation and economic development are:

- Relevant type of transportation infrastructure investment and the location or the area where it is made
- The characteristic data necessary to study, analyze, understand and assess the economic, social and environmental impacts
- The appropriate methodology and process to analyze these impacts
- The proper understanding of the results and the knowledge of the various stakeholders as to the economic effects of transportation investment and development.

2.2.3 Project Evaluation

Project Evaluation has different definitions too and takes place in different contexts. As NSF puts it, the purpose of planning evaluation of a project is to determine and assess the understanding of a project's goals, objectives, strategies and timelines. Sometimes the evaluation of a project is carried out before the project is implemented whereas at other times it is conducted after the project has been put in place. A strong argument can be made for a different approach. Rossi et al¹² argue strongly for:

“The involvement of evaluation in diagnosing and defining the condition that a given project is designed to address, in stating clearly and precisely the goals of the project, and in reviewing the proposed procedures for accuracy of information and soundness of methods.”¹³

Pol defines Project Appraisal/Evaluation as:

¹² Rossi, Peter H. and Freeman, Howard E. (1993), “*Evaluation- A Systematic Approach*” 5th Edition, Newbury Park, CA: Sage

¹³ National Science Foundation (1992), *User-friendly Handbook on Project Evaluation: Science, Engineering, Mathematics, Technology and Education*, URL: <http://www.ehr.nsf.gov/RED/EVAL/handbook/handbook.htm>

“The process whereby a public agency or a private enterprise determines whether a project meets the country’s economic and social objectives and whether it meets these objectives efficiently.”¹⁴

He also describes the Ex-ante Project Appraisal/Evaluation process to consist of the following steps:

- *“Problem Identification and Formulation*
- *Selection and Formulation of Appraisal/Evaluation Criteria*
- *Identifying and Developing Alternatives*
- *Estimating effects of alternatives on the criteria*
- *Valuing the effects of the alternatives*
- *Appraisal/Evaluation of the alternatives using some technique and*
- *Selection of the best alternative for implementation”*

Project Evaluation and Analysis are therefore essential activities in Transportation Infrastructure Project Planning and provide the basic framework for estimating the future needs and accommodating the new trends for transportation infrastructure facilities. A well defined framework for Project Evaluation is a fairly challenging task because of the great diversity of projects and environments entailed in it. In order to be effective, an evaluation framework must take into account, respect and respond to the diverse situations in the developing countries. At the same time, it must also provide a consistent and common process that applies to a wide range of projects and produces evidence based results that promote learning about what contributes to successful and better transportation projects in the metropolitan areas for the developing countries. But it is very difficult to do so since these countries have their own transport related problems and differ substantially in cultures and character.

Project evaluation thus becomes an important part of the overall transportation planning and management process. How transportation is measured or evaluated can have a major

¹⁴ Pol P. (2002), Presentation on Project Appraisal/Evaluation, Erasmus University Rotterdam, Department of Regional Economy, The Netherlands.

impact on the evaluation of a given policy, program, or strategy. *Small*¹⁵ describes how project evaluation, if performed skillfully, can help to identify the key consequences or outcomes of a proposed project and provide qualitative as well as quantitative information about them, the knowledge of which can help guide the policy makers to come up with prudent decisions. It can prove to be a useful tool for studying and analyzing the merits of a particular step or policy inducing transport change and also at the same time can be used to compare with alternative steps or solutions in order to combat a specific transport problem. One of the problems faced by such evaluation processes is that most of the information may not be measurable in same units and hence the analyst may face challenges in determining the precise extent the effects of these changes offset one other.

Thus project evaluation is typically embedded in a larger decision-making process. In their classic work on transportation planning, *Meyer and Straszheim* argue that,

*“Project evaluation and pricing should be viewed as parts of a single integrated planning process.”*¹⁶

A formal procedure is suggested by these two authors that basically involves choosing the best alternative among a given or available set of alternatives, such as maximization of profits or maximization of the use of a particular transport facility or service. Identifying the various constraints in this framework is also a very crucial part because the distinction between these factors or constraints can make a major difference in the overall evaluation process and may even change the whole face of the situation.

One of the important techniques of project evaluation is called the *Cost-Benefit Analysis Approach*. Another one is the *Life-Cycle Cost Analysis Approach*. Both of these approaches are explained in detail in later sections of this chapter.

¹⁵ Small, K.A. (1998), “*Project Evaluation*”, Working Paper for Transportation Policy and Economics: A Handbook in Honor of John R. Meyer, The University of California Transportation Center.

¹⁶ Meyer, John R. and Straszheim, Mahlon R. (1971), “*Techniques of Transport Planning, Vol. 1: Pricing and Project Evaluation*”, Washington D.C.: Brookings Institution, Ch. 14, pp. 232 –236.

As the *TDM Encyclopaedia* by VTPI¹⁷ describes, transportation project planning and evaluation is currently at a relatively very crude level of understanding and development. Planners still tend to follow a narrow perspective when evaluating problems and solutions in the transportation frameworks and thus the broader perspectives are not taken into account. As a result, sometimes solutions implemented to solve one problem give rise to other problems, and thus more integrated transport solutions that provide multiple benefits are left out. Nowadays the experts are realizing the importance of studying the whole systems for planning and evaluation rather than a part of the system.

VTPI also initiates that the evaluation basically is concerned with the incremental impacts in most of the transportation planning situations such as either an improvement or a reduction in the existing transportation facilities or network services. Transportation planners, for example, sometimes may want to compare the incremental benefits and costs for the construction of a new pedestrian bridge or an additional highway to expand the capacity or improve the public transit network services. In such types of evaluations, it is therefore seldom necessary to evaluate the total value of a transportation project or the total value of benefits accrued from the travel of population using that transportation facility or service. This is called *marginal evaluation or marginal analysis*.

An *evaluation framework* in VTPI terms “*specifies the basic structure of the analysis for clear and consistent evaluation and comparison*”. This evaluation framework usually has two major components:

- i) *Evaluation Method* such as cost-effectiveness, benefit-cost, life cycle cost analysis, etc. and
- ii) *Evaluation Criteria*, such as the various factors and the impacts that need to be considered in the analysis, including indirect and long-term impacts.

¹⁷The Victoria Transport Policy Institute (VTPI) is an independent research organization dedicated to developing innovative and practical solutions to transportation problems. TDM Encyclopedia (2002) is a comprehensive source of information about innovative management solutions to transportation problems. It provides detailed information on dozens of demand management strategies, plus general information on TDM planning and evaluation techniques. It is produced by the Victoria Transport Policy Institute to increase understanding and implementation of TDM, URLs: <http://www.vtpi.org> and <http://www.vtpi.org/tdm>

The MSP Program¹⁸ considers the Project Evaluation to be important because of two reasons:

- i) “It provides information for project and program improvement and opportunities for mid-course correction”.
- ii) “It also provides objective data on the project and program outcomes.”

It considers project evaluation on the other hand to be of two types:

- a) *Formative Evaluation*: It assesses the ongoing project activities. It is of two kinds:
 - (i) *Implementation Evaluation*: It assesses whether the project is currently being conducted as planned before.
 - (ii) *Progress Evaluation*: Assesses the progress made in the various components of the project in meeting the project objectives.
- b) *Summative Evaluation*: It assesses the project success, that is, the extent to which the completed project is able to meet its objectives.

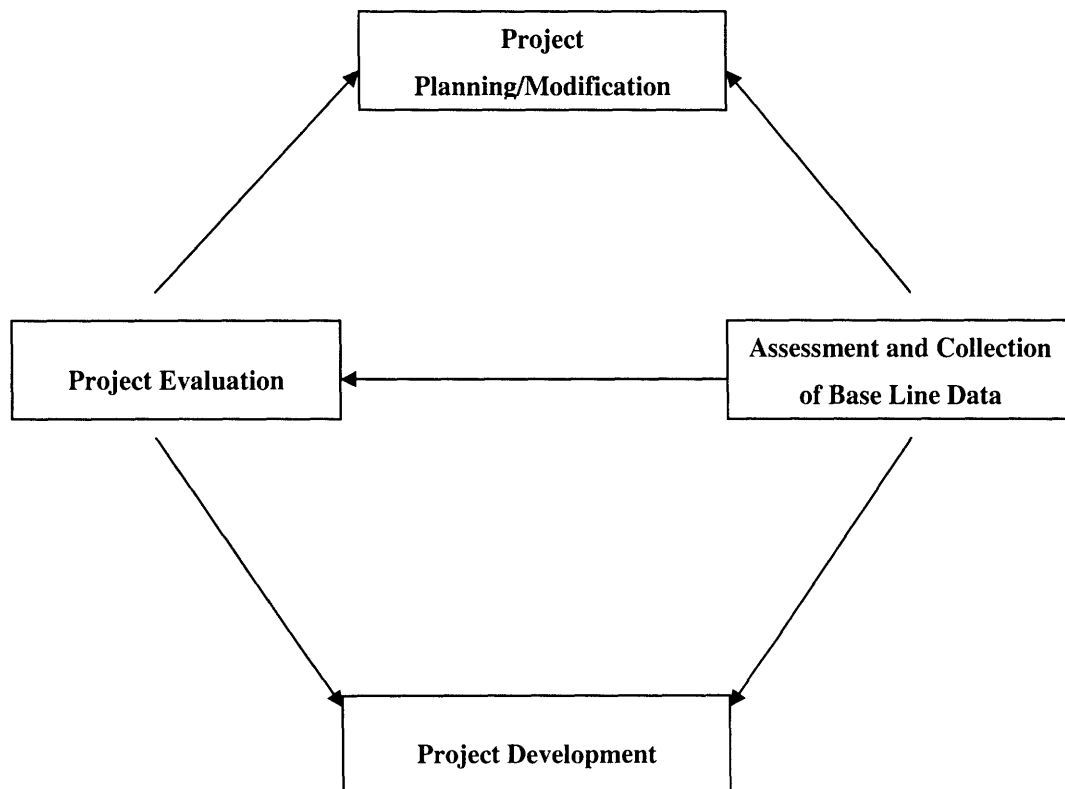


Fig. 2.2: The Project Development/Evaluation Cycle¹⁹

¹⁸ *Project Evaluation Toolkit*, The Math and Science Partnership Program, Launched by NSF and the US Department of Education, URL: <http://www.mspinfo.com/Source/projectevaluation.asp>

It is very important for most project evaluations to have a clear idea and description of the project itself that is to be evaluated. It helps to have a good understanding of the various aspects of the project and also at the same time assists in identifying the critical stages and questions for the evaluation process. Sometimes it occurs that a detailed description or study already exists. But at other times it so happens that even programs that have been around for a long time have very little documentation about various related activities and expected outcomes.

One of the important program evaluation models that is much used nowadays to overcome the above situation in different contexts is the Logic Model by *Taylor-Powell*²⁰ that has been adopted from the University of Wisconsin-Extension. The Logic Model is being used by the UW-Extension and other organizations and entities to depict project and program evaluation actions as an important part of the project or program development process. A logic model as shown in Fig.2.3 describes what the program (or the strategy) is and will do - the sequence of events that links program or project investments to results.

¹⁹ *Project Evaluation Toolkit*, The Math and Science Partnership Program, Launched by NSF and the US Department of Education, URL: <http://www.mspinfo.com/Source/projectevaluation.asp>

²⁰ Taylor-Powell (1998), Ellen, "*The Logic Model: A Program Performance Framework*", Cooperative Extension, University of Wisconsin. URL: <http://www.uwex.edu/ces/pdande/evaluation/evallogicmodel.html>

Logic Model

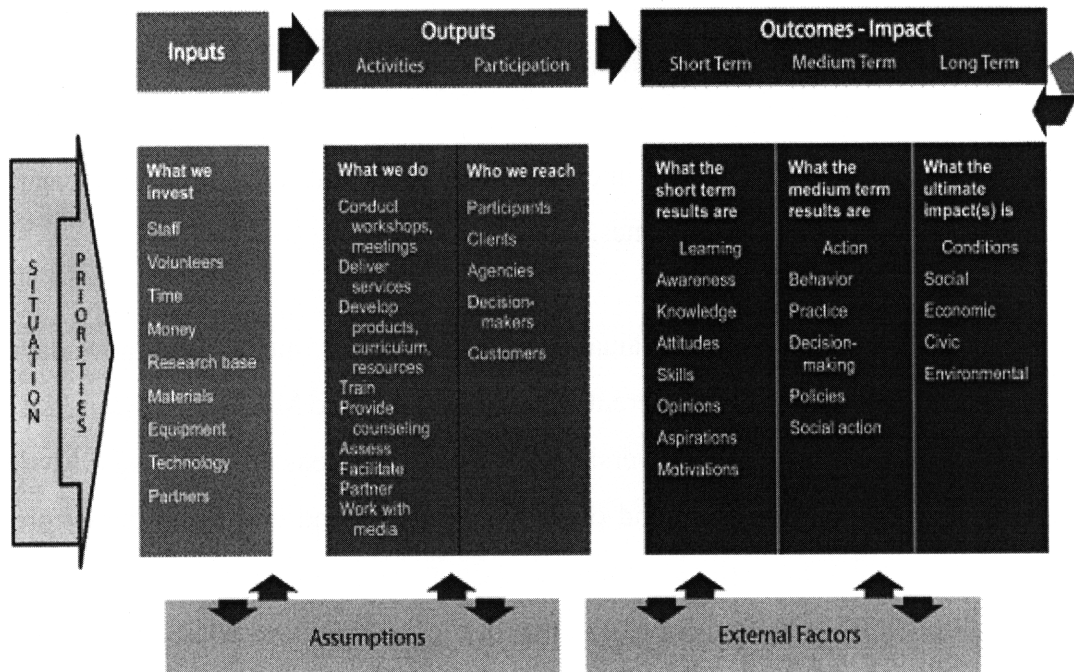


Fig. 2.3: The Logic Model ²¹

The W.K Kellogg Foundation²² defines Logic Model as -

“A picture of how an organization does its work- the theory and assumptions underlying the programs and the projects. It links the outcomes (both the short term and the long term) with program activities and processes and the theoretical assumptions/principles of the program”.

The UW-Extension logic model contains six basic components. These when studied help us to recognize that the transportation planning and evaluation processes have also similar components. These are described by UW-Ex as follows:

1. *Situation: “the problem or issue that the program is to address sits within a setting or situation from which priorities are set”*

²¹ Taylor-Powell (1998), Ellen, *“The Logic Model: A Program Performance Framework”*, Cooperative Extension, University of Wisconsin. URL: <http://www.uwex.edu/ces/pdande/evaluation/evallogicmodel.html>

²² W.K. Kellogg Foundation (2000), *Logic Model Development Guide*, Battle Creek, MI: W.K. Kellogg Foundation URL: <http://www.mspinfo.com>

2. *Inputs: “the resources, contributions and investments that are made in response to the situation. Inputs lead to”*
3. *Outputs: “the activities, services, events, and products that reach people and users. Outputs lead to-”*
4. *Outcomes: “the results or changes for individuals, groups, agencies, communities and/or systems”*
5. *Assumptions: “the beliefs we have about the program, the people, the environment and the way we think the program will work”*
6. *External Factors: “the environment in which the program exists includes a variety of external factors that interact with and influence the program action”*

An excerpt from the *Program Evaluation Toolkit*²³ at University of Ottawa describes how formulating a logic model for a program or a project evaluation can have several advantages:

- *“As can be seen from the figure it clearly summarizes the key elements of the program or the project;*
- *It also explains the rationale behind the program or project activities;*
- *It clarifies the difference between the activities and the intended outcomes of the program and the project;*
- *It clearly depicts the cause-and-effect relationships between the activities and the outcomes - that is, what activities are expected to lead to what outcomes;*
- *It helps to identify the critical aspects and the questions of project and program evaluation; and*
- *It also provides a useful tool for communication for program or project stakeholders as to discuss the program and agree upon its description.”*

A transport project as can be seen thus usually includes a series of steps, the first step being initiated with feasibility and evaluation studies. The subsequent steps are followed by planning, design, construction and then finally operation, monitoring (of outcomes)

²³ *Program Logic Model*, Program Evaluation Toolkit, University of Ottawa, <http://www.uottawa.ca/academic/med/epid/excerpt.htm>

and maintenance of the corresponding transport project. There is no particular blueprint or recipe for conducting a good evaluation. Because the term evaluation is subject to different meanings and interpretations, a program or a project can be evaluated in a variety of ways. Program or Project Evaluation is the thoughtful process of focusing on questions and topics of concern, collecting appropriate information, and then analyzing and interpreting the information for a specific use and purpose of the project or the program.

2.3 Standard Techniques of Project Evaluation and Evaluation Criteria

This section describes planning and evaluation techniques, and discusses how different perspectives; goals and measurements units can affect analysis outcomes. One of the important steps in the planning and evaluation process is setting of specific goals and achievable objectives or problem statements with suitable evaluation criteria. For example if one of the goals is to improve access and mobility, the objectives may include reduction in traffic congestion delays or increase in transit trip speeds or reduction in barriers to non-motorized transport or construction of additional highway systems. The evaluation criteria on the other hand can include quantitative factors such as cost per unit of output and qualitative factors such as public acceptance or environment impacts.

2.3.1 Project Evaluation and Analysis Techniques

The following section takes ideas from the online TDM encyclopedia and other handbooks and describes different existent economic analysis and evaluation techniques often used in planning and evaluation of transport projects in general:

2.3.1.1 *Cost-effective Analysis*: This approach is relatively simple and measures the cost of attaining a particular objective, such as building a highway or a bridge etc while the quality of benefits obtained is held at a constant level. It is practical to use this approach when benefits cannot be translated into equivalent monetary amounts. All relevant costs are reduced to one comparable unit or monetary equivalents. An option here is considered to be cost-effective if the benefits achieved through it outweigh the costs involved in its

implementation. It is used to help decision-makers to select among several available alternatives to accomplish an objective such the costs are minimized and the benefits are maximized.

2.3.1.2 Least-Cost Analysis: This is a simplified version of the cost-effectiveness analysis approach. Here the planners and decision-makers compare the costs of alternative options to achieve a specific objective while no attempt is made to quantify the benefits associated with the available options. The costs in present value terms are assessed and the lowest cost option is selected. One of the assumptions involved in using this approach is that benefits accrued from the system are similar.

2.3.1.3 Cost-Benefit and Net Benefit Analysis: This approach involves comparison of total increment in benefits gained with total increment in costs associated with the implementation of a project. It is different from the first approach in the sense that the cost-benefit analysis is not confined to a single objective or benefit of the project. This approach basically places a value on each incremental benefit and cost of an alternative that is then summed one by one and compared with the other alternatives. The results of the comparison can be outlined as a ratio, with benefits divided by costs (B/C), or as *Net Benefits* that is defined as sum of all benefits minus the sum of all costs.

Another approach very similar to B/C ratio approach is the *Simple Payback* Approach. It indicates the time period required for benefits to repay an investment. *Return on Investment (ROI)* approach on the other hand indicates the annual return an investment provides if all the costs and benefits are reduced to monetary units. But all these methods have a limitation and are affected by how the benefits and costs accrued in a project are incorporated in the analysis. For example, some impacts of the project can be considered either an increase in costs or reduction in benefits, which can change the B/C ratio depending on the situation. The Net Benefits approach provides an absolute measure of benefits, rather than the relative measures provided by B/C ratio, simple payback or ROI.

2.3.1.4 Life-Cycle Cost Analysis: This approach is basically a net-benefit analysis approach that in addition also incorporates the time value of money and is usually

preferred for economic evaluation purposes. Life Cycle Cost Analysis (LCCA) involves performing economic analysis that includes all kinds of costs, the initial costs as well as future maintenance and rehabilitation costs that are anticipated over the life cycle of the project.

One of the advantages of using this approach is that it allows projects to be compared that have benefits and costs occurring at different time periods. Also it helps to deliver the benefits sooner by identifying the value of certain practices and processes that reduce the amount of time needed to implement a particular project. The value of various impacts generally decreases the further they occur in future, so the current value of future impacts are depreciated or discounted to take care of inflation, interest rates on investments and the risk factor. In order to perform lifecycle-cost analysis, the benefits and costs accrued in the project are calculated for each time period (usually a year), applying a *discount rate* to convert all values to a base year. These are then summed over to calculate each option's *Net Present Value* or *NPV* that then becomes the full value of the option over the analysis period reflected in one unit. This approach is usually considered to be the best while implementing projects with a long-term maintenance program.

2.3.1.5 Multi-Criteria Analysis: This is one of the most widely used approach that incorporates both quantitative and qualitative criteria and can even be used in situations when some impacts or factors cannot be expressed in monetary units. Analysis of several criteria to evaluate a given option for its effectiveness and performance in the long-term helps to identify the best alternative available in a given situation. Transportation planners and planning officials use this approach to come up with better solution for almost every transport problem. This approach provides the solution to calculate the total effectiveness of combinations of measures undertaken in a particular project²⁴ –

-“*With different objectives*”

-“*Given the uncertainty of future technical and organizational developments*”

²⁴ The Comprehensive Risk Analysis and Management Network, Part of the International Relations and Security Network at Eth, Zurich, URL: <http://www.isn.ethz.ch/crn/>

- “ *In quantitative as well as qualitative manner*”

- “ *Within the time limit of the project*”

In this approach, each alternative is rated for each of the criteria in relation to other alternatives with some kind of mechanism and then a kind of rating or ranking matrix is formulated. Sometimes this appears to be more easy and transparent to understand rather than a pure quantitative analysis, but then it also tends to be less precise in some of the cases and accumulate a lot of erroneous results. An example of a ranking matrix of various attributes for a set of transport alternatives is given below:

Table 2.1: Ranking Matrix for a Set of Transport Alternatives

| | <i>Cost Effectiveness</i> | <i>Equity</i> | <i>Environmental</i> | <i>Public Acceptance</i> |
|----------------------|---------------------------|----------------|----------------------|--------------------------|
| Alternative 1 | High | High | Very Harmful | High |
| Alternative 2 | Low | Harmful | High | Medium |
| Alternative 3 | Medium | Medium | Very High | Medium |
| Alternative 4 | High | Low | Harmful | Very Low |

In some cases, a more quantitative system can be used and the various factors or criteria can be assigned certain weights or numbers on a chosen scale to denote or signify the various attributes for each option. This approach serves as a useful tool for effectiveness evaluation and decision support for a complex problem with a main objective. It basically structures the problem into a linear hierarchy that takes a set of alternative solutions as input and at the same time uses some mechanism to establish quantitative relations between the objectives and the criteria to come up with the best option as the output in order to accomplish the main goal.

*Schutte*²⁵ describes one of the advantages of using a multi-criteria decision-making (MCDM) approach is that it is capable of addressing both the selection of the best alternative from a set of mutually exclusive alternatives and the ranking of “independent projects”.

²⁵ Schutte, I. C. (2005), “The Appraisal of Transport Infrastructure Projects: Potential Role of State-of-the-Art Decision Support Tools”, Proceedings of the 24th Southern African Transport Conference (SATC), Pretoria, South Africa

A study²⁶ done by the World Bank on the Use of Multi-Criteria Analysis describes Multi-Criteria Analysis (MCA) as a technique for evaluating options where the choice can impact on a number of issues of concern to the various stakeholders one of which is the government, and when one option or alternative is not clearly the best one under all circumstances or for all issues. In this approach, the alternatives are not being based exclusively on monetary evaluations, but other types of criteria are also incorporated. It involves the following steps:

- *“Identifying the Problem to be Addressed*
- *Identification of the various alternatives available along with the “do nothing” option*
- *Identification of the goals and criteria and issues that have to be met by the selection of a preferred alternative*
- *Expression of the goals in the form of achievable objectives that are measurable or quantifiable*
- *Estimation of the likely performance or subjective scoring of each of the alternatives in relation to the criteria under each of the objectives and*
- *Subjective weighting of the scores obtained according to the weights assigned to the criteria under each objective to enable an overall total score to be calculated*
- *Evaluating the Alternatives*
- *Ranking of the different alternatives and Making a Recommendation”*

Thus using two or more criterion to evaluate a set of multiple future initiatives, the alternatives that have the most viability are determined based on a scale of importance and highest feasibility. As the United Nations report on MCA suggests, the main types of data needed for MCA include scientific, social and economic data about the problem specifically to be addressed as well as data obtained from identified stakeholders. One of the major advantages of MCA is that it enables a participatory approach towards decision-making for a particular problem. Now what remains to be decided is the kind of

²⁶ World Bank and IBRD Study (2002), *“Multi-criteria Analysis of the Alternative Mode of Transport”*, Preparatory Activities/Detailed Studies for the Integrated National Transport Strategy, Mauritius

aggregation procedure that has to be used for the multi-criteria analysis. The Aggregation Procedure used in MCA can be either:

- Complete: Unlimited compensation between effects is possible or
- Partial: Limited compensation between effects; for some criteria minimum or maximum values have to be achieved

According to study²⁷ done by the United Nations, the advantages of MCA include the following characteristics:

- *“More Realistic and Explicit”*
- *“Interactive”*
- *“Structured and Flexible”*
- *“Availability of monetary estimates of impacts not required”*

The study also describes some of the disadvantages of MCA on the other hand that include:

- *“Possibility of community preferences being determined by a single decision maker”*
- *“Information requirements to form criteria, compile the impacts and derive weights can, nevertheless be considerable”*
- *“Implicit weights may be unintentionally introduced during evaluation”*
- *“Results are sometimes inexplicable”*

The online *TDM Encyclopedia*²⁸ by VTPI suggests that the solution to one transportation problem or objective often tends to exacerbate other problems. For example, increasing road capacity over the long run tends to increase accidents, energy consumption and pollution due to induced vehicle travel. Market distortion is another root of these transportation problems. From this perspective,

²⁷ Methods of Assessing the Effectiveness of Policies and Measures, United Nations, URL: <http://t062.cpla.cf.ac.uk>

²⁸ The Online TDM Encyclopedia: TDM Evaluation Benefits and Costs, VTPI, URL: <http://www.vtpi.org/tdm>

“Solving transport problems requires planning and evaluation reforms that enhance transport options and market reforms that enable users to choose the best option for travel. Conventional evaluation practices tend to overestimate the overall benefits of the transport solutions since they usually ignore indirect costs and also they tend to underestimate the full benefits of transport planning and management strategies”.

The guide to cost-benefit analysis in *Transport Canada*²⁹ suggests that in these analysis approaches, all benefits should be identified and considered to the extent practicable regardless of the people (public or private) experiencing them, and of whether they are intended or unintended, direct, indirect or induced, positive or negative, transitional or permanent in nature. It must also include a variety of other benefits that are difficult to quantify (for example, comfort, convenience, aesthetics, and contribution to national unity). Some of the benefits are dependent on separate decisions and actions that are beyond control of the BCA in question. These should be clearly identified as conditional benefits unless there is a high degree of confidence that the benefits will be achieved and therefore should not be included in the analysis.

*Blomquist et al*³⁰ states in his paper that the dominant rule theoretically in benefit-cost analysis is the discounted value of social net benefits (SNB) which is also advocated by various applied welfare economists as a better and unambiguous rule compared to the IRR (Internal Rate of Return) and B/C (Benefit/Cost) Ratio. Unfortunately what happens is that when projects of different sizes or scales are compared the IRR criterion can lead to a misleading result and indicate a project to be implemented even when an alternative has a larger SNB. This happens because IRR does not distinguish between projects of different scales since it involves only the rate of return on an outlay irrespective of its size. Another disadvantage that occurs at certain times is that IRR in some cases has no unique value and for a project whose time path for SNB changes signs frequently, multiple and imaginary IRRs can result.

²⁹ A Guide to Cost-Benefit Analysis in Transport Canada (1994), URL: <http://www.tc.gc.ca/BCA>

³⁰ Blomquist, G. C. and Whitehead, J.C. (1992), “*Decision Rules in Benefit Cost Analysis: What is said and What is done*”, Department of Economics, University of Kentucky and East Carolina University respectively.

Also one of the problems with the benefit-cost ratio criterion is that during comparison of projects with different sizes with similar BCRs, the projects may have dissimilar SNBs. Another problem is that some effects of policy can be classified logically in either benefits or costs categories. Since adding values to the numerator and subtracting the same values from the denominator do not have the same effects on the ratio, a policy maker could creatively categorize policy effects and adjust BCR to achieve the desired results.

One explanation given by the above paper for the use of BCR and IRR is convenience of comparison among studies made at different times or comparison between studies made in different countries. Therefore to prevent accounting of only SNB while conducting evaluation and ease of comparison among various studies for decision-makers, reporting of SNB as well as other criterion should be made simultaneously.

*Litman*³¹ in his paper outlined the following general steps of a typical economic evaluation:

- 1) *“Describe each option or alternative to be considered.*
- 2) *Define the framework of evaluation that identifies all the impacts (costs and benefits) and objectives to be considered in the analysis. Efforts must be made to make sure that all the impacts are classified accordingly in order to avoid double counting.*
- 3) *The next step is to quantify and monetize those impacts that are suitable for each option.*
- 4) *The total monetized costs and benefits are calculated for each option that is considered and a discount value is applied to account for future impacts. Thus the present value of all benefits and costs are summed up and NPV is determined.*

³¹ Litman, T. (2002), “*What’s it worth?: Economic Evaluation for Transportation Decision-Making*”, Victoria Transport Policy Institute, URL: <http://www.vtppi.org>

- 5) *Then efforts are made to describe and measure the impacts that are unsuited for monetization. Each alternative option is then rated according to how much it supports or contradicts the thought objectives.*
- 6) *Then the sensitivity analysis is conducted to determine how changes in key assumptions affect the outcomes.*
- 7) *Then various methods are developed to find out various key differences between the options.”*

These steps can be adjusted and repeated accordingly depending on the situation and the viewpoints of the various stakeholders and additional analysis and evaluation may be performed.

It is considered very important to be comprehensive during economic evaluation of a project because usually what happens is that transportation planners traditionally consider a limited set of alternatives and their impacts and focus primarily on certain attributes of an option such as immediate expenses, travel time, associated risk, operating costs etc. Litman describes that conventional analysis often tends to ignore other significant impacts and fail to consider whether they support or contradict the overall strategic land-use objectives and account for other costs associated with the implementation and operation of the project. Efficient evaluation should therefore reflect certain principles that tend to maximize productivity, user benefits and fairness. The transportation policies and programs that are based on these principles can provide additional benefits to the economy and the society while protecting the environment and these benefits are usually not reflected in conventional analysis methods. A comprehensive evaluation is particularly aimed towards getting more information about all the aspects of a particular project and the available alternatives and would possess the following characteristics:

- It is complete, exhaustive, but still relevant
- It depends on socio-economic context
- Its goals are set by the deciders (terms of reference)
- It is open and consistent

Another form of cost-benefit analysis approach that is normally used for various transport segments is:

2.3.1.6 Utility Value Analysis Approach: This approach addresses those consequences or outcomes of the project options that are not measurable or quantifiable in monetary terms such as safety, environment, welfare of society etc. It evaluates the implementation of the projects using a wide range of performance measures or indicators. First of all the objectives that need to be accomplished are identified and then the relative importance of the various options available is rated. This is initially done individually for each goal and then with respect to the overall objective. And then the individual goals are weighted on the basis of relative importance or utility as viewed by various stakeholders and interest groups. The option that comes out with the highest utility values is generally chosen for implementation.

In summary, it can be seen from various transport project studies on the World Bank website that cost-benefit analysis (CBA) has been applied to almost all the projects in the World Bank and subsequently to a number of other international development aid organizations. Due to this reason, it has resulted in a wide application in developing countries as well.

Cost-benefit analysis and multi-criteria analysis have been some of the most commonly used techniques for project appraisal. The only difference that occurs is the way the different impacts are included and accounted for during project evaluation and appraisal in different countries. These approaches become significantly important during the phase of project prioritization and project selection that are important components of a project life-cycle. Projects first have to be prioritized (ranked) in terms of their aggregate worth (defined as a project's performance in terms of all relevant criteria in context) before project selection can take place. At the same time, it is also very important to differentiate between mutually exclusive and independent projects and identify their impacts.

*Gommers et al*³² suggest various direct impacts that need to be included in the analysis:

- Capital Costs
 - Construction Costs
 - Disruption Costs
 - Land and Property Costs
- Recurring Costs
 - Maintenance Costs
 - Operating Costs
 - Vehicle Operating Costs
 - Revenues
 - Passenger Costs Savings
 - Time Savings
 - Safety
 - Service Level
 - Information
 - Enforcement
 - Financing/Taxation

The environmental impacts include:

- Noise
- Vibration
- Air pollution-local as well as global
- Severance
- Visual intrusion
- Loss of important sites
- Resource consumption
- Landscape
- Ground/water pollution

³² Gommers, M. and Schijndel, M. (2001), "Practices in the Evaluation of Infrastructure Investments and New Challenges", Paper presented at the TRANS-TALK Seminar "Improving Evaluation Practices in Transport: Towards a Better Integration of Technical and Political Perspectives", Brussels, Belgium

The socio-economic impacts include:

- Land use
- Economic Development
- Employment
- Economic and social cohesion
- International Traffic
- Interoperability
- Regional Policy
- Conformity to Sector Plans
- Peripherality/Distribution

The literature review provides few examples of transport project impact evaluation in the developing countries. Though impact evaluations might present specific challenges including interactions with other markets and potential selection biases, they should be considered an important component of the whole project life cycle since it can help us to understand the causal sequences and links of transport infrastructure investments to poverty alleviation and other impacts.

It should be noted from these studies that the impact analysis should be viewed as complementary to traditional cost-benefit analysis or other approaches and not a replacement or substitute for them. Also adequate attention should be paid in order to avoid double counting of benefits and costs accrued in a particular transport infrastructure investment.

As suggested by *Boarnet*³³, World Bank urban transport projects are of 3 types:

- *Infrastructure investments* like large-scale road or passenger rail projects or efforts to provide adequate maintenance or refurbishment for existing infrastructure

³³ Boarnet, M. B. (2006), "Conducting Impact Evaluations in Urban Transport", Doing Impact Evaluation Series # 5, World Bank

- *Regulatory reforms* that aim to improve the efficiency of existing systems allowing or encouraging private sector competition but retaining public sector provision of services
- *Traffic or travel demand management* that includes traffic regulation and enforcement, parking controls, traffic control and restraints, efforts to balance access and safety for non-motorized modes with motorized traffic, strategic traffic planning, and pricing.

Boarnet in his paper describes an especially powerful and recently popular approach to impact evaluations that combines *differences-in-differences estimation* with a carefully selected control population.

“Differences-in-differences (DID) estimation compares outcome variables before and after the program intervention (the treatment) for two groups of persons—those who received the treatment, and those who did not. In the context of urban transportation, although there might be some challenges to application of such an approach due to different market segments, non-uniform impacts across different markets and shorter time-frames, such an estimator might compare a labor market outcome (such as income and employment) for two groups of persons— those living near a transportation improvement and those distant from the improvement.” As an example, see Holzer, Quigley, and Raphael (2003)³⁴.

When persons are heterogeneous and project impacts might vary across individuals, predicting marginal effects of a project will require that the DID estimating be adjusted to measure impacts for persons who will most likely be affected by the project.

³⁴ Holzer, H. J., Quigley, J. M. and Raphael, S. (2003), “Public Transit and the Spatial Distribution of Minority Employment: Evidence from a Natural Experiment”, *Journal of Policy Analysis and Management* 22-3, pp. 415-441

Cloete³⁵ mentions that criteria for comparison and selection of the best decision-support tools and approaches could include the following objectives:

- Simplicity of the user interface
- Cost-effectiveness
- Easily accessible technical requirements
- Easy / Simple maintenance procedures
- Visual and graphic capabilities
- Specificity
- Versatility / Flexibility for application to different problems
- Compatibility and easy integration with other programs for optimum use
- Transparency & Legitimacy
- Rigorous scientific basis

There is another form of evaluation conducted during the implementation or post-implementation phase of a project and that is usually called as Monitoring. The following paragraph will now discuss the various aspects of monitoring and evaluation process of a project during its construction and after its construction phase and also expand ideas on its importance on the life of a project.

2.3.2 Monitoring and Evaluation

This is a kind of evaluation that is usually performed while a project is being implemented, with the purpose of improvement in the project design and functioning while in action. *Bamberger et al*³⁶ defines Monitoring as:

“an internal project activity designed to provide constant feedback on the progress of a project, the problems it is facing, and the efficiency with which it is being implemented”.

³⁵ Cloete, F. (2002) “Improving Effective Governance Outcomes with Electronic Decision Support Tools”, MCDA Workshop, CSIR, Stellenbosch

³⁶ Bamberger, M. and Hewitt, E. (1986), “*Monitoring and Evaluating Urban Development Programs: A Handbook for Program Managers and Researchers*”, World Bank Technical Paper no. 53 (Washington D.C.)
URL: <http://web.mit.edu/urbanupgrading/issues-tools/tools/monitoring-eval.html>

He also defines evaluation as, *“a process mainly used to help in the selection and design of future projects. Evaluation studies can assess the extent to which the project produced the intended impacts and the distribution of benefits between different groups, and can evaluate the cost-effectiveness of the project as compared with other options”*.

Different countries have different monitoring and evaluation methodologies and also different levels of investments depending on the set up (or structure) of their economy and the society. Another distinction can be made on the levels of distribution of funds on the initial implementation of the project and then monitoring and maintenance of the project over or after a certain period of time or reimplementation of the project depending on the scenarios.

As suggested in the handbook, Monitoring and Evaluation can help in:

- *“Providing constant feedback on the extent to which the projects are on track and achieving their set objectives*
- *Identifying potential problems and situations well in advance and propose suitable solutions*
- *Monitoring the efficiency with which the project and its sub-components are being implemented and suggest appropriate improvements its design and functioning*
- *Evaluating the extent to which the projects are able to achieve their objectives*
- *Help in providing guidelines for the planning and implementation of future projects*
- *Incorporating the views of various stakeholders and providing joint ownership of objectives and encouraging sustainability of project benefits*
- *Enabling management to keep track of project and adjust operations to take account of any changes or corrections”*

Some of the important components of effective monitoring and evaluation design during project preparation outlined in the handbook are:

- *“Clear and measurable objectives for the project and its components*
- *A defined set of indicators to measure the inputs, the processes, the outputs and the impacts*
- *Suitable provisions for collecting data and managing project records*
- *Institutional arrangements for gathering, analyzing, and reporting project data and statistics and for investing in the project*
- *Provision of ways in which monitoring and evaluation results can be fed back into decision making”*

The first question that comes to mind after this section is why the project needs to be built or implemented after all, i.e. what is the need or the opportunity for the project? The second thought that comes to mind after studying the opportunity, the strategic objectives and the various project characteristics in the current situation is that whether the project should be started or not or should it be continued in line with the objectives of the other projects. The decision is primarily based on the comparison of the project option with the other available alternatives such as:

- Other projects
- “Do nothing” alternative

These projects generally have multiple stages or what we call sub-projects and take place in a pre-defined sequence in order to meet the objectives while satisfying the system constraints and requirements during the conception and the implementation phases. The following section gives a general idea about various aspects of project identification and evaluation and the corresponding criteria used for evaluation.

2.3.3 The Evaluation Criteria

After going through the several techniques of project evaluation and analysis, it can be understood that the criteria used to evaluate different project alternatives in the evaluation and appraisal process play a very important role and they may be of different kinds and may have different requirements. It is to be noted that the evaluation criteria are to be

established not only for a specific project but also for the program and the overall strategy represented by that project in general. Only in this way can the goals be incorporated and integrated in the overall framework for evaluation and decision-making of a project. As discussed before, once the establishment of the objectives and the evaluation criteria is done,

- *Policies or Strategies* (general courses of action),
- *Programs* (coordinated effort with special resources and responsibilities),
- *Projects* (program with a specific deadline) and
- *Tasks* (a specific mission or activity)

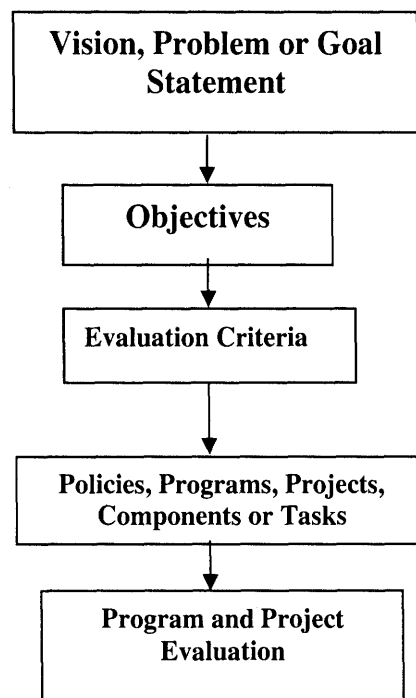


Fig. 2.4 Steps in a Planning Process [Litman, VTPI, 2002]

can be selected from the available set of alternatives and implemented in order to achieve those objectives. Each of these steps should incorporate evaluation criteria and constraints. An idealized outline presented by *Litman* for evaluation purposes is as follows (often it must be adjusted to account for specific circumstances):

The World Bank and other organizations such as Asian Development Bank and International Bank for Reconstruction and Development etc. suggest several criteria that can be categorized as:

Table 2.2 Project Evaluation Criteria

| | <u>Criteria</u> | <u>Project Questions</u> |
|----------|-------------------------------|--|
| 1 | Strategic | -How does the project or the given alternative fit into the overall strategy or goals/objectives of the organization? -Is it the best alternative available? |
| 2 | Economic and Financial | -Is the project economically or financially feasible? -Does the cash flow fit into the overall financial planning? -Are the overall benefits greater than the costs? |
| 3 | Technical | -Can it be built within the specified budget? -Does the organization have the capabilities/knowledge to accomplish this? |
| 4 | Environmental | -What impact does it have on the surrounding environment? |
| 5 | Social | -Does it promote social equity? |

2.3.3.1 The Risk Identification

The evaluation criteria to accomplish the strategic objectives require a definition of a strategic plan and a well defined program for the planning organization that predominantly includes:

- Current goals and objectives
- The long-term vision and strategy

Each project is an important part of the program and the overall strategy and the questions that go behind during its evaluation are of the following nature:

- Does it clearly fit into and support the current goals and objectives?

- Does it support the vision- that is; Is it on the right path?

There are several risks involved during the implementation of a project and the evaluation process must identify and incorporate these risks to the extent possible. The questions that can arise during the conception or implementation phase are: -

- What and where things can go wrong?
- What will happen if things go wrong?
- What needs to be done if things go wrong?
- Is it safe to build it?

The various types of risks can thus be categorized into:

- Project risks
 - Deviation from project plan (risks / schedule)
 - Scope / requirements / structural uncertainty
 - Estimation errors
 - Risks / unforeseen events occurring
- Technology risks
 - Using unknown / immature technology in analysis / design /construction and implementation phase
- Other risks
 - Building an excellent system no one wants (market risk)
 - Building a system that no longer fits the overall strategy (strategic risk or incompatibility risk)
 - Building a system that the users cannot use (redundancy)
 - Losing support from management (management risk)
 - Losing budget commitments (financial risk)
 - Environmental Risks
- Unforeseeable events / unpredictable risks

2.3.3.2 Strategic Considerations:

The strategic considerations during the evaluation process play a very important role and involve a lot of factors such as:

- Contribution to the stated strategic objectives
 - Economic/Market Share in comparison to other sectors
 - Cost cutting and Efficiency
 - Better and Faster Level of service
- Compatibility with the existing environment
 - The existing available modes
 - The existing infrastructure
- Impact on the existing organization structure and personnel
 - Organizational capabilities
 - Organizational culture
- Impact on the society
 - Life of the people
 - Promotion of equity
- Impact on the environment

The other issues relating to these considerations can be put in the form of certain questions such as:

- Where the project is going to be built?
- In what stages the project is going to be built?
- What are the functional and non-functional requirements (performance, scalability, reliability, durability, flexibility etc.)?
- Is all the equipment and personnel available?

These issues include all the aspects, not just whether it can be built or not and they have a huge impact on the cost/benefit analysis during project evaluation. Therefore the corresponding assessments have to be reiterated throughout the project as more detailed information becomes available.

Thus it is very important to take into account all the risk assessments and issues related to sound evaluation of a transportation infrastructure project. The *Project Evaluation*

Toolkit of the Math and Science Partnership Program³⁷ suggests the following Steps in Conducting an Evaluation:

- *“Developing Evaluation Questions (Clarify Goals and Objectives, Identify Key Stakeholders, Determine Available Resources)*
- *Matching Questions with appropriate Information-Gathering Techniques (Select a Methodological Approach and Suitable Data Sources)*
- *Collecting Data*
- *Analyzing Data based on the evaluation plan and Identify Risk*
- *Providing Information to targeted groups and stakeholders”*

The components of project evaluation recommended by the program for it to be used as an efficient and effective instrument are:

- *Questions*
- *Indicators*
- *Measures*
- *Baseline, annual, benchmark, and end of project data and statistics.*

Some of these questions have an important bearing on the overall evaluation process.

- *Has evaluation been a part of the planning process?*
- *Does the organization have an unbiased evaluation process?*
- *Does the project have adequate funding?*
- *Is the evaluation focused on high-priority areas?*
- *What is the role of stakeholders and will they see this evaluation as credible? And*
- *What is the evidence?*

It can be noted that basic principles on which Transport Project Evaluation is based or should be based are similar to ones that are applicable in evaluations of any other projects, for that matter. As *Kelleher et al*³⁸ suggest evaluation in basic sense is usually

³⁷*Project Evaluation Toolkit*, The Math and Science Partnership Program, Launched by NSF and the US Department of Education, URL: <http://www.mspinfo.com/Source/projectevaluation.asp>

³⁸ Kelleher, J., Sommerlad, E. and Stern, E. (1996), “*Guidelines for eLib Project Evaluation*”, The Tavistock Institute, Evaluation Development and Review Unit, London URL: <http://www.ukoln.ac.uk/services/elib/papers/tavistock/evaluation-guide/intro.html>

designed around a set of general principles or essential building blocks that guide the overall decision-making process in putting together an evaluation plan for a particular project and keeping it under review. The framework identified by them suggests some of the design principles for project evaluation and the main questions that need to be addressed as described in the following Table 2.3.

Table 2.3 Project Evaluation Characteristics [Based on Kelleher et al's Guidelines]³⁹

| <u>Characteristic of Project Evaluation</u> | <u>The Corresponding Evaluation Question</u> |
|--|--|
| Purpose of Evaluation | <i>“What are the main purposes of the evaluation?”</i> |
| Stakeholders | <i>“Who are the different groups or individuals who have a stake in the project and its evaluation?”</i> |
| Lifecycle | <i>“What evaluation activities are appropriate at different stages of the project cycle?”</i> |
| Utilization | <i>“How will the evaluation be integrated into the project?”</i> |
| User Involvement | <i>“How will the end users be involved in the project and its evaluation?”</i> |
| Methods and Techniques | <i>“What kind of evaluation questions will be asked and what assessment methods and techniques are appropriate?”</i> |

2.4 Critical Review

The following section presents a critical review of the various project evaluation and analysis techniques from the viewpoint of different authors with reference to transportation infrastructure development developing countries.

Studies done by the World Bank suggest that Project Evaluation and Analysis Techniques in most of the developing countries are not able to take into account several factors that

³⁹ Kelleher, J., Sommerlad, E. and Stern, E. (1996), “*Guidelines for eLib Project Evaluation*”, The Tavistock Institute, Evaluation Development and Review Unit, London URL: <http://www.ukoln.ac.uk/services/elib/papers/tavistock/evaluation-guide/intro.html>

lead to various transport problems. *Humplick*⁴⁰ suggests the following factors that are affecting transport in the developing countries, particularly the South Asian countries:

- *Globalization of Trade*
- *Demographics and Income Disparities*
- *Rapid Urbanization*
- *Shifting Development Paradigms*
- *Decentralization and Governance*

Also her findings describe how the infrastructure endowments are no longer substantial to support and deliver development and comparative advantage. It stresses the fact that transportation costs and access to immobile factors are key determinants of the comparative and competitive advantages of geography and location in the developing countries and therefore should be incorporated in the overall evaluation process. High transportation costs usually tend to result in less inter-regional trade and concentration of population in multiple urban centers whereas low transportation costs on the other hand tend to result in dispersion of economic activity to even-sized urban centers or concentration in mega cities or metropolitan areas of the country. The increasing urbanization and concentration in large cities as well as population pressure and inequalities across all regions has lead to rate of urban growth to surpass the growth of urban poverty especially in South Asian countries. The World Bank is trying to take several initiatives in this regard and introduce long-term system wide approaches rather than project approaches to investment in urban metropolitan areas and also at the same time focus on improvement of policies and methodologies to better plan, evaluate and manage transport infrastructure in those developing countries.

World Bank studies also show that in the developing countries particularly in the metropolitan areas, the continuous growth in demand for various modes of transportation has resulted in several problems such as increased congestion and higher rates of deterioration in infrastructure thus ultimately leading to its higher construction and maintenance costs. Both of these consequences have serious negative impacts on the

⁴⁰ Humplick, F. (2000), Infrastructure Sector Manager, “*Transport in South Asia: Issues and Options*”, World Bank, URL: http://www.worldbank.org/transport/tr_facil/docs/fh_keynt.pdf

economy as well as the environment and the society. Since the economic and social well being of a nation depends much on the efficient movement of people and goods, the transportation system infrastructure becomes an indispensable component in catalyzing as well as sustaining the growth of the nation.

*Bedi et al*⁴¹ suggest that a significant positive impact on the economic growth and development can be achieved through major investments in transport sector projects, so when a question arises, “*How much should be invested in such projects for example, roadway systems?*” Conventional decision analysis would normally result in cost-benefit studies of the net gains from investing in such projects relative to those from other sectors such as health care, education, research and development or national defense. When it comes to determining where the investments must be made, different transport projects are evaluated on a similar basis. The value of such evaluations of transport systems is central to this appraisal.

The cost-benefit analysis approach as described above is one of the approaches of Project Evaluation and is based on the rationale for combining the costs and the benefits accruing to various parties into a single measure or quantifying them in terms of monetary equivalents. *Small* describes in his paper how several specific issues arise while applying this unifying principle in evaluations for transportation situations: issues in measurement of costs and benefits, issues related to capital intensity and long lifetime of many of the transportation projects, issues in proper accounting for various externalities and so on.

One of the major objections to this kind of approach is that the decisions on the projects could just be reduced to a technical exercise only if all the relevant effects of a project could be measured as monetary equivalents and if decision makers were fully agreed to those measurements.

Nash describes that,

⁴¹ Bedi N., Gillen D. (1999), “*Assessing the Economic Value of the Transportation Network*”, Paper presented at the 78th Annual Meeting of the TRB.

“Whereas many economists assume that these conditions meet, there are many others who argue that the purpose of cost-benefit analysis is not to prove policy makers and planners’ judgments to be wrong but rather to improve their understanding of the ramifications of the alternative decisions.”⁴²

The second objection is regarding the unfair basis for the justification for the projects just because their aggregate benefits exceed their costs. These assumptions do not seem realistic since they assume everyone to be identical and all to be identically impacted by the project outcomes. The basic premise on which the need for such an approach arises is that there are several conflicting situations in a real world where people’s different states and preferences cause them to be affected differently. Otherwise there would be no problems at all and the result would be a unanimous decision.

It is suggested from both of the above objections to cost-benefit analysis approach that the project evaluation is inherently political. The paper gives an idea that there are a lot of political forces acting behind the decision for a project and the value of any particular evaluation technique such as cost-benefit analysis depends on how it informs that political process. Cost-benefit analysis raises other issues as well; some of them are especially significant for transportation. For example, transportation projects are aimed towards saving people time or improving safety. But these projects on the other hand may also have potential environmental effects. It is now well recognized that transportation activities often harm the environment. So how to evaluate these factors and impacts? In principle, environmental effects can be evaluated but accounting for these effects raises measurement issues that are more difficult than those related to safety. Since the environment effects are more varied and diffusely distributed, and perhaps more likely to raise moral issues, there are even greater challenges for the policy makers to account for such effects and deal with the health effects on individuals. So the question that arises is- Is it really worth quantifying environmental benefits and costs in monetary terms as part of project evaluation?

⁴² Christopher A. Nash (1993), “A Cost-Benefit Analysis of Transport Projects”, Alan Williams and Emilio Giardina eds., Efficiency in the Public Sector: The Theory and Practice of Cost-Benefit Analysis (Aldershot, UK: Edward Elgar, 1993), pp. 83-105

The primary reason for this is that it can help bring environmental and other costs and benefits into a single comprehensive framework that can promote better decisions by allowing decision makers to realistically trade off environmental considerations against others. One of the primary arguments on the other hand against doing so is that this process adds considerable uncertainty to the resulting evaluation and therefore some kind of mechanism is required to evaluate and account these effects in the overall analysis.

Economic Evaluation thus becomes a very important component of the overall project evaluation and appraisal process and this step lies at the interface between technical work (engineering, planning, and economics) and political decision-making steps. This is a crucial point which requires not only the evaluation to be technically sound, but also that it must be capable of explanation and communication of the various impacts to the decision-makers and the stakeholders and be able to meet their information needs.

*Litman*⁴³ considers economic evaluation (also called economic analysis or appraisal) to refer to methods for determining the value of a policy, project or program in its entirety and helping the planners to make decisions that usually involve conflicts and trade-offs. Other parts include information collection and distribution, a decision-making process, public involvement, institution development and the negotiation between various stakeholders. His paper clearly indicates that the transportation decisions are often criticized for inadequate and biased economic analysis. In his paper, therefore he describes some of the techniques for performing comprehensive and objective evaluation and also identifies ways and methods to avoid commonly occurring problems.

*Transport Notes*⁴⁴ describes that the projects in the transport sector are valued in terms of their net worth (the difference between the value of their benefits and their costs, both measured as much as possible in terms of monetary units). This simple approach leads to many questions as mentioned by *Mackie et al*⁴⁵; evaluation by whom, for whom, from

⁴³ Litman, T. (2002), "What's it worth?: Economic Evaluation for Transportation Decision-Making", Victoria Transport Policy Institute, URL: <http://www.vtpi.org>

^{44,45} Mackie, P., Nellthorp, J. and Laird, J. (2005) "Notes on the Economic Evaluation of Transport Projects", World Bank Transport Notes # TRN-5

what perspective, and at what stage etc. This is important to know since transport projects typically impact many stakeholders- the transport agencies, operators, individual transport users, local residents and businesses, land and property owners, national and local taxpayers etc. And each of these stakeholders will want to assess the impacts of the projects or the policies from the perspective and understanding of their own interests. The *Economic Evaluation Notes*⁴⁶ provide guidance on:-

- The criteria for selection of a particular evaluation technique or approach.
- The selection of values of various inputs to the evaluation
- Specific problems and issues in economic evaluation

The notes also provide a framework that deals with the context within which the economic evaluation techniques can be used in the transport sector. Some of the key questions which the framework should address are:

- Is a project or a policy intervention worthwhile from overall social point of view?
- What is the impact on identified stakeholders and social groups?
- Is the project financially sustainable? How will be the project actually be funded and how will the debt be repaid?
- Is the project practicable? Are there any technical or social barriers to implementation and execution?

As seen from the Transport Notes, the economic evaluation framework may involve the following stages in the process:

- *The initial definition of the project or policy for feasibility study:*
- *Screening from a large number of possible projects or project options to a manageable set of alternatives for full evaluation based on certain indicators and criteria*
- *Project selection including accept/reject, choices between the alternatives and prioritization*

⁴⁵ Mackie, P., Nellthorp, J. and Laird, J. (2005) "Notes on the Economic Evaluation of Transport Projects", World Bank Transport Notes # TRN-5

A study done by *Harvey*⁴⁷ concludes that Project Evaluation in developing countries is much more complex than in developed countries and it is very critical to accurately identify and evaluate the risks involved in a project and to measure the degree of mitigation-if any. The project needs to be evaluated thoroughly for various potential risks- technical, operating, environmental, social, political or financial, and each risk needs to be handled consistently by suitable approaches if the project has to be sustained in the long-term. This is because the strategic decisions concerning investments in transportation infrastructure are based on the analysis of these risks and they have an important bearing on a nation's overall development. Well-maintained transportation infrastructure in developing as well as developed countries is clearly a fundamental part of a functioning economy.

Economic development can be a complex and ambiguous subject often with different meanings for different people in different countries. This is the reason why the definition of economic development impacts is not always clear and consistent between academics, policy makers and planners, practitioners, and the public and depends on the setting of a particular region. But generally it seems that it relates to the development of a region's economy and these impacts have a major role to play while evaluating and implementing a particular project. These are some of the impacts that should be accounted for in economic evaluation and analysis of a project.⁴⁸

- *User impacts*, such as value of travel time, travel cost or safety etc
- *Economic Development impacts*, such as level of economic activity in a given area or generation of more businesses or jobs etc
- *Environmental impacts*, such as air pollution, noise and quality of life factors
- *Social impacts* including all types of benefits and costs that are valuable to society
- *Other external impacts*

⁴⁷ Harvey, C.R. (2002), "*Risk Analysis and Project Evaluation*", Project Appraisal and Risk Management (PARM), Duke University and National Bureau of Economic Research

⁴⁸ Methods of Highway Project Impact Evaluation, A Study done by Cambridge Systematics, Inc.
URL: http://www.mdt.state.mt.us/research/docs/reconfig/literature_review.pdf

The above study also specifies the criteria for deciding which impacts to use in the evaluation process and they usually include:

- Information/Data available;
- Resources available;
- Analysis tools available;
- Usefulness for public information;
- Usefulness for decision-making.

There are great differences between investments in infrastructure and in other sectors of production. Since there a lot of disparities existing among various regions and countries, a lot of differences usually result in several crucial aspects of project evaluation and appraisal which in turn give rise to different theories, styles, ways and methods behind a number of practical approaches for project evaluation in these countries. Although there are direct and indirect connections (industry development, travel, welfare of society, tourism, employment etc.) between transportation investments and economic development, the timing and duration of benefits generated from each of these connections will essentially be different. The study notes that the impacts of construction are usually short-term and cannot be considered equivalent to subsequent impacts from industrial and other activity. If the transportation infrastructure facility is built but not used to the maximum capacity, the benefits from industrial and tourism development may lag behind the completion of the project for a long period of time and may never generate adequate benefits. The time frame therefore becomes a very critical factor in the process of evaluating potential benefits.⁴⁹

A World Bank Study done by *Schelling et al*⁵⁰ on designing and evaluating a rural basic access road project indicates that conventional project design, evaluation and appraisal methodologies particularly those aiming to achieve both social equity and economic efficiency objectives have some serious limitations when applied specifically to projects

⁴⁹ Methods of Highway Project Impact Evaluation, Literature Review done by Cambridge Systematics, Inc., URL: http://www.mdt.state.mt.us/research/docs/reconfig/literature_review.pdf

⁵⁰ Schelling, D. and Liu, Z. (2000), "*Designing a Rural Basic Access Road Project: The Case of Andhra Pradesh in India*", Infrastructure Notes, Transport Sector, World Bank, URL: http://www.worldbank.org/html/fpd/transport/publicat/pub_main.htm

in developing countries, for example, in cases of the rural basic access road projects. These limitations can be overcome by the use of suitable participatory approaches towards planning and evaluation and other practical tools.

The study notes that many poor villages in developing countries usually do not have all-weather road access and are often cut off for long periods during the wet seasons when access roads become unusable. The provision of basic access roads can thus help to serve as a valuable instrument for alleviation of rural poverty. Conventional road appraisal methodology focuses more on the quantification of direct road user benefits. The expected benefits of improvement usually come through increased socio-economic opportunities that increase traffic, which in turn are difficult to forecast and quantify in monetary terms for the case of rural access roads. Also limited budgets to be allocated between poverty-focused and efficiency oriented road works presents a major problem. Therefore a proper balance must be considered as well as economic criteria in selection of individual roads or projects for investment to maintain a degree of equity among different villages. Conventional appraisal methodology offers little assistance in these dimensions. The case thus justifies the use of other tools that are necessary to supplement conventional appraisal techniques, for example, participatory approach for planning and evaluation and combination of already existing project evaluation techniques in order to come up with better solutions.

Also for example, Build, Operate and Transfer (BOT) is one of the commonly used public-private partnership models or strategies (out of Design-Build, Design-Build Operate, Design-Build-Finance-Operate and other approaches) for new transportation infrastructure development in developing countries (particularly in South Asian and Latin American countries) whereby private funds are used to undertake the infrastructure facility. As described by *Chen et al*⁵¹ this concept basically involves:

- *“the assembling of private investors to finance, design, build and operate the infrastructure for a certain number of years called a concession period;*

⁵¹ Chen A., Subprasom K. and Chootinan P. (2001), “Assessing Financial Feasibility of Build-Operate Transfer Project under Uncertain Demand”, Transportation Research Board Paper.

- *in return the private investors receive revenues generated from toll charges over this period;*
- *after the expiry of the concession period, the infrastructure facility is returned back to the government.”*

Most of the BOT project developments in the developing countries are funded by the World Bank. This public-private partnership serves to be an attractive and efficient means to develop, operate and manage new transportation infrastructure in developing countries faced by severe budgetary constraints from the government.

*Baietti*⁵² (2001) in one of his World Bank papers describes how private investments in infrastructure in the developing countries, particularly in the East Asian countries is dominated by greenfield projects. These projects are usually undertaken by a private entity or a public-private joint venture which then builds and operate a new facility through a build, operate and own (BOO) or build, operate and transfer (BOT) contract. Generally these kinds of BOO and BOT projects are easy to understand, structure and implement and involve less political complications. Also one of the trends is that private sector participation in infrastructure in the developing countries has largely been confined to the power and telecommunications sector. Private investments in the transportation infrastructure have fairly been limited and a large share of these investments has been predominantly taken by road projects followed by rail and port projects. Most private sector transport projects built in the developing world are BOO-or-BOT types with the exception of a few ones. These kinds of projects though less technology intensive as compared to power and telecommunications projects, have certain unique features that make them complex to structure and implement and thus not very attractive to the private investors. On the other hand these projects also include:

- High initial costs of project development,
- The challenges in acquiring land and right of way,
- The lengthy process of environmental clearances,
- The conflicting situations from political sides and different stakeholders,

⁵² Baietti, A. (2001), “*Private Infrastructure in East Asia: Lessons learned in the Aftermath of the Crisis*”, World Bank Technical Paper, Washington D.C.

- Frequent cost overruns
- Unpredictability of geotechnical conditions
- Labor challenges and
- Uncertainty in demand due to the competition from various other modes and available alternatives.

The worldwide experiences in many developing countries shows that considerable amount of time is required to conclude negotiations for successful participation from the private sector. Some of these projects are never completed and failure rates are often high during or after implementation. Though private sector projects have a promise of increased efficiency, responsiveness to changing scenarios and economic gains, environmental and social aspects of private sector development are also increasingly been seen as an integral part of the sustainable transport development. Since government is the one that sets the rules for privatization, they have the responsibility to ensure that the design and implementation process facilitates the accomplishment of long-term objectives. *Lovei et al*⁵³ describe how several developing countries have embarked on large-scale privatization programs without adequate information on the current environmental, economic and social conditions and the potential risks and without clear understanding of domestic sector guidelines and standards. It is mostly seen as a problem to be avoided and not as a risk to be reduced or to take advantage of the benefits. So it is very important to take into account the environmental and social conditions because if they are not addressed specifically during the development process, improvements may still occur but they will be short term and be limited to those resulting from the broader objectives and capabilities of the new investors.

Some of the recent developments in transportation infrastructure evaluation as described by *Gommers et al*⁵⁴ are:

⁵³ Lovei, M. and Gentry, B. S. (2002), "*The Environmental Implications of Privatization*" Lessons for Developing Countries", World Bank Discussion Paper, Washington D.C.

⁵⁴ Gommers, M. and Schijndel, M. (2001), "Practices in the Evaluation of Infrastructure Investments and New Challenges", Paper presented at the TRANS-TALK Seminar "Improving Evaluation Practices in Transport: Towards a Better Integration of Technical and Political Perspectives", Brussels, Belgium

- There is increasing awareness for the valuation of the environmental impacts in the current evaluation of transport infrastructure projects especially since there are no concrete and agreed figures or estimates available that can be easily be used in monetary evaluation methods such as cost-benefit analysis.
- Another enhancement is the increasing attention that is being paid towards integration of the evaluation part of transportation infrastructure into the whole decision process that governs investments in the infrastructure at local, regional and national levels. The whole consensus-building process that involves the interaction with the general public and the local residents during the whole evaluation process even becomes more important in the future.
- The other thing that needs to be noted as a development in the evaluation of infrastructure is the fact that the evaluation of an investment in transport infrastructure is in itself a complicated process. It is not just evaluation of one thing or one component but a combination of evaluations of several of the project's components and programs. Thus effective evaluations in turn also depend on the availability of accurate data and information about these individual components. All these individual components play a vital role in the overall outcome of an evaluation.
- Apart from analyzing the direct impacts of a project, increasing attention is also being paid towards including the indirect impacts which can be either positive or negative in nature. The indirect impacts can lead to more system efficiency through network effects, economies of scale or positive external effects. Sometimes they can also tend to reduce the efficient movement of people and goods in other areas.
- Another major development is that more transportation modes are taken into account instead of one mode/project. There is a growing trend towards formation

of multi-modal project appraisal methodologies that tend to analyze challenges from a system's perspective as a whole rather than just one part of the system.

- A recent trend in the evaluation of transportation infrastructure projects is the increasing focus on the possibility of Public Private Partnerships (PPP). Private financing can definitely help the government in minimizing public investment costs and also increase efficiency especially in bigger transportation projects.

As can be identified from several studies, the future challenges in transport infrastructure evaluation pertain to the following areas:-

- a) When it comes to development of comprehensive programs for multi-modal project evaluations and integration of several modes together for optimization, there are several challenges on how to treat the rather different characteristics of the various modes in a consistent manner. As *Vickerman*⁵⁵ suggests in his paper, the overall goal here is to obtain a consistent set of user benefits.
- b) Another major challenge is how to measure and include the indirect impacts of the transportation infrastructure investment.
- c) The third challenge that comes during project appraisal and evaluation is to what methodology or measure is used to evaluate the environmental impacts and other impacts that cannot be easily quantified in terms of monetary units.
- d) As discussed before, one of the major roadblocks is the integration of the evaluation process into the whole decision-making process for transportation infrastructure projects and inclusion of proper communication to all the stakeholders and fostering public participation as well. This presents us with the challenge to form and develop adequate modeling, data and impact analysis tools to be used in the new environment with so many variables in action and achieve the overall objectives in a wider context.

⁵⁵ Vickerman, R. (2000), "Evaluation Methodologies for transport projects in the United Kingdom", Journal of the World Conference on Transport Research Society, Special Issue "Transport Policy, International Comparison of Evaluation Process of Transport Projects", Volume 7-1

After critically reviewing the various project evaluation methods with reference to developing countries, the following section now describes various aspects in relation to sustainability of transportation infrastructure in developing countries. It discusses various challenges faced by them and the ways to confront them.

2.5 Sustainability of Transportation Infrastructure

We know that improved transport infrastructure is one of the key contributors to economic development of a nation. But on the other hand it has other impacts too, on the environment as well as the society. These impacts can either be categorized as negative or positive.

Rapid economic growth in the country gives rise to explosive demands for mobility and access to different services. Most of the cities in the Asia and the Pacific region face serious congestion problems that lead to inhibition of the flow of passengers and goods and thus impede access to economic opportunities and social amenities. However, at the same time, the essential mobility required to provide access to basic services such as work, education and social services in vast metropolitan and rural areas of Asia is being hampered by a lack of even basic infrastructure.

The sustainable transport website⁵⁶ of UK describes how using transport for various purposes has an impact on the environment and this effect is often negative with the exception of walking and cycling. Most of these impacts are not easy to quantify for evaluation and appraisal purposes. The negative effects on the environment of using transport fall into three main categories:

- *Contribution to Global Warming*
- *Contribution to local and atmospheric air pollution*
- *Noise pollution, Ground pollution and local community impacts*

⁵⁶ Sustainable Transport.org.uk is collaboration between Wastebusters and Sd3 Ltd. This website is aimed to provide practical information to the public, to businesses and to Local Authorities to enable improved decision making about transport use in order that we might reduce our negative impacts on the environment, society and the economy. URL: <http://www.sustainabletransport.org.uk>

On the other hand, the social impacts of transport infrastructure and services are harder to quantify and deal with.

The organization for sustainable transport also describes some of the issues relating to the positive and negative social impacts of transport such as:

- *Access to public transport*
- *Access to amenities*
- *Mobility*
- *Safety*
- *Comfort*
- *Convenience*
- *Social inclusion*
- *Health and Cleanliness*

The UK-Sustainable Transport website states that:

“Although it is difficult to quantify many of the above issues of transport, they are all very valid when identifying the attractions of different transport choices. The safety of each particular mode of transport is something that we can easily quantify and assess every time we get into a particular mode of transport. Interestingly, although many people have a fear of flying, statistically it is still the safest mode of travel. This is due to the amount of passengers transported by each journey and the long distances travelled.

In comparison, although walking and cycling are environmentally beneficial, promote a healthier lifestyle and contribute to better communities, in safety terms they are exposed to considerable dangers. This is not necessarily the fault of the pedestrian or the cyclist but more a reflection of the numbers of vehicles on the roads and the speed at which they travel. Pedestrians from poorer communities are also disproportionately at risk from motor vehicles. Motorbikes fair the worst in safety

terms mainly due to their level of exposure and lack of protection compared to being inside a vehicle.”⁵⁷

Considering the positive as well as negative impacts of transport, various countries-both in the developing as well as the developed world are showing considerable interest in developing sustainable transportation and having a strong understanding between its linkages to land use and urban development patterns, economic growth, planning policies and evaluation methods, environmental impacts and social equity. But one of the major questions that need to be resolved is how exactly to define sustainability in the context of transport development?

*Deakin*⁵⁸ describes in her paper the Brundtland definition of sustainability that states: -

“Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their own needs.”

However, sustainability is a much broader concept having economic and social as well as environmental dimensions. The author describes that sustainable development is now being viewed as development, the objective of which is to improve service quality, the standard of living and quality of life, while at the same time protect and enhance the natural environment and honor local culture and history.

Sustainable transportation will therefore have certain attributes that will follow from the expanded definition of sustainable development. The paper describes sustainable transportation to be: -

- *Safe*
- *High service quality and accessibility*
- *Ecologically sound*
- *Economical and*
- *A positive contributor to regional development.*

⁵⁷ UK –Sustainable Transport Website, URL: http://www.sustainabletransport.org.uk/pages/social_zone.htm

⁵⁸ Deakin, E. (2000), “*Sustainable Transportation: Findings from an International Scanning Review*”, University of California Berkeley , URL: <http://www.uctc.net/sustrans/>

Deakin also describes how sustainable transportation planning practice is different than traditional planning approach due to the fact that social, economic and environmental objectives are an integral part of sustainable transportation planning, rather than the constraints or the focus of mitigation efforts. And hence new procedures and methods for planning and evaluation of transportation infrastructure need to be envisioned and developed. For this purpose, performance measures as well as performance indicators are a key element of sustainable transport development and implementation. These measures serve as tools to evaluate conditions over time, assess progress and determine the effectiveness of specific policies and planning actions.

A World Bank Paper on Sustainable Transport and Priorities for Policy Reform suggests some of the challenges for transport policy as:

- *Increasing access and affordability*
- *Maintenance crisis*

And confronting these challenges involves:

- *Adjusting to ever changing global trade patterns*
- *Increasing responsiveness to transport users*
- *Coping with rapid motorization*

It can be seen from worldwide experiences of the World Bank in several developing nations that poverty reduction and sustainable development require macroeconomic policies that have a sound base, promote open trade markets and are leading to vast amounts of increase in human and capital resources. The World Bank's new approach to country economic reports⁵⁹ (for example, in India) describes that sustainable development is also based on a comprehensive framework that requires:

- Good governance and institutional management
- High-quality infrastructure and public services for the promotion of rural development and livable cities and accelerate economic growth

⁵⁹ Country Economic Report, "India: Policies to Reduce Poverty and Accelerate Sustainable Development", The World Bank Group, URL: <http://www.worldbank.org.in/sar/sa.nsf>

- Health, education and social services that reach the poor, both men and women in an effective and timely manner
- A sound financial sector with adequate regulation and supervision
- Powerful human resources base for quality development
- Sound legal, incentive and regulatory frameworks that protect property rights and stimulate competitive markets
- A good balance between the private and public sector participation and decentralization of the existing structure of operations
- Overall strengthening linkages between trade, economic growth, employment and education

Therefore all aspects of efficient and sustainable transport development need to be studied and examined in order to achieve the desired objectives and translating broader goals of sustainability into specific transportation policies, strategies, programs and projects. And as *Deakin* describes, this may involve considering changes to every aspect of planning practices and evaluation approaches from the materials and designs used in construction to the kind of alternatives considered for implementation. This also involves combining various perspectives on human, physical, social, financial and natural capital that play a key role in sustainable development. Fig. 2.5- a and b present various aspects of sustainable transport development in a region along with their synergies and various trade-offs as identified by the World Bank Group.

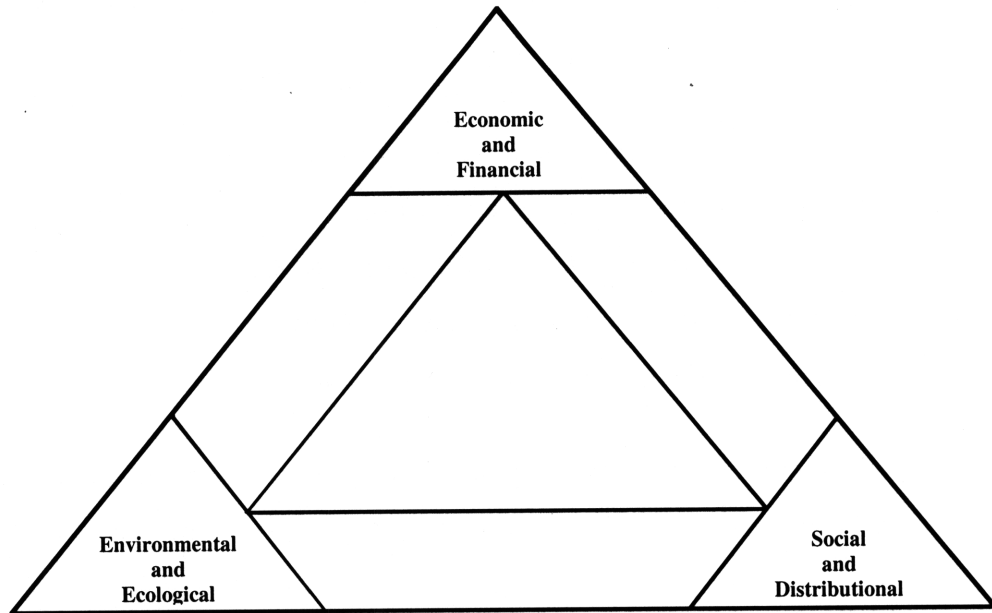


Fig. 2.5-a Sustainability, Synergies and Trade-offs⁶⁰ [Source: The World Bank Group]

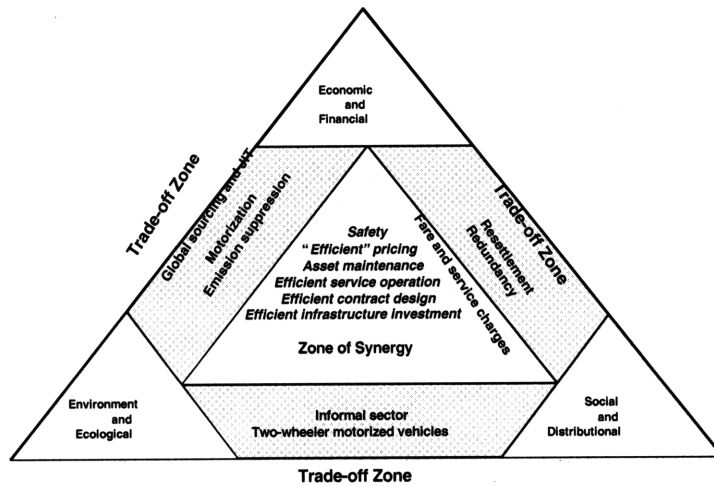


Fig. 2.5-b Sustainability, Synergies and Trade-offs [Source: The World Bank Group]

⁶⁰ *Sustainable Transport*, Transport Economics and Sector Policy, The World Bank group
 URL: http://www.worldbank.org/transport/pol_econ/tsr_docs/tsr_ind.ppt

The World Bank report suggests that a sound environmentally sensitive strategy requires:

- ✓ *Integrated transport infrastructure and land-use design and development*
- ✓ *Planning and Implementation for non-motorized transport*
- ✓ *Encouragement of use of urban mass transit*
- ✓ *Establishment of direct road user charges on the users*
- ✓ *Availability of multi-modal urban transport funds*
- ✓ *Appropriate public transport fares and financing*

Therefore efforts should be made to integrate environmental and economic elements in project appraisal through:

- ✓ *Preparation of suitable environmental strategies*
- ✓ *More systematic estimation/evaluation of impacts*
- ✓ *Using the most cost efficient transport solutions*
- ✓ *Including effects on non-motorized transport*
- ✓ *A proper framework of protection against damage to ecological or cultural heritage of the region*

Encouragement of economic growth on the other hand must also be supplemented by measures to recognize the special problems rural areas particularly in developing countries and also target the transport priorities of the poor and thus help in protecting against adverse effects of liberalization in the transport sector. This can be achieved by improving the physical access to jobs and amenities and by eliminating gender biases and also at the same time by enabling greater use of non-motorized transport. Particularly in the developing countries, rural poverty can be handled by placing greater emphasis on access rather than high performance in rural infrastructure and supporting cost effective labor-intensive methods of construction and maintenance.

The paper also describes various reforms at the institutional level that are the basis of policy reforms involving a number of critical issues such as:

- *Redefining the role of the government*
- *Commercialization of infrastructure*
- *Decentralization and user involvement*
- *Functional coordination between different sectors*
- *Appropriate roles depending on the sector environment and space*

Studies conducted by the World Bank show how transport generates growth both at the national level as well as at the international level by facilitating trade and by provision of access to health, education facilities and other amenities in the region. Cross-country studies at the macroeconomic level have confirmed that transport investment raises growth by increasing the social return to private investment without hindering other productive investments⁶¹ and that inadequate infrastructure serves to be an important constraint on aggregate agricultural and industrial productivity⁶². On the other hand at the microeconomic level, improvements in transport sector result in lowering of agricultural input prices and hence production costs⁶³, provide greater access to various markets and hence diversification of outputs⁶⁴. In urban areas, the quality of overall transportation infrastructure and public transport service affects a lot of decisions taken at the regional and the national level, the efficiency of the labor market⁶⁵ and the scale and form of urban agglomerations.

The importance of the transportation infrastructure does not decrease as the countries begin to grow and industrialize. Developing countries in particular have largely benefited from participation in globally integrated production and assembly chains that would not have been possible without high quality, domestic, regional and international transport.⁶⁶

⁶¹ Easterly, W. and S. Rebelo (1993), "Fiscal Policy and Economic Growth", Journal of Monetary Economics, Vol. 32 (2-3), pp. 417-458.

⁶² Antle, J.M., (1983), "Infrastructure and Aggregate Agricultural Productivity: International Evidence", Economic Development and Cultural Change", Vol. 31 (3): 609-619.

⁶³ Binswanger, H., M-C. Cheng, A. Bowers and Y. Mundlak (1987), "On the determinants of Cross-Country Aggregate Supply", Journal of Econometrics Vol. 36 (1/2): pp 111-131.

⁶⁴ Riverson, J. and S. Carapetis, (1991), "Intermediate Means of Transport in Sub-Saharan Africa: Its potential for improving Rural Travel and Transport", World Bank Technical Paper 161, World Bank, Washington D.C.

⁶⁵ Hamer, A.M. (1986), "Urban Sub-Saharan Africa in Macroeconomic Perspective: Selected Issues and Options", World Bank, Washington D.C.

⁶⁶ World Bank (1993), "The East Asian Miracle: Economic Growth and Public Policy", New York: Oxford University Press.

The Project Evaluation Techniques should provide a sound base for inclusion of sustainability issues existing in the developing economies as well as the developed ones. *Munasinghe*⁶⁷ describes in his paper how road or public transport systems fall into disrepair since they are environmentally unsustainable and usually fail to meet the needs for the poor and often have damaging consequences on the environment and society. Hence there arises a need for suitable policy instruments, which can serve all of the dimensions of sustainability in a synergistic way providing “win-win” solutions for every sector. These typically include-

- Measures to improve faster repair and maintenance
- Charging the users for external effects
- Technical efficiency of supply
- Safety
- Proper Design and Implementation
- Public Administration

But sometimes the situations are not able to promote this synergy due to increased mobility, particularly private motorized mobility that enhances the GDP of the country but in turn damages the environment. There may be some other consequences of transportation infrastructure development such as it may involve involuntary resettlements. More efficient transportation infrastructure in a competitive framework may also involve loss of jobs thus imposing some social costs and restructuring of prices and services that may hurt some users. Therefore it must be noted that the concept of economic efficiency should not be confused with technical efficiency. He makes an important point that,

“Technically superior infrastructure becomes only economically superior if the extra benefits generated from its technical superiority outweigh its extra cost of construction.”

⁶⁷ Munasinghe, M. (1993), “*Environmental Economics and Sustainable Development*”, World Bank Environmental Paper No. 3, Environmentally Sustainable Development Department, Washington D.C.

Also public transport services provided cheaply and motorized transport (for example, motorcycles, scooter-rickshaws etc.) may meet the transport needs of the poor but be environmentally damaging.

Thus all of the above-discussed phenomena involve various “trade-offs” in different situations and it is technically difficult to come up with some common guidelines laid out for project appraisal and evaluation that may be applied in all the situations. It should have characteristics that are flexible and can be adjusted over different situations. The policies for sustainable transport are one that both identify and implement the “win-win” policy instruments and explicitly confront the trade-offs so that the balance is chosen rather than accidentally arrived out. These policies are consistent of informed and conscious choices and decisions.

The World Bank Report paper clearly suggests that it is very important to have a sound economic base that is very fundamental to sustainability. Transportation infrastructure investments should thus continue to be subject to rigorous cost-benefit analysis, although expanded to encompass environmental externalities. Inadequate maintenance budgeting can hamper the growth of transportation infrastructure and this can be accentuated by governments taking the option of deferring maintenance during a debt crisis. Development of an economy will be usually constrained where transport infrastructure is very deficient. This applies both to low-income developing countries with sparse transport networks and to some wealthier and more rapidly growing countries where inadequate transport capacity creates severe bottlenecks in trade flows. Developing countries must be able to provide transport that is fast, economical and reliable and above all flexible in response to user needs.

The paper also describes how the ever-increasing demands for greater transport flexibility have increased dependence particularly on road transport and this tends to aggregate energy consumption and generate air pollution and have other adverse effects on the surrounding environment. These impacts though not always cumulative and irreversible in nature, are nevertheless not sustainable since they do not represent the intended outcomes. In fact these impacts are very difficult to be reversed once the activity

locations and the personal lifestyles have been arranged to accommodate a high level of road transport dependency. The challenges here are to devise a transport policy that makes sure that the actual results of implementation are chosen rather than being unintended and unforeseen consequences of the formulated policies.

The project appraisal and evaluation techniques therefore must view transport from a general perspective and account for sustainable development. Whatever the case may be and whatever levels of balance chosen, increasing economic sustainability can always lead to advancement in environmental sustainability, but this not happen necessarily always. Such failures to accommodate environmental considerations in the evaluation and assessment of projects and policies lead to creation of what are called “sustainability gaps”. The policy challenges are therefore to recognize such trade-offs in different situations and to devise suitable instruments that prevent development of such sustainability gaps.

World Bank Studies also indicate that in metropolitan and urban areas of developing countries, the principal resource of the poor is their labor. It therefore becomes critical for provision of adequate and affordable transport to the poor workers who have to make excessively long journeys in major cities. In both urban as well as rural areas, anything that prevents basic public transport provision or makes it unaffordable will be inherently damaging to the poor and this damage can include the elimination of their homes or jobs. Also particular problems arise in meeting the transport needs of women. A very large proportion of the trips made by women are in categories that are conventionally and often considered as “inessential”. The consequence of this consideration is that these needs have not received adequate attention both in the planning as well as financing of the transport. Another problem is the failure to provide or maintain those activities and services that are most critical in ensuring that the poor have access to various markets, employment and social amenities. The World Bank studies describe that the planning skills and paradigms that are more relevant to industrial countries have been deployed in developing countries has meant that priority has been given to the provision of high mobility, rather than basic accessibility.

The challenge therefore is to define ideas and strategies that developing countries need to promote sustainable transport development. Various policy and institutional changes are necessary in order to adopt and enhance social, economic and environmental sustainability. The new focus however does not lessen the importance of efficient transport to trade and mobility and hence to economic growth or its contribution to the achievement of other objectives. But it does stresses on the fact that the traditional emphasis on public sector participation and regulation has often failed to achieve sustainable transport development.

The World Development Report (1994) on infrastructure stressed the importance of expanding the role of competitive markets and the involvement of the private sector to increase the efficiency in the provision and operation of infrastructure and services in a broader framework of sustainable development. A rigorous economic evaluation of investments in transport infrastructure, appropriate price incentives for its efficient use, and adequate financial and fiscal provisions for its maintenance remain crucial.

The World Bank has identified three principles for the guidance of urban transport development in most cities of developing countries:

- 1) Economic Viability
- 2) Financial Viability
- 3) Efficiency

It also considers environmental viability and social equity as essential aspects of sustainable transport development.

Equity is another important consideration in decision-making. Economic Evaluation should therefore indicate the distribution of costs and benefits by income class as well as transportation need and the degree to which these options tend to support or contradict the equity objectives of a project. Also this estimation of costs and benefits involves uncertainty and variability because some impacts are difficult to quantify and the way to overcome this is by specification of cost ranges rather than point estimates and then by performing a sensitivity analysis although there may be practical limits to this analysis.

Since most transportation economic evaluation practices are developed to evaluate similar options and assume a limited set of objectives, they are generally unsuitable for comparison of options that involve different strategies or programs.

Also since transportation is closely linked with other sectors and markets through their dependence on the physical movement of either people or goods, it is important to account for impacts of transport evaluation on those segments as well and calculate the total benefits and costs in the overall analysis.

Small suggests that the sound evaluation of a project therefore depends on accurately predicting its effects. The stakes are usually high for the durable investments that are typical of transportation infrastructure projects. The mistakes can cause severe bankruptcies or in burdensome taxpayer obligations for future bond payments on unproductive investments. Thus errors sometimes may be very large and several performance indicators can be over or underestimated that may result in devastating situations. A reasonable conclusion that can be made here is that real value of forecasting and analysis of the future is to learn and understand the factors that affect the success of the projects rather than to definitely predict the success of the projects. Also as it is said in his paper, “*predictions are useful as long as we do not believe them*”. It is important to carry out sensitivity analysis by using several alternate values of parameters that are crucial to the evaluation of the transport project.

As described in the above paper, recently the importance of the so-called “external effects” has come to be realized as crucial to transportation policy formulation. These effects can be either positive or negative. In practice it is more common to measure the primary or direct effects in the transportation sector itself and then to separately consider those ancillary changes or externalities. These external benefits happen to be maximum when a transportation improvement opens up new avenues for development, thereby tapping into new sources of agglomeration economies and bringing previously isolated regional economies into a wider and more competitive economic system. These externalities are therefore likely to be more important for the developing countries.

Also it must be kept in mind as Small puts it, that project evaluation is performed for decision makers and not technicians. Since proposed project alternatives tend to create conflicts, the need for formal tools and techniques for project evaluation arises and this helps to take into account multiple effects (both direct and indirect) of a project. Also formal project evaluation can be used as a tool to explicitly consider various alternatives of a project being proposed. But another aspect of formal tools for project evaluation is that the outcomes of such evaluations can be used by various stakeholders to convey a false sense or picture of certainty of their respective positions. The solution to this consequence might be to perform a comprehensive sensitivity and risk analysis to account for the uncertainty in the evaluation process.

Another major that needs to be dealt with is the gender equity issue. It is evident from most of the studies done by World Bank and other authorities that the investment in transport has not brought equal benefits to women and men and that the failure to account for gender relations in the design of transportation infrastructure and services can lead to inappropriate allocation of resources. It is generally assumed that well-designed transport strategies, projects and programs will be gender-neutral. The failure to improve the gender awareness of sector programs in transport can also result in their incapability to promote sustainable economic growth and may also undermine the equity objectives of program support in different sectors. Elson et al⁶⁸ describes and evaluates in his paper the extent to which the framework for sector support to transport takes the gender issues into account and also suggests ways through which program aid to the transport sector can be made more gender aware.

In the past few years, the project aid provision is gradually being replaced by a more integrated and sector-based approach to development. EC⁶⁹ states that,

“The sectoral approach seeks recipient government and donor consensus on the foundations of sustainable transport infrastructure. That in practical terms means

⁶⁸ Elson, D., Evers, B. and Turner, G. (1999), “Transport Sector Programmes in Developing Countries: Integrating a Gender Analysis” GENECON Unit, Graduate School of Social Sciences, University of Manchester, UK
URL: http://www.geocities.com/transport_research_genecom.htm

⁶⁹ European Communities-Commission (EC) (1996), “Towards Sustainable Transport Infrastructure: A sectoral approach in practice”, European Commission, Sustainable Transport Development and Natural Resources, Brussels, Luxembourg

replacing the project-by-project approach by a sectoral approach covering all issues of sustainability.”

But a crucial weakness of this approach is that the decisions about resource allocation to the sector and sub-sectoral activities are driven largely by narrowly defined commercial motives and with insufficient attention given to broader aspects and views of economic development. Mostly with the project finances the decisions about appropriate allocation of government resources are made on the basis of cost-benefit analysis but however, there are no comparable ways to go for the sectoral approach. The existing approaches adopt narrowly defined notions of efficiency and do not have the sector wide review to make decisions about the most efficient and equitable ways for allocation of a mix of public and private resources to the sector as a whole. Also there is little opportunity to benefit from inter-sectoral complementarities from the perspective of household providers and users of transport services when there is no co-ordination among the ministries of transport, planning, health, agriculture, rural development, industry etc in defining the sector priorities. Expenditure will be more focused on highways and roads, particularly the non-motorized transport for the continued provision of essential transport services to meet the needs of the poor. This approach usually does not account for gender differences in access, use and control of transport, or the different needs of women and men as transport providers.

The World Bank studies indicate that though some of the needs of the household are addressed but it is only from the viewpoint of the consumers of transport services without pondering over the gender differences in specific transport needs within the household. The household needs from the transport providers' perspective such as water carrying, carrying children, food and goods to and from markets, schools, and hospitals are some of the least important priorities of the sectoral approach. In short what it means is that greater consideration has been given by the transportation planners to men's priorities and transport needs rather than those of women. This neglect of the needs can encourage marginalization and may lead to exclusion of the poor, particularly poor women and that can threaten the potential for sustainable and balanced growth of the developing nations. Though it is clear that there are some shortcomings in the transportation infrastructure

planning and development procedures and these are more spread out in the context of developing countries, overcoming these weaknesses and developing the overall process is not easy at all. Several other factors come into picture and they have an important role to play for the intended improvements.

*Lewis*⁷⁰ suggests embedding the entire process of evaluation in a public-decision making process that includes interactive sensitivity analysis and open discussion of the merits of assumptions used in the analysis. It proposes combination of more transparent technical tools of evaluation along with educational and consensus building tools. But even the most sophisticated analysis possible may fail to account for problems such as administrative competence, undermining by political opposition, and unknown geological features or new inventions that tend to make a project somewhat outdated. Recently it has been argued that for developing countries, it is these factors that significantly affect the overall performance of a project and are more important for the project success than most of the technical factors that are of concern to various methodologists- including those factors highlighted in the evaluation methodology of the World Bank. Also there may be a limitation that formal evaluation of such projects may miss significant benefits by failing to foresee the many ramifications of change. Another important point is that it exists within a political context of a country. The best method of evaluation would make it possible to understand and justify political decisions that are in the interests of the economy, the society and the environment.

*Pearman*⁷¹ in his paper describes how,

“Transportation planning for large infrastructure projects is usually concerned with the medium and long-term future that is inevitably characterized by a high magnitude of uncertainty. In particular, it lacks the knowledge about the development of social and economic framework in countries within which existing

⁷⁰ Lewis, D. (1996), *“Exploring the Application of Benefit-Cost Analysis Methodologies to Transportation Infrastructure in Decision-Making”*, TRB, Washington D.C.

⁷¹Pearman, A.D. (1988), *“Scenario Construction for Transport Planning”*, School of Economic Studies, University of Leeds, Leeds, Transportation Planning and Technology Paper, 1988, Vol. 12, pp. 73-8

transport policies will have to operate and future policy decisions have to be made”.

This characteristic is a part of strategic decisions made both at the public as well as the private sector.

A sound transportation planning process will adequately address the future needs of the transportation for a given region. Conventional planning and evaluation tools are therefore of little assistance in this regard because of their implicit or explicit reliance on extrapolation of existing trends to picture in the future. Also they are somewhat vulnerable to changes in the underlying circumstances that render these techniques sometimes inappropriate depending on the scenarios.

The paper stresses on the fact that the transport infrastructure planning depends on the construction of a series of “scenarios” that serve as a useful background/support against which the strategic decision- making can take place. He also describes that scenario analysis is a potentially powerful instrument that can help in representing the type of uncertainty encountered in strategic transport planning although the number of established transport applications is very small.

Scenario construction can be considered as one vertex of a triangle that derives from adopting a particular approach to choice of transport strategy as shown in Fig. 4.2. The other two vertices are the specification of the strategies to be tested and the evaluation and choice process to be followed. All the three vertices are very strongly dependent on each other.

Indeed the literature on scenarios frequently suggests that there is no unique correct way of going about the process (e.g. *Klein and Linnerman*⁷²) but the general approach must be tailored to the particular issue under study.

⁷²Klein, H.E. and Linnerman, R.E. (1984), “*The Use of Scenarios in Strategic Environmental Assessment: A world wide study of corporate planning practice.*” Paper presented in International Symposium on Forecasting, London

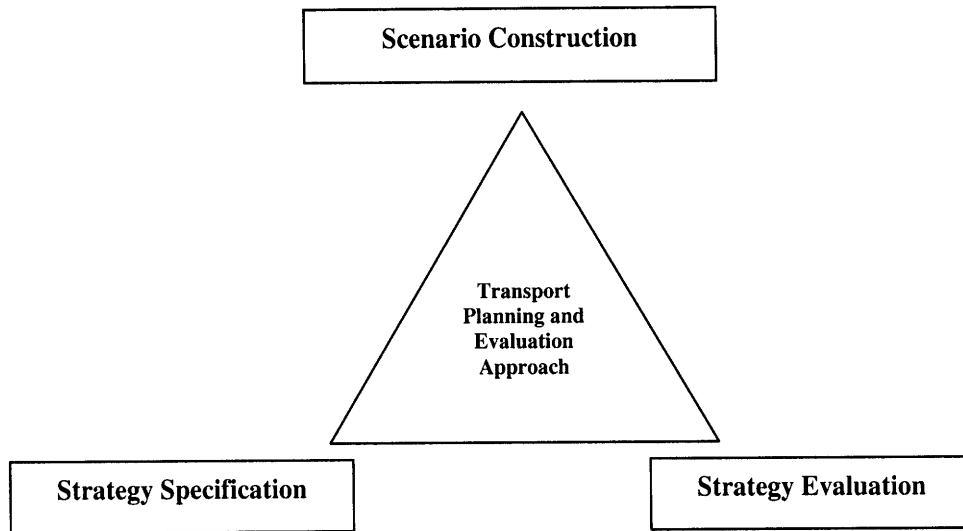


Fig. 2.6 Three Vertices of the Transport Planning Approach based on Scenarios [As described by Pearman]

The author also describes that it is important that the strategies are carefully designed and selected and local circumstances are clearly understood since they are a major input to the effective strategy definition. The transport infrastructure planning process does not start from scratch always but takes as given a conception of existing transport related problems and anticipated developments.

He also says that strategy specification can sometimes become rapidly unmanageable because of the huge range of possible policies and combinations of policies that might reasonably be evaluated. One of the ways to overcome this situation is to start the strategy development process with a clear statement of the objectives that the decision-making body associates with the transport sector and the constraints (like national political developments affecting transport, investment fund availability, local political issues, local organization of the transport sector, employment etc.) under which it is perceived to operate. Therefore a number of alternative strategies or options must be investigated and their feasibility evaluated. Building on this evaluation stage, then a small number of transport strategies or combination of the more promising options are taken and evaluated against a central scenario using a well defined procedure for the target years. The output for this will be a single general line of transport strategy or possibly

two or more attractive options to be presented for final decision making in the appropriate forum.

Another point to be noted is that the evaluation and choice of different strategies in conventional transport planning in most cases is based on the idea of maximization of expected net benefits. This is partly due to the fact that not all the future stages are identified and partly because probabilities of those futures are not normally calculated. In addition, scenario based planning approach to planning is quite distinct from the evaluation aspects of conventional cost-benefit analysis and other procedures. Strategies here are evaluated not in terms of net benefits but in terms of the proportion of the time that embarking on a given course is compatible with achieving a satisfactory end result.

2.6 Summary of Literature Review

The first part of the literature review presents information from several articles suggesting the importance of transport in a nation's economic and social development. After reviewing the various related literature, it can be fairly understood that the transportation infrastructure plays a key role in the economic and social development of a country. It stresses on the fact that it is very important to fully understand the way it interacts with the economy, the society as well with the environment particularly in cities that are considered as major growth centers in the developing countries. The transportation infrastructure investments usually involve great risks and uncertainties and therefore must be well planned and evaluated in advance. Any given improvement or development in transportation infrastructure may result in changes in land-use patterns and land value, displace the urban poor, allow more women or rural population to participate in the labor market, not to mention the potential impacts it can have on the surrounding environment. Thus it can be concluded that the project evaluation and appraisal process constitute an important part of the overall transportation planning and implementation framework that is currently at very crude level of understanding, particularly in metropolitan areas of developing countries. Project evaluation, therefore if performed skillfully can help to identify the key consequences or outcomes of a proposed

transportation infrastructure investment and provide quantitative as well as qualitative information about them.

The literature review then describes the notion of evaluation of strategies, programs, and projects with reference to transport development and presents several standard techniques of project evaluation along with the evaluation criteria used in the evaluation framework. It can be concluded from this section that the outlined methodologies have certain drawbacks that sometimes lead to bad conception of transport projects or prevent design and implementation of some of the best transport solutions or sometimes even generate misleading results. The planners still tend to follow a narrow perspective while identifying and evaluating problems. As a result, sometimes solutions implemented to one problem give rise to other problems and thus more integrated transport alternatives that provide multiple benefits tend to be left out.

The critique presented in the later part of the literature review shows that the developing countries are not able to account for several factors that lead to different transport related problems arising due to globalization of trade, decentralization and governance, demographics and income disparities, and rapid urbanization. It can also be seen that the infrastructure endowments in the developing world are no longer substantial to support and deliver fast-paced development and a comparative advantage. The increasing urbanization in large cities as well as constantly increasing population pressure and income inequalities have led urban growth rate to surpass the growth of urban poverty especially in south-asian countries. In this context, World Bank has suggested long-term system wide approaches rather than project approaches to investment in urban metropolitan areas and also at the same time focus on improvement of policies and methodologies to better plan, evaluate and manage infrastructure in those developing countries. Another impact is that the continuous growth in demand for various modes of transportation has resulted in several problems such as increased congestion and higher rates of deterioration in infrastructure that ultimately calls for higher construction and maintenance costs. This can lead to serious negative impacts on the economy as well as the environment and the society.

The review also describes that conventional planning and evaluation practices sometimes tend to over or under estimate the overall costs and benefits of transport planning and management strategies and hence give rise to several transport problems. In fact one of the studies concludes that project evaluation in developing countries is much more complex than in developed countries and therefore it must thoroughly be evaluated of various potential risks -technical, social, operating, environmental, political or financial. Each risk also needs to be handled effectively by suitable approaches if the project is to be sustained in the long term. Also most project evaluation methodologies do not account for sustainability and other externalities of the project related to economic, social and environmental terms. Thus it is necessary for evaluation and analysis process to be embedded in the public-decision making process and provisions for interactive sensitivity analysis and open discussion of the merits of assumptions in the analysis be made. Combination of more transport technical tools of evaluation along with educational and consensus building tools is proposed but sometimes even they fail to account for administrative incompetence and political instability that may give a whole new direction to the conceived project. Other major issues are related to rural and gender transport in most of the areas in developing countries. This is important from the point of view that most of the developing countries' economies are predominantly agricultural and women in the household play a key role in income-generating activities. They therefore need efficient and accessible means of transport in order to move from one place to another.

In the end, the whole chapter summarizes that project evaluation is basically a process whereby a public agency or a private enterprise determines whether a given project option would meet the country's economic and social objectives and whether it meets those objectives in an efficient manner. The review also outlines several steps of the project identification and evaluation process, the risks and strategic considerations involved and signify their importance in the overall evaluation process. It also discusses some aspects of the strategic and scenario planning process and how it can be used effectively in the overall transportation planning process.

The next chapter will focus on identifying several case examples of transportation infrastructure projects in metropolitan areas of developing countries and reviewing them

briefly. An attempt will be made to identify and study the 'gaps' in those cases that are related to the project identification and evaluation procedures. The gaps will then be delved upon further and categorized into several areas depending on the literature review and the framework prepared for project evaluation. The chapter will also try to come up with certain important questions that can help planners and other officials to come up with better ideas and understanding of the project evaluation and implementation process and at the same time help overcome the gaps found in the existing evaluation processes.

Chapter 3

Planning Methodology and Case Examples

3.1 Overview

The literature review clearly suggests that there exist certain gaps in the existing project evaluation methodologies for transportation infrastructure projects in developing countries. This chapter is aimed towards review of various case studies and performance audit reports of major transportation infrastructure projects from several developing countries and tries to analyze whether they were able to achieve the desired objectives or not and what went wrong with their evaluation and appraisal processes. An effort will be made at the same time to identify the various “gaps” and weaknesses in the evaluation methodologies for the above projects and come up with suitable steps and requirements that can overcome them and help to improve the overall transportation planning and management process in general. A framework to identify those gaps in several areas of the project identification and evaluation process will also be developed and presented.

The following section explains some ideas on the overall transportation planning process along with classic travel demand modeling and planning approaches. It also describes how the characteristics of metropolitan areas of developing countries affect the planning and evaluation process and what areas need immediate attention to make the process more efficient.

3.2 The Transportation Planning Process

Transportation planning, analysis and evaluation are essential components of the overall infrastructure development and play a major role in examining the potential of future activities to guide a system towards a desired direction. Transportation planning in fact is a complex process that involves a basic sequence of several steps. Several of these steps can take place at once and it is not unusual to repeat some of these steps outlined several

times. It involves a number of decision-making steps that in turn involve a multiplicity of attributes. The basic steps include the following activities: -

A: Conception

- Problem/Project Definition
- Defining of goals, objectives and criteria
- Data collection, modeling and analysis
- Demand Forecasts
- Developing Alternatives
- Evaluation (multi-criteria analysis) of the alternatives and Ranking of the alternatives
- Choice of the best alternative

B: Implementation

- Implementation Plan
- Construction
- Operation, Monitoring and Maintenance

The chapter will start with a brief review of some ideas about existing transportation planning process for different transportation infrastructure projects. This will help us to identify some of the key gaps in evidence to be addressed through several case studies at the country level. The review will consider various methods of transport project evaluation used by both public as well as private sector in the identified case examples and select best practices in project evaluation/appraisal that have been shown to increase the performance of infrastructure projects over a period of time and also list the gaps existing in those methods at the same time. This will lead to the preparation of a set of preliminary exhibits depicting conceptual frameworks for project identification and evaluation and finding out of a series of critical gaps to be examined through case examples in the developing countries.

3.2.1 The Classic Travel Demand and Planning Model

Different authors have different outlook towards the transportation planning and evaluation processes and they have therefore defined the transportation planning approach in different ways. Some of the textbooks that deal with this process in depth include:

Principles of Urban Transport Systems Planning by Bruce G. Hutchinson (McGraw Hill, 1974), *Metropolitan Transportation Planning* by John W. Dickey (McGraw Hill, 1975), *Introduction to Transportation Engineering and Planning* by Edward K. Morlok (McGraw Hill, 1978), *Fundamentals of Transportation Systems Analysis* by Marvin L. Manheim (The MIT Press, 1979), *Transportation Demand Analysis* by Adib K. Kanafani (McGraw Hill, 1983), *Urban Transportation Planning: A Decision-Oriented Approach* by Michael D. Meyer and Eric J. Miller (McGraw Hill, 1984), *Discrete Choice Analysis: Theory and Application to Travel Demand* by Moshe Ben-Akiva and Steven R. Lerman (The MIT Press, 1985) etc.

Conklin⁷³ finds that transportation planning in most of the developed and developing countries consists of the following basic components:

- Having knowledge about the current status of transportation system and identifying the trends and demands that will shape the future transportation operating conditions. The planning process also involves identifying the strengths and the weaknesses and the demands on the transportation systems and forecasts these trends in the future.
- The next step is basically identifying the goals and objectives of transport development in a given region, which are often stated in terms of mobility and accessibility improvements.

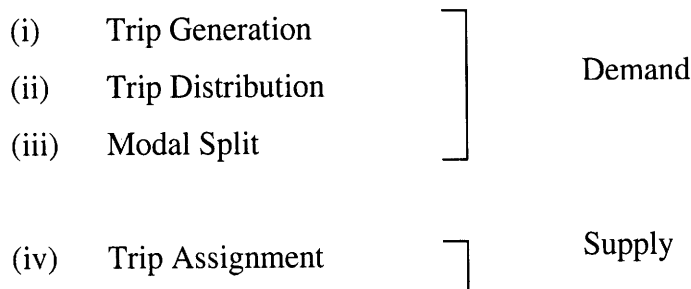
⁷³ Conklin, C. (1999), " *Using Scenarios in Regional Strategic Transportation Planning: An Evolving Methodology*", MIT

- The transportation plans then analyze the statistics and identify the infrastructure improvements that will address the weaknesses identified and also accomplishes the objectives planned.
- The final step is regarding the economic and implementation considerations and figuring out how these infrastructure projects will be made feasible and financed.

The long-term transportation planning process thus involves not only the above steps but also loading the transportation demand over the existing and planned networks (including highways, ports, railways, terminals etc.) and analyzing their outcomes. These depend a lot on the characteristics of the study area such as population level, the economic activity, vehicle ownership levels, existing travel demand, land use, transportation facilities and available monetary resources.

The traditional planning process can be defined to consist of 4 essential steps as shown in

Fig.3.1: -



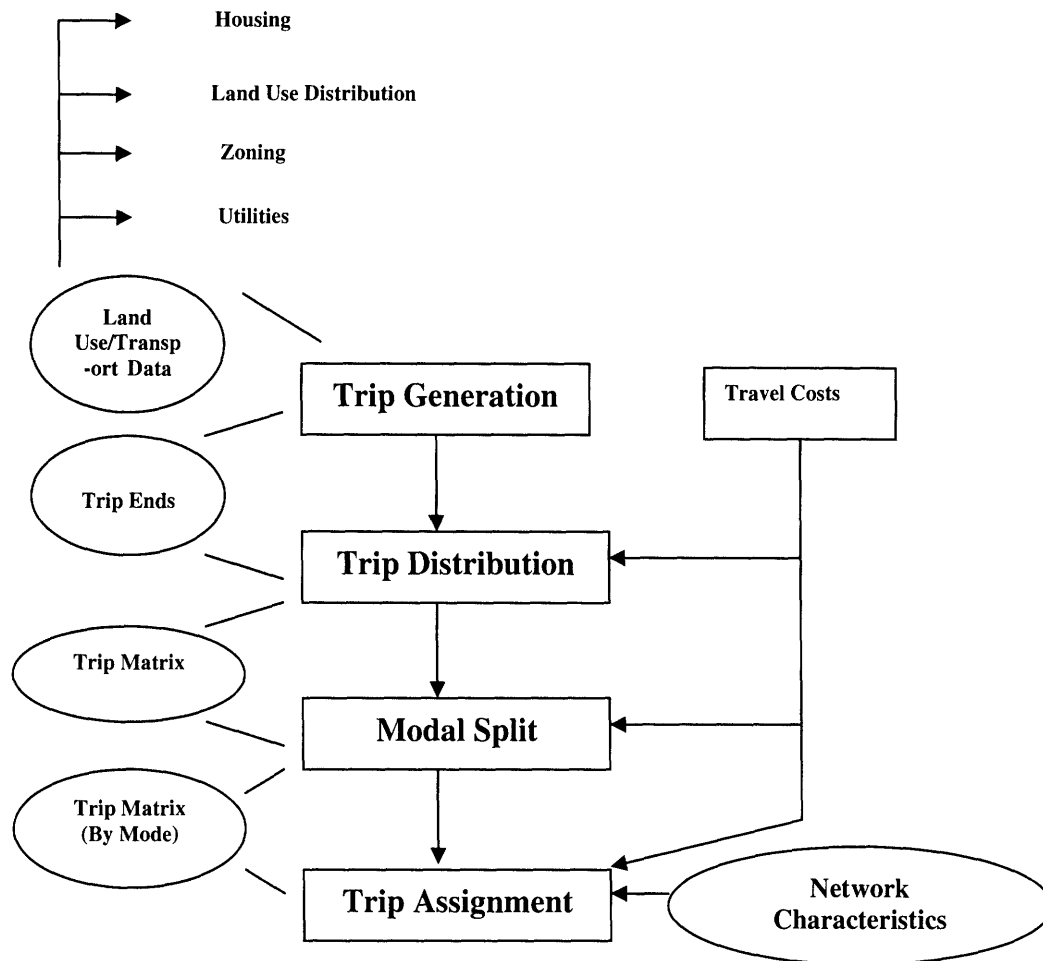


Fig. 3.1 The Classic Model for Travel Demand Modeling and Planning

The planning model is further explained as follows: -

- The approach starts by considering a zoning or network system of the area under study and the collection and coding of socio-economic along with transport system data. These data would include base years level of population of each type in each zone of the study area as well as levels of economic activity including employment, shopping space, educational and recreational facilities and network and transport system characteristics.
- These data are then used to estimate a total number of trips generated and attracted by each zone (trip generation).
- The next step is the allocation of these trips to particular destinations (trip distribution).

- The following stage involves the mode choice process i.e. allocation of trips in the Origin-Destination Matrix to different available modes.
- Finally the last step in the classic travel planning models requires the assignment of trips of each mode to their corresponding networks (trip assignment).

This classic approach is usually not followed as much in developing nations as in the developed countries that have well planned urban infrastructure and proper land-use plans in the cities. This is because the metropolitan areas in developing countries have certain characteristics that are very dynamic in nature that in turn present more difficulties for application of standard evaluation methodologies and planning procedures. One of the reasons being increasingly mobile population levels and densities in the urban areas and the other being transport infrastructure having a non-uniform spread out in the city. Due to the rapid expansion of the urban areas, the existing transport systems are already stretched to capacity levels and thus transportation services are not able to meet the needs of the users. In the developing countries, some of the extreme issues like the existence of different motorized and non-motorized transport modes, low vehicle ownership levels and non-uniformity in the availability of choice opportunities usually results in capacity shortage and several transportation sectors and projects competing for funds at the same time. Also poor quality transport infrastructure facilities raise the travel / transport costs and result in uncertain travel / delivery times forcing people to not reach work places on time / hold large inventories.

Some of the interesting trends supporting the above phenomena and as described in one of the *World Bank's Reviews*⁷⁴ by Gwilliam are:

“Urban population continues to expand at more than 6 percent per year in many developing countries. The number of mega cities- cities with over 10 million inhabitants- is expected to double within a generation. More than one-half of the developing world's population, and between one-third and one-half of its poor,

⁷⁴ Gwilliam, Ken (2002), “*Cities on the Move*”, A World Bank Urban Transport Strategy Review, World Bank, Washington D.C.

will then live in the cities. Per capita vehicle ownership and use continue to grow up by 15 to 20 percent per year in some countries. Traffic congestion and air pollution continue to increase. Pedestrian and other non-motorized transport (NMT) continue to be poorly served. Increased use of private vehicles has resulted in falling demand for public transport and a consequent decline in service levels. Sprawling cities are making the journey to work excessively long and costly for some of the very poor.

Also the cities are now increasingly involved in trading patterns on a global scale, which makes the efficiency of their transport infrastructure more critical. At the same time, responsibility for urban transport is being decentralized to the cities, which are often short of funds and are institutionally ill prepared for the new challenges. The safety and security of urban travelers are other emerging problems.”

Project appraisal and evaluation are a very important part of the transportation infrastructure investment decisions since ineffective planning and unplanned transportation can actually lead to more problems and negative consequences rather than solving some of the challenges. As *Evren et al*⁷⁵ describe in their paper, there are some examples such as unplanned developments resulting from the lack of or a misunderstanding of the planning concept. Then there are others which are developments against plans under operation. For example, as suggested by *Evren et al*, the most striking fact of the last fifteen years of the transportation sector is that 16 billion US dollars were spent in Turkey to build 1700 kilometers of motorways. It was decided to build 1200 kilometers of motorways in spite of the fact that no new motorways were suggested in their national plan. On the other hand, there were suggestions to build high-speed railway, and a quarter of the construction was complete when it was abandoned in favor of motorways. Such planning decisions without a firm backing of project appraisal and

⁷⁵ Evren, G. and Akad, M. (2002), “Transportation Planning Problems in Developing Countries” Proceedings of the 13th Mini-EURO Conference, “Handling Uncertainty in the Analysis of Traffic and Transportation Systems”

feasibility studies can cause tremendous negative impacts and reduce the effects of the efforts made in favor of planned transportation infrastructure developments.

Compared to the developed countries, the planning problems are even more severe in the developing countries. The planning efforts cannot yield the best results in a short period of time without the necessary tradition and the past experiences. Also low national income leads to poor infrastructure and therefore big investments are vital to support and encourage growth in developing countries.

Traffic congestion has become a common problem for many of the big cities in the developing countries. Some of the reasons for this may be related to:

- Urban geography in developing country not too suited for cars
- High rate of car usage
- Inadequate traffic management
- Widespread disobedience to the traffic rules
- Inadequate public transport

It can be seen from several project studies conducted by the World Bank that most of the measures taken to prevent or remove congestion in developing countries are meaningless because they inherently lack permanency and do not help to solve the non-car owning majority's problems. As suggested by *Evren et al* the real problem waiting to be solved in these countries is public transportation, on which the vast majority of population depends upon. There is a growing importance for the efforts towards creating the supply to meet the ever-increasing transport demand with respect to increasing population and a growing economy. The state of transport in the cities in the developed countries differs widely from those of in the developing countries. So the planning based on conditions in developed countries might not be directly suited and cannot be directly translated for conditions existing in developing countries. A different formulation needs to be assessed for the developing countries in general.

In short, it can be said that a “passive” approach, which predicts the future through present trends and developments instead of directing it, can be valid for the developed countries. “Active” approaches that are directive in this sense are necessary for the developing countries.⁷⁶

Another thing that needs to be noted from the paper is that transportation planning in many developing countries has become a methodological problem, or even further, a modeling problem due to many hidden and inherent arbitrary assumptions in its structure.

Another issue is management and financing of transport infrastructure projects in developing countries. Engineering approach towards evaluation of transport planning strategies and alternatives will no longer be sufficient just by itself. It has become quite necessary to pay attention to economical, social and cultural dimensions as well. Sometimes institutional or political structure and existence of many stakeholders in developing countries might pose challenges to the execution of the overall evaluation process as well.

Project evaluation and analysis thus play a pivotal role in planning for transportation infrastructure for any city as it determines several future scenarios for travel demand, population, freight movement, traffic, economic growth etc. Introduction of a new node or improvement of existing ones indirectly influences the travel behavior in a given area. Hence there is a need to make different modes and infrastructure facilities available to users, channelizing and guiding their developments in a manner that a balanced share is carried out by each mode providing desired accessibility to a trip maker. A comparative analysis is therefore necessary to effectively detect, analyze, verify and develop strategies for improving the overall efficiency of the system. But the complexities of the task and the increased number of factors to be considered in the analysis have further complicated the process. Though a wide range of methodologies and techniques that vary from simple evaluation procedures to complicated ones with reasonable accuracy and results have

⁷⁶ Evren, G. and Akad, M. (2002), “Transportation Planning Problems in Developing Countries” Proceedings of the 13th Mini-EURO Conference, “Handling Uncertainty in the Analysis of Traffic and Transportation Systems”

been developed over the past years. But at the same time little attention has been paid to their exact roles due to which certain performance gaps have resulted between the conception and the final implementation stages of those projects.

Decision-making is therefore very important at every step of the transportation planning and implementation process. It involves taking several courses of action, developing new ideas and ways of meeting the challenges and finding alternative strategies to make the planning process more efficient. Some of the multi-criteria decision making techniques used in transportation design and planning process are:

- Analytical Hierarchy Process
- Fuzzy Techniques
- Metagame Theory etc.

These techniques use different strategies and evaluation criteria to make the most suitable and viable choice among a given set of alternatives to solve a particular transport problem.

The following Table 3.1 represents various methodologies for project evaluation, their features and their positive and negative points.

Table 3.1 Different Project Evaluation Methodologies

| SNo | Project Evaluation Methodology | Features | Advantages | Disadvantages |
|-----|--|--|---|---|
| 1 | Cost effective analysis | -Measures the total cost of the transport project -Quality of benefits held constant | -Relatively Simple -All relevant costs are reduced to one comparable unit or monetary equivalent | -Only used when benefits cannot be translated into equivalent monetary amounts |
| 2 | Least cost analysis | -Lowest cost option is selected for implementation -Costs assessed in present value terms | -Much simple to use -No complex calculations | -Benefits not quantified -Benefits accrued are assumed similar |
| 3 | Cost-benefit analysis (Net Benefit and B/C Ratio); Two Types -Simple Payback Approach - ROI Approach | -Involves comparison of total increment in benefits gained with total increment in costs | -Not confined to a single objective or benefit | -The ratio or difference sometimes does not depict the actual situation as benefits can be taken as negative of costs |

| | | | | |
|---|---------------------------------|---|--|---|
| 4 | Lifecycle cost analysis | -Basically a net-benefit analysis approach but incorporates the time value of money | -Allows comparison of projects that have benefits and costs occurring over different time periods -Best for implementing projects requiring long-term maintenance. | -Benefits and Costs accrued have to be calculated for each time period -Issues with selection of accurate discount rate |
| 5 | Multi-criteria Analysis | -Identifies the best alternative by evaluating options against several criteria that are assigned weights according to level of importance -More Realistic and Interactive | -Incorporates both quantitative as well as qualitative criteria -Can be even used when impacts cannot be monetarily expressed or projects with different objectives | -Results sometimes cannot be explained -Possibility of group preferences being determined by a single decision-maker -Implicit weights may sometimes be reduced |
| 6 | Utility Value Analysis Approach | -Measures the utility of each characteristic for each alternative by a performance measure or an indicator -Option with highest utility value is chosen for implementation | -All characteristics of the alternatives are taken into consideration -Addresses those outcomes that are not quantifiable in monetary terms | -Is more time consuming -The weights for utility are relative and may vary depending on situations |
| 7 | Logic Model | -It gives a picture of how an organization works-the theory and assumptions underlying various strategies, programs and projects -Links the outcomes with program activities and processes as well as assumptions of the program | -Explains the rationale behind several project activities -Clearly depicts the cause and effect relationships between activities and outcomes -Identifies critical aspects of evaluation | -The external factors have to be taken into consideration -Has to be followed in a methodological and sequential manner |

3.3 Project Evaluation as a Part of Project Cycle

Transportation and Road Research Laboratory through its guide on project appraisal⁷⁷ suggests that the transportation projects are usually planned and carried out using a sequence of activities known as the 'project cycle' that includes several steps such as:

- identification of potential strategies, programs, projects,
- feasibility and evaluation studies,

⁷⁷ The Guide to Road Project Appraisal by TRRL, The transport-links website presents information about transport-related matters arising out of the UK Department for International Development's (DFID) programme of aid to developing countries, URL: http://www.transport-links.org/transport_links/publications/

- detailed planning, analysis and design,
- securing funds for the project
- project implementation
- operation and
- evaluation

The project cycle can be represented as shown in Fig. 3.2

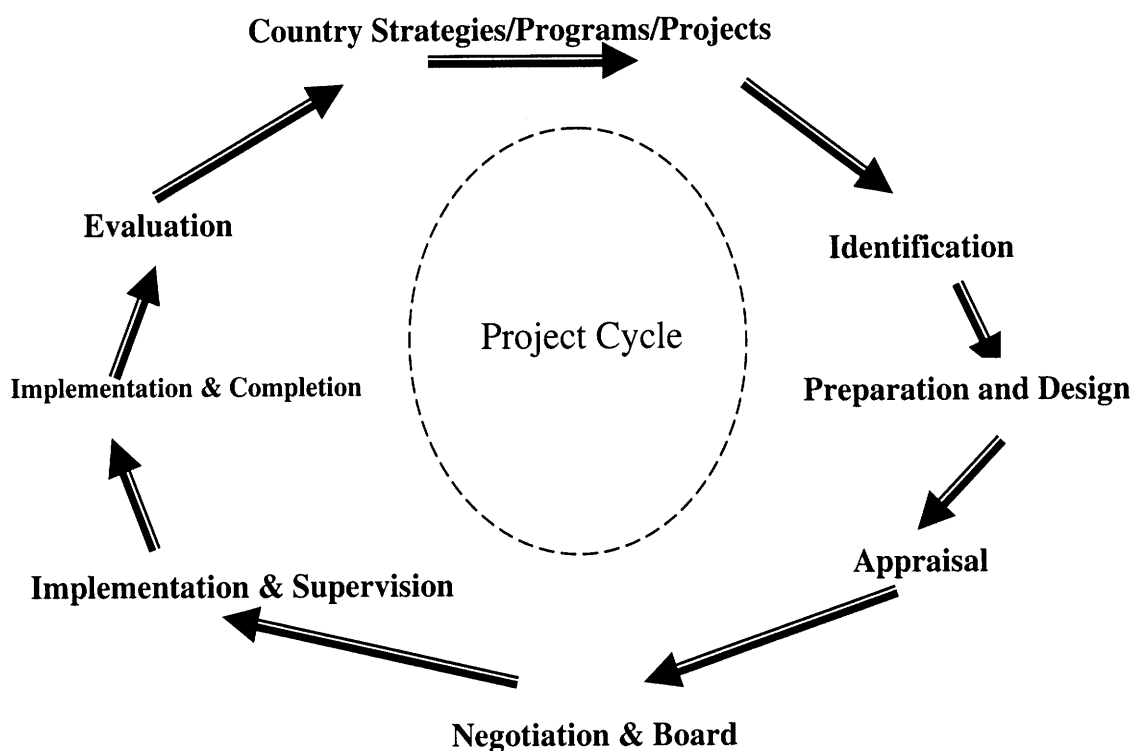


Fig. 3.2: The Project Cycle⁷⁸

Fig.3.2 gives a general idea about various aspects of the project cycle. The project identification and evaluation process as a part of the project cycle can be developed and represented as follows in Fig. 3.3. It is worth mentioning here that evaluation of a project can occur at several levels and may be of different kinds.

Three Levels of Evaluation in the Project Evaluation Framework can be described as:

- Preliminary Evaluation (Planning/Feasibility Studies):
- In-Project Evaluation (During Implementation):

⁷⁸ Baum, Warren C. (1982), *"The Project Cycle"*, Washington, DC, The World Bank Group, URL: <http://worldbank.org/infoshop/projectcycle.htm>

- Post-Implementation Evaluation/Project Performance Review
(After Implementation and through Feedback):

As can be seen in Fig. 3.2, evaluation is conducted at one of the final phases of the project cycle. This step basically consists of systematically looking back at the successful and unsuccessful elements of the project experience to learn how planning can be improved in the future. It is important that the project be fully studied throughout all stages of the project cycle for evaluation to be successful. This will help in monitoring the details of events and identifying problems that need to be brought to attention of the project's management. This will also help in giving specific recommendations about improving various aspects of the project that can be used to improve ongoing and future planning and implementation process.

The Fig. 3.3 clearly lists the steps of evaluation of different transportation infrastructure projects as a part of the project cycle. First of all it involves identifying the need of the project along with the constraints and the criteria that will be used during the implementation of a particular option chosen from the given set of available alternatives. The project then goes through a set of different preliminary analyses and appraisal processes in order to rank the available options and come up with the best alternative for project implementation.

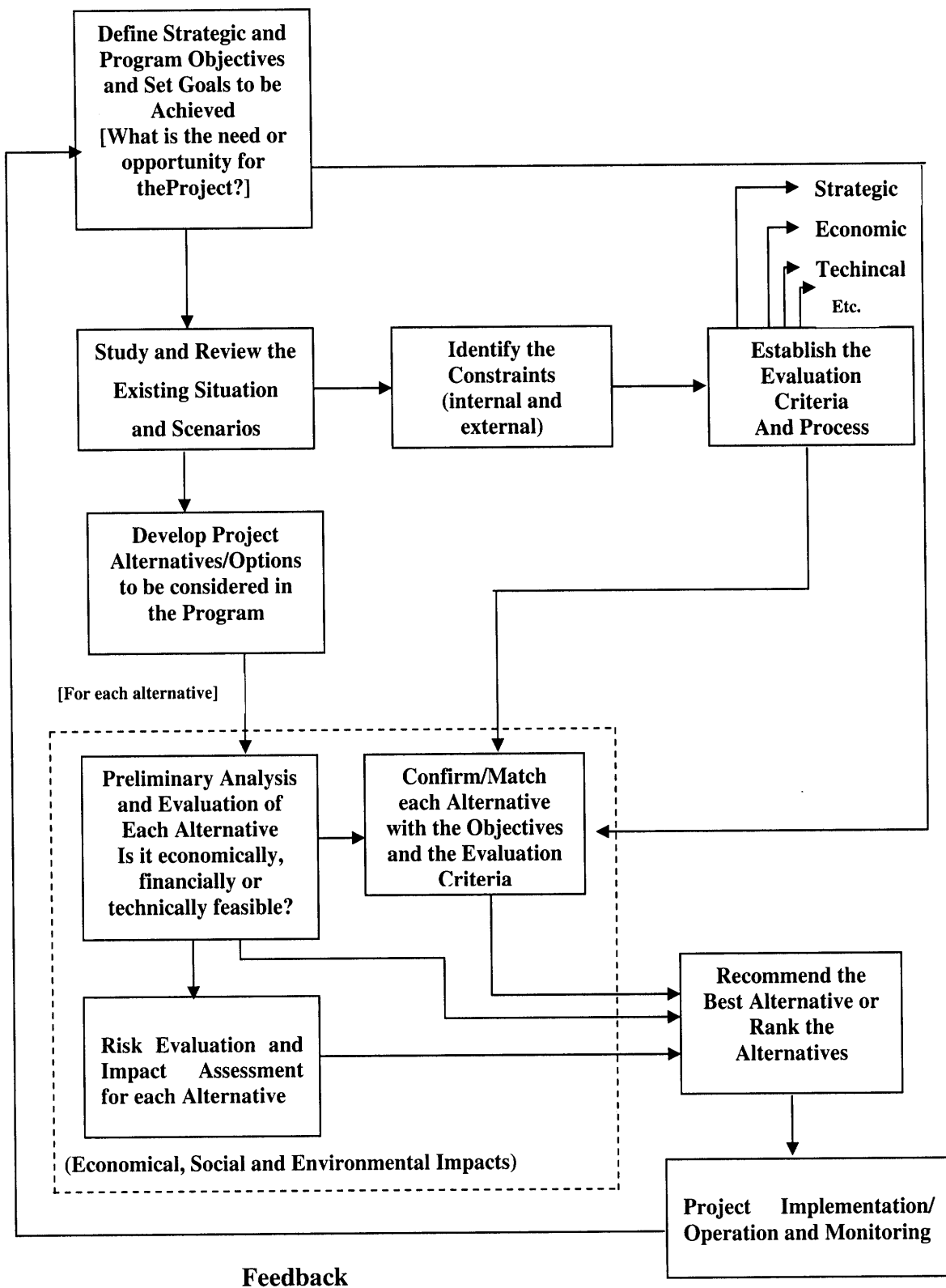


Fig. 3.3 Project Evaluation as a part of Project Cycle

As it can be seen from the previous chapter that a number of gaps and shortcomings exist in several areas of the project identification and evaluation process, our next step will be to study and review some case examples of transportation infrastructure projects from credible websites such as those of World Bank, Asian Development Bank and several others. This will in turn provide further support to the hypothesis that there exist certain gaps in the existing project evaluation and analysis methodologies in developing countries.

3.4 Case Examples

The following sections study, review and analyze several case examples of transportation infrastructure projects in developing countries from different websites. The aim is to study their project evaluation methodologies and find gaps and shortcomings in them due to which the projects were not able to achieve the desired outcomes at the optimum level. The basic objective behind studying these transportation projects will be to improve our understanding of gaps in the methodologies, help identify priorities for improvements in the neglected areas, and also allow us to recommend additions to or changes in the standard techniques and methodologies for project evaluation.

3.4.1 An Overview

Various sustainability case studies⁷⁹ done by the Western Australian Government reveal that the current system of assessing and evaluating a future transportation project is prominently based on the financial implications of implementing the project and categorizes any other areas of impact such as environmental and social into an externalities group. The disadvantage of this strategy is that the externalities are only taken into account into in the final stages of the evaluation process and therefore the impacts of implementing such transport infrastructure project upon these areas are not fully accounted for within the design and conception phases. Eventually this results in negative impacts on the environmental and social well being of the country.

⁷⁹ WA Sustainability Case Studies, The website provides an overarching perspective on sustainability in Western Australia and keeps people informed about the Western Australian Government's activities in this area.
URL: <http://www.sustainability.dpc.wa.gov.au/CaseStudies/multicriteria/multicriteriatransport.htm>

There are also many environmental, economic and social reasons for designing and implementing efficient and high quality transportation systems. The environmental reasons include the level of greenhouse gases and other emissions generated from the transport industry and also noise and water pollution. Thus high levels of dependence on motorized transport are of concern and alternative modes of transportation need to be exercised. It is very crucial therefore to have the basis for considering the infrastructure development in a balanced manner to make these alternative modes of transportation more accessible and easier to use. Economic concerns relate to the productivity and efficiency of the state's economy on basis of high quality transport systems. Social concerns for a good transport system relate to equity concerns such as accessibility. These issues must therefore be addressed more widely and frequently in the overall evaluation process to ensure the entire community and economy benefits from the implementation of such a transport improvement project. These case studies promote the idea of multi-criteria integrated transport planning and assessment that is based around the idea that the transport infrastructure not only has achievements and impacts within the transport industry but also beyond it, having impacts on the economic, environmental and social elements of the society.

Here a few case examples from the Asian Development Bank, World Bank and other international organizations such as Institute for Transportation and Development Policy (ITDP) and International Forum for Rural Transport and Development (IFRTD) etc. are chosen to identify and highlight some of the above-mentioned "gaps" as well as other shortcomings in the current project evaluation methodologies. These case examples from different organizations then also suggest some of the ways to overcome those gaps identified during the planning and implementation process.

3.4.2 Case Examples from Asian Development Bank

The Asian Development Bank is a,

*“Multilateral development finance institution dedicated to reducing poverty in Asia and the Pacific. The studies done by the ADB include performance audits and evaluation reports of specific projects in various countries, reviews of all completed ADB-financed transport projects and programs within a country and several broader multi-country evaluations of selected projects. These studies present the major findings, lessons learned and issues involved in various transport projects relevant all over the world and thus contribute to substantial improvements in future transportation infrastructure development.”*⁸⁰

The Asian Development Bank describes evaluation as an important process that –

“Helps decision-makers responsible for planning, designing, and implementing projects and programs to understand whether resources were well spent; whether the planned outcomes were achieved; and whether procedures were followed.

The three functions of evaluation are to:

- 1. Distill lessons learned for future operations and disseminate them internally and externally*
- 2. Ensure accountability for use of resources to improve development effectiveness*
- 3. Follow up on evaluation recommendations to sustain project benefits.”*⁸¹

The post-evaluation in ADB consists of self-evaluation by the operations evaluation department (OED) through a project/program completion report (PCR) and independent evaluation by OED through project/program performance audit reports (PPARs). PCRs are usually prepared for all projects and programs 1-2 years after their completion. For overall assessment, the OED evaluates groups of projects or operations to understand the thematic or systemic issues. The OED thus basically evaluates and rates individual loan and technical assistance operations to produce (PPARs) or technical assistance audit reports.

⁸⁰ Asian Development Bank, URL: <http://www.adb.org>

⁸¹ Evaluation Section of the Asian Development Bank, URL: <http://www.adb.org/Evaluation/default.asp>

The OED of ADB has altogether evaluated 915 projects and programs completed from year 1974 to year 2001 in different areas that can be categorized as follows: -

- Agriculture and Natural Resources
- Energy
- Finance
- Industry
- Social Infrastructure
- Transport and Communications
- Multi-sectors / Others

The various projects and programs have been reviewed and categorized by ADB either according to the different member countries or according to the particular sector they relate to.

The transport and communications sector accounts for about 128 of those reports that specifically involve projects and programs in the following major areas:

- Roads and Road Transport (72)
- Railways (3)
- Airports and Civil Aviation (7)
- Telecommunications (16)
- Education (30)

The number in the parentheses above indicates the number of performance and evaluation reports in that particular sector of transport. Out of these, the Project Completion Reports in the Transport and Communications sector include five projects in all.

The Evaluation reports from OED are available online from year 1995 onwards and the structure they follow is given as:

Project Completion / Performance Audit /Evaluation Report:

- Basic Data / Map
- Project Background Description (Objective and Rationale / Project Components and Objectives)
- Evaluation of Design and Implementation (Inputs / Costs / Outputs / Schedule and other implementation arrangements)
- Evaluation of Performance (Relevance of project / Efficacy and Achievement of Objectives / Sustainability Assessment / Environmental, Socio-cultural and other impacts)
- Overall Assessment and Recommendations (Assessment / Lessons learned and Recommendations)

It is to be noted that while evaluating different projects, ADB pays particular attention towards these issues:

- ✓ *“Economic viability, technical feasibility, and financial soundness of projects*
- ✓ *Effect on development activity in the country concerned*
- ✓ *Contribution to removing economic bottlenecks*
- ✓ *Capacity of the borrowing country to service additional external debts*
- ✓ *Introduction of new technologies to raise productivity*
- ✓ *Expansion of job opportunities*
- ✓ *Strengthening of institutions along the criteria of good governance*
- ✓ *Integration of environmental and social considerations into these projects”⁸²*

The following section will identify several case examples and performance evaluation reports from the ADB Website and study them to summarize the various issues and identify the gaps in the project evaluation methodologies for transportation infrastructure projects in developing countries.

⁸² Projects Section of the Asian Development Bank, URL: <http://www.adb.org/Projects/default.asp>

Review of Project Performance and Evaluation Reports from ADB⁸³:

About ten project performance and evaluation reports of various transport projects in different sectors of developing countries are selected for review from the evaluation section of the Asian Development Bank and then, the summaries of these extensive studies (that are about 30 to sometimes 175 pages in length) are being presented in the following sections one by one. The summaries, though not detailed, describe the major objective of the project along with the characterization of prominent gaps encountered in their identification and evaluation procedures and then suggest some useful steps in order to overcome the cited gaps and improve the whole transportation planning and evaluation process.

3.4.2.1 Special Evaluation Study of Port Projects (February 1998)⁸⁴

As the ADB Report describes, this study was initiated to review the operational policies and strategies for the port sector (in India, Malaysia and Philippines) by assessing the extent to which Bank assistance has been responsive to the needs of the recipients and effective in attaining its objectives. The results of the study suggested that a new approach is needed for proper assistance from the Bank for the port sector. The proposed new approach should look beyond the physical environment of the port to the underlying trade that the port serves. Also it was noted that the most substantial benefits come from the link between transport, trade, and national economic development, and the link between local economic development and accessibility provided by the transport. On the other hand, the conservative approach to public investment in facilities and technology continue to provide limited impact on the development of port sectors and thus ultimately to the countries' trade facilitation. The traditional method of project evaluation has accordingly focused on the savings in the transport costs due to a project related increase in handling capacities and poses a number of serious problems related to both the method of calculation and the relevance of derived benefits to economic development.

⁸³ Asian Development Bank Project Performance and Evaluation Reports in Developing Countries, URL: <http://www.adb.org/evaluation/reports.asp>

⁸⁴Special Evaluation Study of Port Projects in the Transport and Communications sector, Feb 1998, URL: <http://www.adb.org/Documents/PERs/SS-30.pdf>

As the study suggests, the proposed new approach should be comprehensive and responsive to the various changes that have occurred in the transport industry, that is:

- The declining role of the public sector in the operation and maintenance of transport facilities
- Efficiency gains achieved through the deregulation of the transport sector
- The increasing integration of transport systems to reduce the cost, time, and the losses involved in movement of people as well as goods
- The globalization of trade and standards of transport technology and productivity

It is also recommended that in the final design of projects, engineering focus should be placed on improving performance and reducing the cost of individual activities. Also a number of problems associated with these Bank-assisted projects were identified which relate not only to the quality of physical infrastructure, facilities and equipment but also to the efficiency with which these assets are used to provide adequate services. The Project designs often failed to take into full consideration the complexity of the transport business or anticipate the rapid evolution of the transport industry. To improve the project quality

- A more thorough review of engineering design must be undertaken
- The relationship between the ports and the trade facilitation needs to be considered in detail during the project identification
- It is necessary to consider the effectiveness of the evaluation measures particularly the economic and financial internal rates of return
- Changes in patterns and technology should be closely examined
- A more flexible instrument is required during periods of rapid and unpredictable developments
- The projects should continue to focus on strong financial performance of these transport facilities
- The projects should also address the issues relating to the maintenance of public infrastructure

3.4.2.2 Special Evaluation Study on the Operation and Maintenance of Road Facilities and their Impact on Project Sustainability (December 1998)⁸⁵

ADB states that adequate transport infrastructure is a necessary foundation for national economic growth and for most developing countries; the importance of road sector far exceeds that of all other alternative transportation modes. This study reveals that insufficient provision of budget for operation and maintenance has been among the major problems of various projects in almost all the sectors of the developing member countries. This has resulted in the premature breakdown and suboptimal operation of completed road project facilities leading to reduced economic and financial internal rates of return and weakened overall project viability.

The new approach involves strengthening design capabilities of the local institutions in building well-designed roads, financing procurement of required maintenance equipment, and extending support for policy reforms. Often, the lack of government funds was cited as the major reason for the low level of or lack of systematic and appropriate road maintenance activities in developing countries. As commercialization continues to be a key response for strengthening the management and financing of roads, there is a need to complement it with

- Creating ownership of road-users in the management of roads
- Stabilizing financing for road projects
- Clarifying responsibility for organization and management of road maintenance
- Providing effective systems and procedures and strengthening managerial accountability.

⁸⁵ Special Evaluation Study on the Operation and Maintenance of Road Facilities and their Impact on Project Sustainability, Dec 1998, URL: <http://www.adb.org/Documents/PERs/SS-32.pdf>

3.4.2.3 Project Performance Audit Report on the Tenth and Eleventh Road (Sector) Projects in Indonesia (April 2002)⁸⁶

The ADB describes that this project basically aimed to improve the national, provincial, and district roads, and bridges to bring them to a technically efficient standard so that the road network could be preserved. Also the government there gave more attention for improvement of the road capacity in high-traffic corridors and for expansion of the network in the less developed islands in eastern Indonesia. In order to support the implementation of this road development program, two ADB projects, the Tenth Road (Sector) project and the Eleventh Road (Sector) Project were formulated. The project design and evaluation used were generally appropriate for this project with some exceptions here and there. The designs were revised before implementation in some cases but changes were not always carried out and sometimes the changes made were not sufficient.

The costs for road betterment were kept within the estimated values by reducing the length of roads being improved in the project. The road betterment subprojects eventually led to better performance and also helped in carrying significant volumes of road traffic. It was also confirmed that the socio-economic impact of the projects was positive. The environmental impacts were minimal but it was noticed that the projects did not significantly improve road safety. There were also long-term sustainability issues as a result of reduction in road maintenance expenditures. Also due to the recent administrative changes, the responsibility for maintenance was transferred to the regional governments that raised even more concerns about future maintenance programs for provincial roads. The institutional development and other impacts were modest. It was concluded that adequate attention needs to be paid during the implementation to subproject selection and civil works quality, followed by adequate maintenance and evaluation. Also the roles of institutions need to be defined more concretely since they play an important part in the overall transport development.

⁸⁶ Project Performance Audit Report on the Tenth and Eleventh Road (Sector) Projects in Indonesia, April 2002, URL: http://www.adb.org/Documents/PERs/ppa_IN105-02.pdf

3.4.2.4 Project Performance Audit Report on the Heilongjiang Expressway Project in the People's Republic of China (August 2001)⁸⁷

The project connects the cities of Harbin and Jiamusi in Heilongjiang Province and was formulated as a priority development to improve access to nearby cities and ports, relieve traffic congestion over the existing highway and reduce the vehicle operating costs. The project rationale was to support infrastructure development of the region, provide poverty relief and also raise national productivity and improve transport efficiency. It also aimed towards reducing vehicle accidents and strengthening the institutional capacity of Heilongjiang for highway planning, construction, operation, and management. The project was rated successful and the project ERR supports the overall efficiency and economic viability of the Project. But there are still some other issues such as:

- *“Weaknesses in pavement and safety design could have been likely avoided with greater attention to technical aspects and*
- *Failure to demonstrate adequately that economic development and poverty reduction objectives were achieved”*

The savings in Vehicle Operating Costs (VOCs) that were expected to benefit the farmers were only partly passed because of government controls on the price of key farm inputs. Other socio-economic benefits were not measured fully and also the impacts of the project on education and provision of access to other services was largely unknown. The study suggests that there was a need for more rigorous review of technical features at appraisal and during implementation to avoid design deficiencies associated with engineering and safety standards and also the need to make the project rationale more clear and a plan to achieve the project objectives so that there is a clear basis for monitoring and evaluating the project impacts and benefits. Also the purpose of the lessons that need to be learned and taken into account is to ensure that: -

- All future reviews of feasibility studies should compose of adequate review of technical and safety aspects of engineering and

⁸⁷ Project Performance Audit Report on the Heilongjiang Expressway Project in the People's Republic of China, August 2001, URL: http://www.adb.org/Documents/PERS/ppa_prc26377.pdf

- The future projects are planned and evaluated with greater attention to make sure that the design specifications are consistent with meeting project objectives

Also the pavement and highway designs corridor developments should be designed in such a way so as to meet the international safety standards and constructed with more durable pavement surfaces.

3.4.2.5 Impact of Rural Roads on Poverty Reduction: A Case Study Based Analysis (October 2002)⁸⁸

This study in essence tries to find out whether the assumption that the investments in rural roads reduce poverty is true or not and also at the same time tries to find the evidence of the ways in which the impacts occur and what are their determinants. The basic objective is to improve the design of rural roads to achieve sustainable benefits for the poor. There is a need to capture the real-life situations that often have a major impact on the project design and evaluation assumptions. The analysis is done by treating poverty as a multi-dimensional concept and by adopting an assets-based approach towards understanding poverty.

The study stresses the importance of baseline surveys and data monitoring to be realized by all stakeholders during project design and evaluation process if rigorous impact evaluations are to be carried out in future. Also the context in which the economic impacts occur was often determined by conditions such as climatic, agricultural potential, spatial position and proximity to networks, and world market commodity prices, as well as the social structure and concentration of various assets. Although it was seen that these factors are not affected by road development, their careful consideration during the project identification and design phases would enable a better evaluation of evaluation for poverty reduction through the projects, while at the same time complementary measures could be considered to increase the positive project impacts. Another thing noticed was that the economic benefits attained were different for different socio-economic groups. Also the problems of maintenance were compounded due to unclear institutional

⁸⁸ Impact Evaluation Studies; Impact of Rural Roads on Poverty Reduction: A Case Study Based Analysis, October 2002, URL: http://www.adb.org/Documents/PERs/IES_RuralRoads.pdf

responsibilities for the rural road projects. Developing a sense of responsibility in rural communities supported by technical expertise of local authorities can yield direct economic benefits while building ownership and promoting sustainability.

Another very important way in which the poor can feel the direct benefits of road projects is through labor-based road construction and maintenance. Thus roads are clearly a critical enabling condition for improvement in the standard of living of people in the rural areas. The understanding of distribution of these benefits altogether is a separate issue. Nevertheless, recognition of the distribution of these assets can help to understand how the benefits actually accrue and for planning complementary measures to enable those who lack assets also to benefit from the infrastructure investment. This suggests that integrated projects can help in tackling poverty in a more effective and efficient manner. The study also acknowledges the fact that the governments have a crucial role to play in this task such as facilitating a regulatory environment for competitive transport services and participatory selection of roads to be improved and promoting an understanding of priority of poverty reduction among its institutions.

3.4.2.6 Project Performance Audit Report on Ulaanbaatar Airport and National Air Navigation Development Projects in Mongolia (August 2002)⁸⁹

The study reveals that the air transport is inherently commercial in nature, and has the capacity to generate substantial revenue streams where the market demand is sufficient. Aviation infrastructure in developing economies such as Mongolia with vast distances, limited facilities and low demand is likely to be of limited financial viability but very essential for economic and social development. The condition of the old airports and systems of traffic control and traffic management and safety were below international safety standards. Some of the major objectives of the project were to: -

- Open up the economy of Mongolia to new markets by upgrading Ulaanbaatar Airport and civil aviation facilities to attract and cater for international traffic
- Improve the operations and safety of both domestic and international aircrafts and

⁸⁹ Project Performance Audit Report on Ulaanbaatar Airport and National Air Navigation Development Projects in Mongolia, August 2002, URL: http://www.adb.org/Documents/PERs/ppa_mon25306.pdf

- Encourage participation from international carriers for overflights

The difficulties encountered during the implementation were mainly attributed to the international contractor's inexperience in the estimation of construction costs, delays in importation and the limited availability of local labor and materials. The project met its objectives in improving the safety of aircraft operations and facilitating economic development in Mongolia. The operating costs were also reduced through construction of adequate maintenance facilities.

The successful implementation of such projects demonstrates that for such economies in transition, ADM must play a proactive and up-front role in project preparation and implementation and also combine strong policy and capacity-building components with physical works. The lessons learned include: -

- Giving full autonomy to civil aviation authorities in Mongolia to develop and implement medium-term capital expenditure programs to meet the demands of both domestic and international operations and
- Taking necessary steps to expand the domestic sector and introduce private carriers and
- Ensure aviation safety by having strong regulatory and management capacity

3.4.2.7 Program Performance Audit Report on the Railway Recovery Program in Bangladesh (August 2002)⁹⁰

This report reveals that the Program was designed to first of all restore and sustain Bangladesh Railway's financial viability and secondly to restructure it in order to make it more responsive to the changing demands of the transport market. The program aimed at reducing the growing dissatisfaction among the customers and passengers that was evident from the current state of the railway services. Specific reform measures were taken in deficit reduction, termination of open-ended subsidies, and introduction of public service obligation policy, labor rationalization, organizational reforms and investment

⁹⁰ Program Performance Audit Report on the Railway Recovery Program in Bangladesh, August 2002, URL: http://www.adb.org/Documents/PERs/IN202_02.pdf

program rationalization. The termination of open-ended subsidies would lead government to pay for only those services that were considered socially desirable but were not commercially profitable. The organizational reforms were designed to separate Bangladesh Railway from the Ministry and to structure it along commercial lines. The investments aimed to improve railways' performance by controlling capital expenditure and by ensuring that they are targeted at areas that have no commercial justification.

A series of operational, financial and macroeconomic performance indicators were used to assess the impacts on the economy, advancement of the sector goals and enabling environment for the private sector. In some of the cases, the impacts were evident but they were short-lived. Also there were sustainability issues since there was a mismatch between some objectives and the policy and institutional measures.

The main lessons to be learned is that a large and stable number of change agents at all levels but necessarily at the top is necessary precondition for the success of reforms. The blueprint target-oriented approach has failed to generate incentive to continue reforms after the completion of the program with respect to program design and implementation. Thus the future design and evaluation should be more result oriented by seeking the accomplishment of intended objectives rather than the outputs.

3.4.2.8 Project Performance Audit Report on the Second Tribhuvan International Airport Project in Nepal (November 1999)⁹¹

The study reveals that despite experiencing severe cost overruns and implementation delays, the project has managed to achieve its main objectives to reduce constraints on increasing passenger traffic by

- Relieving congestion in the existing terminal area
- Accommodating future international aircraft and passenger traffic and
- Improving safety of aircraft operations and also providing other substantial benefits.

⁹¹ Project Performance Audit Report on the Second Tribhuvan International Airport Project in Nepal, November 1999, URL: <http://www.adb.org/Documents/PERs/pe527.pdf>

Some of the issues related to sustainability of project institutions and benefits were clearly understood and necessity of effective maintenance and management of airport facilities was realized. Interrelated issues that were considered important for sustaining the benefits included adequate maintenance and applying sufficient airport user charges and ensuring continues safe operations.

One of the lessons learned was that inappropriate assumptions about design, implementation issues and external events could lead to significant changes in the original scope of the project. Another lesson learned was that the government approval of prequalification listing, proposal of tender evaluation, and contract signing are subject to significant delays and uncertainty. Therefore greater efforts should be undertaken to significantly reduce unnecessary bureaucratic delays in moving the process forward to minimize he costly overruns and facilitate a timely implementation period for completing the project.

3.4.2.9 Project Performance Audit Report on the Shenyang-Benxi Highway and Jilin Expressway Projects in the People's Republic of China (October 2000)⁹²

The study describes that this project was aimed at providing infrastructure support for the continued economic and social development of corridors and also improve the efficiency and capacity of the road transport network by improving access and reducing existing congestion coin the adjacent hinterland. Some of the other issues in these corridors related to cost recovery objectives through toll revenues, corporatization and asset securitization and adequate maintenance and operation for long-term sustainability. But the project when implemented did not had an adequate internal rate of return and efficiency owing to higher capital costs and lower-than anticipated economic benefits arising essentially from a more modest traffic volume and lower rates of traffic diversion from either rail or completing alternative highway modes of transportation. Another issue was the relative unattractiveness of using corporatization as a means for mobilization of capital fund for future transport sector projects.

⁹² Project Performance Audit Report on the Shenyang-Benxi Highway and Jilin Expressway Projects in the People's Republic of China, October 2000, URL: <http://www.adb.org/Documents/PERs/PE553.pdf>

The lessons learned include the lack of proper economic appraisal methodology to the Shenyang-Benxi Highway Project as well as benchmarking and standardization of the performance indicators for project economic and social impact evaluation. Also attention is called for the need to have improved highway design, management and maintenance systems to guide the implementation process in a proper way. Also suitable noise mitigating measures should be considered and given more attention in project design and implementation.

3.4.2.10 Project Performance Audit Report on the East-West Highway Maintenance Project in Bhutan (August 2000)⁹³

This project was formulated through a feasibility study financed by the ADB and was considered important because of its strategic role within the overall road network of the country. Most of the road sections in the project required rehabilitation and reconstruction but they were not included owing to high repairing costs. The study suggests that an accurate assessment of project efficiency, that is, actual and expected project benefits in relation to project inputs is somewhat problematic because of the lack of baseline data, the delays in project implementation that causes a shift in project scope, and the general difficulty of formulating a more verifiable counterfactual scenario.

The project as a whole did not fully meet its objectives. Some of the key issues were:

- Many weaknesses in project design and its implementation were overlooked and the feasibility studies done were no longer relevant owing to changing and unpredictable road conditions in Bhutan.
- Although the importance of the reconstruction process was known at appraisal, it was excluded from the original design.
- There were some situations regarding delegating the current operational functions to the private sector.
- Also there was a shortage of trained personnel to accomplish the tasks.

⁹³ Project Performance Audit Report on the East-West Highway Maintenance Project in Bhutan, August 2000.
URL: <http://www.adb.org/Documents/PERs/PE548.pdf>

The key lessons learned from this experience include: -

- Providing more flexibility to the project designs during the implementation process. The design and evaluation process should not be too rigid and impractical. This can be accomplished by dividing the full project into subprojects to be implemented on a rolling basis.
- The approach to institutional development should also not be rigid but adaptable to changing local conditions.
- The project design should be driven by needs rather than by the funds available or loan amounts.
- Importance of professional construction supervision must be understood.
- Analysis on the basis of unverifiable assumptions should not be carried out and adequate importance needs to be given to road maintenance programs.
- Also the economic evaluation for road maintenance project should be selective and focus on the timeliness and cost-effectiveness of the proposed interventions, given the unnecessary and largely unverifiable nature of the assumptions made in the process.

Also it can be seen that the long-term strategic framework for *Asian Development Bank* defines three core areas:-

- Sustainable economic growth
- Inclusive social development and
- Governance for effective policies and institutions

The framework also identifies three cross-cutting themes:-

- Promoting the private sector development
- Supporting regional cooperation and integration
- Addressing environmental sustainability

3.4.3 Case Examples from World Bank

The World Bank is,

*“one of the world’s largest sources of development assistance. Its primary focus is on helping the poorest people and the poorest countries. This site provides an overview of how the Bank uses its financial resources, its highly trained staff, and its extensive knowledge base to help developing countries onto paths of stable, sustainable, and equitable growth.”*⁹⁴

It can be noticed from the World Bank website that the Operations Evaluation Department (OED) of the World Bank is an independent unit within the World Bank;

*“The goals of evaluation by OED are to learn from experience, to provide an objective basis for assessing the results of the Bank's work, and to provide accountability in the achievement of its objectives. It also improves Bank work by identifying and disseminating the lessons learned from experience and by framing recommendations drawn from evaluation findings.”*⁹⁵

It can also be noticed that,

“The World Bank has developed an increasingly rigorous system of evaluation over the past 30 years. Evaluation measures achievements in relation to institutional policies, Bankwide program objectives, and the goals set for each operation. It is designed to:

- *Provide an objective basis for assessing the performance of policies, programs, projects, and processes;*
- *Help provide shared accountability for the achievement of the Bank's objectives; and*
- *Improve policies, programs, and projects by identifying and disseminating the lessons learned from experience and by making recommendations drawn from evaluation findings.*

⁹⁴ The World Bank Group Website, URL: <http://www.worldbank.org/about>

⁹⁵The Operations Evaluation Department of the World Bank Group, URL: <http://www.worldbank.org/oed/about.html>

Evaluation at the Bank has two major dimensions: (a) self-evaluation by the units responsible for particular programs and activities; and (b) independent evaluation by the Operations Evaluation Department (OED). These dimensions link to a system of organizational learning, use of external expertise and stakeholder participation-that, in combination, make it unique among development organizations.”⁹⁶

OED's uses certain methods for evaluation purposes that can be categorized as follows:

- *Project Reviews,*
- *Country Assistance Evaluations,*
- *Sector and Thematic Reviews and*
- *Process Reviews*

Their further description given in the World Bank website is as follows:

Project Reviews: Projects are selected for performance assessments based on a variety of criteria. The operational staff prepares a self-evaluation (known as an Implementation Completion Report, or ICR) for every completed project, and also rate project performance through Project Performance Assessment reports (PPAs). These PPAs rate projects in terms of their outcome (taking into account relevance, efficacy, and efficiency), sustainability of results, and institutional development impact.

Country Assistance Evaluations: These examine Bank performance in a particular country, usually over the past four to five years, and report on its conformity with the relevant Bank Country Assistance Strategy (CAS) and on the overall effectiveness of the specific CAS.

Sector and Thematic Reviews: These examine Bank performance and experience in a lending sector (such as agriculture, transport, and the like) or thematic area (poverty, gender, and so forth) over five to ten years and report on their conformity to Bank policy and good practice, as well as on the development effectiveness of the Bank's activities.

Process Reviews: These examine ongoing activities such as aid coordination or development grant making and report on their overall efficiency, consistency with stated objectives, and effectiveness.

⁹⁶ Overview of Evaluation by OED, URL: <http://www.worldbank.org/oed/eta-overview.html>

The following section will examine some of the performance reports by presenting a couple of sector and thematic reviews related to gender and rural transport in the developing countries. This is done because provision for gender and rural transport are some of the most important issues that need to be tackled with, particularly in developing countries where the economy is predominantly agricultural in character and women play a major role in performing various income-generating and household activities.

The World Bank Gender and Transport Thematic Group (GTTG)⁹⁷ describe the importance of gender issues in transport sector. It mentions that,

“Until recently, it was assumed that transport infrastructure and services such as roads and buses benefit both genders equally. The term 'gender' refers to the economic, social, political and cultural attributes and opportunities associated with being male and female. Lately, with the completion of Bank's Gender Strategy, Poverty Reduction Strategy and impact evaluations of transport infrastructure projects both by the Bank / international agencies, it is being recognized that men and women due to their different constraints, options, incentives and needs have different transport priorities and are affected differently by transport interventions. In addition, poor women are also subject to heavy time burdens due to the need to balance their productive, social, and reproductive roles in societies that subject them to socially imposed constraints that further limit their opportunities to improve their economic conditions and /or enjoy equal access to human capital and employment.”

The following are some of the major key issues in gender and transport identified by GTTG:

- *Designing travel and transport projects that respond to the needs of both men and women*
- *Gender and urban transport*

⁹⁷ The World Bank Gender and Transport Thematic Group (GTTG) is a cooperative venture of the Gender and Development Network and the Transport Technical Department. It facilitates the integration of gender into transport policies and projects.
URL: <http://www.worldbank.org/gender/transport/index.htm>

- *Gender and rural transport*

The following case studies are done through a research program of the International Forum for Rural Transport and Development (IFRTD).

“The research program basically explores ways in which gender and gender relations affect transport deprivation and how this deprivation can be remedied through more appropriate and gender-sensitive interventions. These case studies focus on women’s transport needs, how transport policy and other external conditions affect women’s transport needs, and how these needs relate to women’s livelihoods.”

3.4.3.1 SPATIAL MOBILITY AND WOMEN'S EMPOWERMENT: Implications for developing rural transport in Bangladesh⁹⁸

The authors in this study explore the known linkages between spatial mobility and the social and economic empowerment of women, and analyze the gender aspects of transport with reference to rural Bangladesh where women are faced with many mobility limitations and gender issues in transport are an under-explored area of research.

The study describes that the existing pattern of transport in Bangladesh is determined by its dominant topography. Therefore most modes of transport here are non-motorized and the country exhibits heavy domination by the pedestrian traffic. The study also states the fact that in 1986 NMT accounted for about 94 per cent of commercially operated vehicles and two-thirds of carrying capacity in the country.

The other district feature the study illustrates is the regular flooding during the monsoon in large areas of the country. A majority of the earthen roads are flooded during the monsoon and remain muddy for much of the year. The available modes of transport are bus, rickshaw, tempo, rickshaw van in the 'easy access' rural areas, and during monsoon, country boat is the available alternative.

⁹⁸ Matin N., Chowdhury M., Begum H., and Khanam D., (1999) “*Spatial Mobility and Women’s Empowerment: Implications for developing rural transport in Bangladesh*” Case study presented at the International Forum for Rural Transport and Development workshop in Sri Lanka, URL: http://www.worldbank.org/gender/transport/Case_Studies/spatial.htm

“Women in rural Bangladesh face a rigid division of labor in the composition of work being done by women and men. Rural men spend 5.97 hours daily on work and rural women-spend 7.57hrs. Of this, 5.57 hours are spent by women on subsistence activities and housework; men devote little more than half an hour to such work.”

The gender division of labor has been induced by the traditional cultural restrictions on women's mobility. It has also reinforced the restrictions. Also most of the activities for women are designed such that they do not require much mobility. Though such division has helped women to participate in income-generating activities, in turn it has also contributed to the reinforcement of traditional restrictions on women's mobility outside the home.

“The report encompasses considerable variation, but the authors note how women from many different locations and backgrounds have been able to break through barriers, and have established examples of increased spatial mobility as a means to empowerment with minimum aid from outside institutions. Class, wealth and caste have complex effects on women’s mobility, but generally the poor and destitute have fewer restrictions than the well off. Women-only buses or the availability of rickshaws help women to move around in a restrictive society.”

Some of the other recommendations by the authors to increase women's mobility include:

- *well-maintained earthen roads*
- *increased availability to women of non-motorized means of transport (credit programs)*
- *bicycle incentives for schoolgirls to ride to school*
- *women friendly bus services*

Another study relating the issue of gender and urban transport in developing countries is given in Box 3.1.

Gender and Urban Transport

Box 3.1

“The population of the city of Dhaka has grown over the last decade, creating a massive demand for transport, which has not been matched with investment in infrastructure. While inadequate transport services impact all residents, women commuters face particular mobility constraints. Since purdah (seclusion of women from men) defines separate spaces for men and women and based on their different roles within the household and society, women have distinct transport needs. Their access to social and economic opportunities and mobility in public places are thus compromised by the lack of an effective transport system to meet their needs.

The current transport services provided by public and private buses are insecure, unreliable, congested and unsafe. It is difficult for women to compete with men for the limited space, particularly given the cultural background in Bangladesh, which has a restrictive attitude towards women’s mobility. Bus operators are also less inclined to accommodate women’s specific needs due to their focus on maximizing returns.

Women’s transport problems require particular attention, because their labor force participation and productivity is adversely affected and because it impairs women’s access to education opportunities or impacts on their educational performance. Although women’s educational opportunities at every level have increased due to shifts in policy, many such opportunities remain restricted due to inadequacies in the existing transport system. For many, transportation costs are unaffordable, while for others the risks of sexual and verbal harassment are simply too high.

Finally, the multiple roles of women (i.e. shopping, visiting doctors, paying household bills, domestic chores, and remunerative tasks) have increased their demand for transport. In the absence of adequate transport, many women are forced to rely on more expensive modes of transport or spend more time walking to their destinations.”

Source: Study on Gender Dimension in Dhaka Urban Transport Project⁹⁹

3.4.3.2 Other case examples

Some of the other case examples summarized from the World Bank website include:

3.4.3.2.1 India: Transportation of rural women to and from Calcutta (IFRTD)¹⁰⁰

This study basically examines the situation in which rural women that take train each day from a group of rural villages outside Calcutta to go for work in the city. This daily migration is due to the economic disparity between the urban and rural areas along with

⁹⁹ The World Bank Group, The Gender and Transport: Case Studies,
URL: http://www.worldbank.org/gender/transport/Key_Issues/key_issues.htm

¹⁰⁰ Mukherjee, M. (1999), “From Dawn to Dusk: Transportation of Rural Women to and from Calcutta Metropolis”, Case study presented at the International Forum for Rural Transport and Development workshop in Sri Lanka
URL: http://www.worldbank.org/gender/transport/Case_Studies/dawndusk.htm

other resource constraints. Even though the trains are overcrowded, a large proportion of women are forced to commute in search of income to support their families.

The author discovers in the study conducted that a large and growing number of women traveling daily into the city are bearing considering mental and physical costs to themselves in addition to the associated ill effects on their families. The author also reports that the rural/urban commuters have to virtually suffer in the non-existent rural transportation and chaotic, overcrowded urban public transport. The study also reveals that a majority of the women traveling were working in the informal sector. Girls under 20 years of age mostly commuted for educational purposes. The author also finds most women in the informal sector simply did not pay for the tickets and there was evidence of severe poverty and lack of access to water and sanitation. The income opportunities were extremely limited in the rural areas and that was the major reason why most women had to make a difficult and unsafe journey in a crowded trains often running on late schedules.

The author draws out the following conclusions:

- Economic reasons are the major driving factors behind such daily mass commuting.
- Journeys are time consuming and not comfortable and safe
- Inadequate women facilities on the train
- Less interaction of women with their families

The suggestions to improve the situation include:

- Increase in the number of buses and trains
- Better transport infrastructure facilities and other amenities
- Better-managed time schedules of trains
- Avoid police corruption and employ productive staff

The long-term suggestion from the women themselves was creation of alternative ways of generating income nearby their villages. The author concludes that any solution must

be economically viable and sustainable and the present circumstances require a great deal of human and economic resources to resolve the existing situation.

3.4.3.2.2 India: Women, water, and transport in arid areas (IFRTD)¹⁰¹

The author in this study examines the existing relationships between women, water and transportation in the rural and drought-prone district of Banaskantha in northern Gujarat and then makes appropriate suggestions for improvements. Here in this district woman hold the primary responsibility for provision of water for domestic and other uses. The study aimed to examine how this is affected by the availability and utility of transport facilities that is ultimately linked to the potential for the economic and social development of the women in the district.

One of the most striking features of the study was the extraordinary time and energy women spend to collect and transport water from the source to home. The villages continually faced an acute shortage of potable water. The lack of adequate transport facilities and safe drinking water has a bad effect on women's income generating abilities too due to which the general welfare of the family suffers. Transportation becomes much more important in the district since basic necessities such as food, water and medical care are either scarce and/or inaccessible to the rural inhabitants. The laborers also have to suffer particular health and social/domestic problems due to the nature of their work environment compounded by lack of access to transport. The only formally regulated transport facilities are the buses operated by the State Transport Corporation. These bus services are still inadequate considering the size of the population of the district and other characteristics. The alternative is to either walk long distances or use private means of transport that are both expensive and unsafe to use.

The author describes the effects of transport deprivation on women as:

- Women are forced to walk long distances in uncomfortable conditions
- Inaccessible timely medical care

¹⁰¹ Bid, P., Nanavaty, R. and Patel, N., (1999), "*Mapping Interplay of Women, Water and Transportation in Arid Areas*", Case study presented at the International Forum for Rural Transport and Development workshop in Sri Lanka
URL: http://www.worldbank.org/gender/transport/Case_Studies/aridarea.htm

- Wastage of valuable time on shopping for household necessities and to collect water
- Time and energy taken away from household income-generating activities
- Women face difficulty to participate in important socio-economic activities.

Also headloading by women for transportation of water leads to different consequences that are not good for their health and in turn distracts their attention from their homes, children and income-earning activities.

The author concludes that both adequate transport and water facilities are essential for the population of the district and steps must be taken to address the specific needs of women during transport planning activities. The author suggests for integrated approach whereby transportation is considered an important component along with other issues that affect women's lives such as food security, empowerment through employment and basic access to medical care etc. Also efforts need to be made to fully understand the relationship between water, transportation and housing construction and transport used in rural communities. Thus transport is a major component for sustainable economic development in rural areas.

The following section gives a brief description about some of the major gaps and issues in project evaluation methodologies in developing countries.

3.5 Description of Some of the Major Gaps and Issues in Developing Countries

Conklin¹⁰² describes some of the shortcomings of the conventional transportation planning process and evaluation methodologies in his paper. These are clearly similar to some of the gaps that can be identified from the literature review and the case examples. These gaps can be listed as follows: -

(i) Intermodalism: It is basically using different, interconnected modes of travel to reach a certain destination either for passenger or freight movement. Its importance in today's

¹⁰² Conklin, C. (1999), " *Using Scenarios in Regional Strategic Transportation Planning: An Evolving Methodology*", MIT

world is often overlooked, as are inter-modal connections and multi-modal solutions to the problem. Most of the planning approaches consider a unimodal approach rather than an integrated approach.

(ii) Technology Scanning: This involves identifying various technology development solutions in different sectors and seeing how they can play a major role in impacting and improving the performance and competitiveness of the current transportation systems. For example, the introduction of Intelligent Transportation Systems for the purpose of transportation demand management can be useful feature that can enhance the performance of the overall transportation system in a given region.

(iii) Freight Movement: Most of the transportation planning procedures do not identify and address the requirements of movement of freight from one point to another. They tend to focus more on the passenger side of the travel issues but freight also does needs proper attention since it plays a crucial role in regional economic development.

(iv) Private Sector Participation: Currently the transportation planning in most of the nations do not adequately involve private sector participation from major employers, shippers and carriers in transportation. There are little opportunities for input from the private agencies and the business community since the infrastructure development process is highly dominated by the public sector agencies. Deregulation from the government sector in some of the areas can lead to better and more efficient transport solutions.

(v) Transport-Economy Linkages: It is obvious to the transportation planners that the transportation and economy of a country are inherently linked. So due considerations must be made to address the local economy issues and gaps by investment into adequate transport infrastructure projects and then build upon the linkages between the local and the global economy.

(vi) **Strategic Perspective:** Conklin describes that many transportation plans are primarily focused on capital investment rather than the operation of the regional transportation system. They may not consider the project in its entirety and identify several programs and projects to be implemented according to the strategy.

(vii) **Human Resources Development:** The need to develop and train future transportation and planning officials has to be addressed. Adequate knowledge and experience needs to be imparted to them so that they can have a better understanding about various needs and issues related to transportation and economic development in a nation.

3.6 Evaluation and Appraisal Questions

Over the past few decades, the World Bank and Asian Development Bank have funded and supported numerous projects in various sectors in both developing as well as developed countries and based on their experience, they have come up with a few guidelines and key questions that can help them to better evaluate and assess various infrastructure development projects.

As suggested by ideas from these development organizations and also after reviewing a few of the gaps from the case studies and evaluation reports compiled by them, the Guidelines or the Key Questions¹⁰³ for the Economic Analysis of Projects can be generally described in the form of following questions (with reference to our analysis of case examples):

1) Project Rationale:

- *What is the rationale or goal of the project?*
- *What needs does it address to in particular?*
- *What is the rationale for public sector involvement/private sector operations?*
- *What are the main alternatives to the Project?*

¹⁰³ ADB is a multilateral development finance institution dedicated to reducing poverty in Asia and the Pacific, Asian Development Bank Guidelines for Economic Analysis, URL: <http://www.adb.org/Documents/Guidelines/Eco-Analysis/appendix1.asp>

- *Have changes in policy been considered as an alternative to investments?*
- *Have efficiency improvements been compared with capacity expansions?*

2) Macroeconomic and Sectoral Context:

- *How does the project relate to the overall development strategy?*
- *How does it relate to sectoral strategy? Is it a priority investment?*

3) Project Alternatives:

- *Have project alternatives been considered in terms of location, scale and timing?*
- *How has the best alternative been chosen?*
- *Have the subprojects been ranked in an appropriate way?*
- *Has the least cost alternative been identified for the project or major subprojects?*
Has the most cost-effective means been identified?
- *Is it truly the most cost-effective means?*
- *Does the Project have several outcomes and impacts?*

4) Data (Demand) Analysis:

- *What is the basis for projecting the demand for project output?*
- *How the data is analyzed to predict the future needs?*
- *What kind of demand models is used for analysis?*
- *How will the demand be affected by income growth? By increase in price or user charge?*
- *What other sources of supply are there to meet the demand?*

5) Identification of Costs and Benefits:

- *Have the “with” and “without” project situations both been described?*
- *Have all project costs and benefits comparing with and without project situations been identified?*
- *Which of these costs and benefits have been identified, and which have been not?*

6) Use of Discount or Shadow prices:

- *Has an Economic Rate of Return been calculated?*
- *What discount rate has been used: to choose between alternatives and to assess economic viability and how was it arrived?*

7) Sensitivity Analysis:

- *What kind of sensitivity analysis has been applied?*
- *Does it relate to underlying benefit and cost variables?*
- *Have the key variables been identified?*
- *What measures are proposed to monitor the key variables?*

8) Risk Analysis and Impact Evaluation:

- *Are there risks associated with the project and have those risks been assessed?*
- *Is there is a Risk Analysis?*
- *Have the impacts of the project been identified and evaluated?*
- *What measures have been proposed for reducing project risks?*

9) Financial and Fiscal Sustainability:

- *Have the financial returns to different project participants have been calculated?*
- *What is the difference between FIRR and EIRR and what accounts for the difference?*
- *What will be the source of funds to meet the fiscal requirements?*

10) Environmental Sustainability:

- *Have the environmental effects of the project been identified?*
- *How they have been quantified and valued?*
- *Have they been integrated into the economic analysis?*

11) Social Equity and Distribution Analysis:

- *Does the project promote social equity?*
- *Has a distribution analysis for both costs and benefits been undertaken for the project?*

12) Benefit Monitoring and Evaluation:

- *What are the key variables necessary to identify the project impact during project operation and implementation?*
- *Does this include key performance variables, physical or financial, for the implementing organization?*
- *Is the project being monitored?*

13) Overall Assessment:

- *Have the major conclusions of the economic analysis been clearly spelt out?*
- *Does the project incorporate the best alternative?*
- *Is the project economically viable?*
- *Are any policy charges necessary to complement project implementation?*

3.6 Summary

The chapter first explains the conventional transportation planning and travel demand modeling process. It then lists the several project evaluation methodologies and identifies the gaps in them. Then it explains several aspects of the project cycle and establishes the framework for project identification and evaluation of transportation infrastructure projects. The chapter lists and reviews several case examples from the Asian Development Bank, the World Bank and several other websites. Table 3.2 presents a summary of case examples and performance audit reports of several of these transportation projects in the developing countries and the gaps identified in their project evaluation methodologies.

Table 3.2 Case Examples and Gaps Identification

| SNo | Name of the Project | Special Features | Gaps Identified | Steps Recommended |
|-----|---|--|---|---|
| 1 | Port Projects in India, Malaysia and Philippines | -Traditional PE method focused on the savings in the transport costs due to project related increase in handling capacities | -Approach not comprehensive and responsive to the changes occurring in transport industry, e.g. deregulation and globalization -Complexity of Projects not taken into full consideration | - Close examination of changes in patterns and technology - Address issues relating to maintenance of infrastructure -More flexible instrument required |
| 2 | Heilongjiang Expressway Project in the People's Republic of China | -Connects Harbin and Jiamusi to improve access to nearby cities and reduce VOC. | -Weaknesses in pavement and safety design; Little attention to technical aspects -Inadequate demonstration of poverty reduction and economic development | - More rigorous review of technical features during appraisal and implementation; - Make project rationale more clear. -Need of a clear basis for monitoring and evaluation |
| 3 | Ulaanbaatar Airport in Mongolia | -Inherently commercial in nature with capacity to generate substantial revenues | -Aviation Infrastructure here with vast distances and low demand is likely to be of limited financial viability | -Suitable methods for project preparation and implemented needed -Combine strong policy and capacity-building components with physical works |
| 4 | Railway Recovery Project in Bangladesh | -Program designed to restore and sustain Bangladesh's Railway financial viability and to restructure it to accommodate changing demands -Incorporated several organizational and policy reforms | -Railways not structured along commercial lines -Failure of the blueprint target-oriented approach to generate incentives for reforms | -Large number of stable change agents required at all organizational levels -Future project design and evaluation need to be more result oriented -Focus on accomplishment of intended objectives rather than outputs |
| 5 | Second Tribhuvan International Airport Project in Nepal | - Aimed towards reducing constraints on increasing passenger traffic | -Significant delays and uncertainty in government approval of the proposals -Issues related to sustainability and timely maintenance not understood. | -Greater efforts need to be undertaken to reduce bureaucratic delays and minimize costly overruns |
| 6 | Shenyang-Benxi Highway and Jilin Expressway Projects in Peoples Republic of China | -Aimed to provide infrastructure support for the continued corridor development -Improve the capacity and | -Project when implemented did not had adequate IRR -Higher capital costs and lesser economic assets -Lack of proper economic and | -Need to have better idea about all costs and benefits associated with the project -Improved management and maintenance systems to guide |

| | | the efficiency of the road transport network | social appraisal methodology | implementation process are required |
|----|---|--|--|---|
| 7 | East-West Highway Maintenance Project in Bhutan | -Aimed to strategically improve the overall road network and make it more efficient | -Problematic assessment of project efficiency in relation to project inputs due to lack of baseline data. -Shift in project scope due to delays in implementation -Irrelevant feasibility studies due to changing and unpredictable conditions | -Provision of more flexible and practical project design and evaluation process -Division of the full project into several sub-projects -Economic Evaluation should be selective and focus on the timeliness and cost-effectiveness of proposed interventions |
| 8 | Rural Roads Projects and their Maintenance in India | -Aimed to provide adequate transport infrastructure to meet the demands and accelerate national economic growth | -Insufficient provision of budget for operation and maintenance -Premature breakdown and suboptimal operation of road facilities -Reduced ERRs and FRRs | -Need to strengthen the design standards and institutional capabilities -Adequate and stable financing of required maintenance equipment -Provision of effective systems and managerial procedures |
| 9 | Tenth and Eleventh Road (Sector) Projects in Indonesia | -Aimed to improve the national, provincial and district roads and bridging them to a technically efficient standard -Also aimed to reduce road maintenance expenditures | -Projects did not significantly improve road safety -Long-term sustainability Issues | -Adequate attention required during implementation for subproject selection and improving quality of civil works -Proper maintenance and evaluation procedures required. |
| 10 | Sustainability Case Studies in Western Australia | -Aimed towards designing and implementing high quality transportation systems | - All kinds of impacts not analyzed -Externalities taken into account only in final stages of the evaluation process -High Dependence on NMT | -Social and Environmental concerns need to be widely and frequently addressed at every step of project evaluation -Use of multi-criteria integrated transport planning and assessment approaches |
| 11 | Spatial Mobility and Women's Empowerment: Case Study of Rural Transport in Bangladesh | -Explore the known linkages between spatial mobility and the social and economic empowerment of women -Analyze the gender aspects of rural transport | -Transport dominated by existing topography -Division of labor based on gender - Class, wealth and caste have complex effects on women's mobility | -Planning and Evaluation approach to be more women-friendly -More availability of NMT to women e.g. bicycles etc. -Well-maintained road infrastructure |

| | | | | |
|----|---|--|---|---|
| 12 | <p>a) India: Transportation of rural women to and fro from Calcutta (IFRTD Case) and</p> <p>b) India: Women, Water, and transport in arid areas (IFRTD)</p> | <p>-To examine the conditions in which rural women take train each day from villages outside Calcutta to go to city for work</p> <p>-To examine the existing relationships between women, water and transportation in the rural areas of India</p> <p>-Also to examine how this is linked to potential economic and social development</p> | <p>-Economic Disparities being the major reasons for daily mass commuting</p> <p>-Unsafe and uncomfortable journeys for women</p> <p>-Inadequate women facilities of transportation</p> <p>-Unavailability of suitable means of transport for women to allow them to transport water from source to home</p> <p>-Private means of transport expensive and unsafe to use</p> | <p>-Increase in the number of buses and trains, More and better provision for accessible public transport infrastructure facilities</p> <p>-Better managed schedules of buses and trains</p> <p>-Adoption of Integrated Approach for transportation to be considered as important along with other issues</p> <p>-Improve the understanding of the relationship between transport, water, housing and social and economic development</p> |
|----|---|--|---|---|

These case examples and the framework serve as a useful basis for identifying gaps and developing key questions that must be considered during the project conception, evaluation and the implementation process.

Chapter 4

Methodology, Framework and Analysis of the Gaps and Issues

4.1 Overview

This chapter will focus on developing a methodology and outlining a framework for project identification and evaluation that can help to structure and analyze the gaps that have been found and identified from the literature review. This methodology and framework developed will also help to identify and structure the gaps and shortcomings in project evaluation methodologies identified from the case examples presented in the previous chapter. This will then ultimately allow us to prioritize the gaps into certain categories and also recommend actions and strategies to overcome them in the best possible manner.

4.2 Methodology and Framework used to Structure the Identified Gaps

The framework used for identification and evaluation of projects has been developed and presented in Fig. 4.1. As shown in the figure, the process starts right from the conception stages of developing strategies, programs and projects with the identification of needs in a particular area. The objectives of the project need to be clear and well defined. They do not necessarily have to be constant for all the time. They can be adjusted or modified on account for subsequent developments and information available but this practice may lead to certain challenges in the overall decision-making and implementation process. Sometimes the strategic objectives are too tight and inflexible and remain unchangeable despite the changing conditions and new information available later in the development phase. Sometimes there are occasions where the objectives are in conflict particularly in the public sector organizations. The transport project then has to be developed with due consideration to all the objectives. Then it goes through a series of intermediate steps that involve coming up with suitable alternatives/options and their analysis and evaluation for performance in the given area. These steps involve assessing the viability of a particular

project option. The project viability basically refers to the ability of a project to meet the established objectives which may be technical, financial, operational, social, economical, and environmental or a combination of any or all of the above.

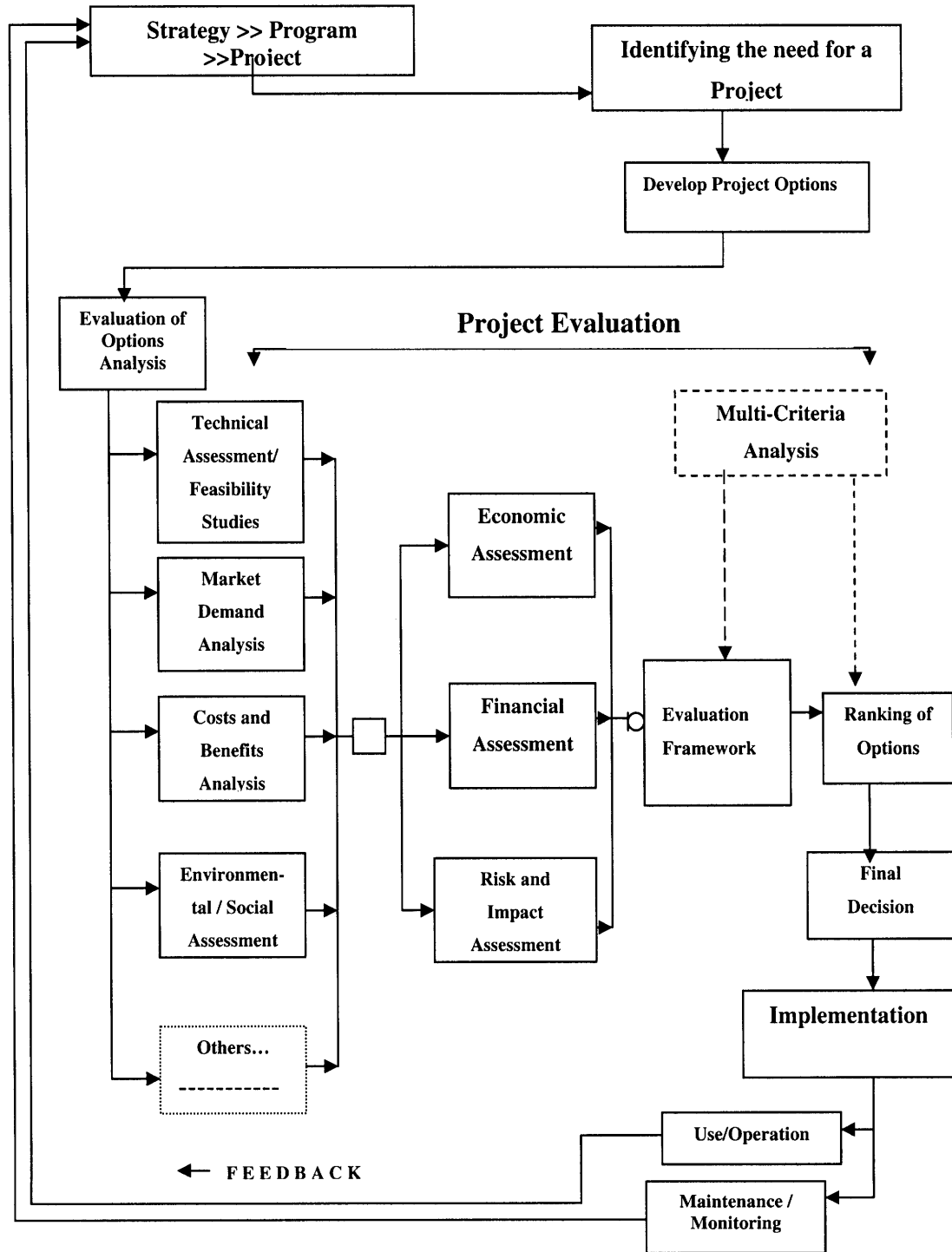


Fig. 4.1: Project Identification and Evaluation Framework

A project is said to be financially viable if it meets the objectives of profitability by acceptable means. It is said to be economically viable when it meets its economic objectives. This can be accomplished through the use of several assessment frameworks involving different criteria.

Then the feasibility studies start after the project identification phase and include clear list of alternatives and at least some of the criteria to judge and assess them. It is one of the principal stages of project evaluation and development and helps to give an early assessment of the viability of the project along with the risk involved. The analysis of the project options also involves market demand analysis, cost-benefit analysis, environmental/social assessment studies etc. These also involve establishing the criteria to assess those alternatives and come up with the best option for the implementation process. The final steps go through the economic/financial appraisal and risk and impact assessment of these alternatives and then matches their outcomes with the established set of criteria and objectives.

A large part of project evaluation is comparative in nature and involves considering and applying weights to the criteria so as to place the alternative options in order of acceptability (Ranking of Options). The best possible alternative within the given constraints is then selected for implementation and open to public for use. The end stages also involve the maintenance and monitoring programs laid out for the entire project under the operation phase and these give us the feedback and ideas for new strategies, programs and projects to be developed in the new scenarios for the given area.

It can be seen from the previous sections that the gaps identified from the literature review and the case examples are similar in some contexts and overlap in some sense or the other. Though the gaps do not overlap to a full extent, they suggest that there are weak links in the project evaluation and analysis procedures for transportation infrastructure projects. The above framework for project identification and evaluation will now be used to structure and assess these different gaps that have been identified in

project evaluation methodologies from the literature review in chapter 2 and in the case examples reviewed from different websites in chapter 3.

4.3 Major Gaps and Findings

The gaps identified will be presented in the following order and then categorized according to the framework in the later sections:

- Gaps from Literature Review
- Gaps from ADB Cases/ World Bank Cases / Other Cases
- Other Ideas on Gaps

4.3.1 Gaps in Project Evaluation Methodologies in Developing Countries- Identified from Literature Review

The literature review presents the current state of knowledge about the various project evaluation methodologies and the kind of impact they have on the overall transportation infrastructure development in a country. It considers different available methodologies, practices, and tools in project design and evaluation to identify and distinguish the impacts of transport project development from those of other socio-economic activities and also identify several key gaps in areas of project identification and evaluation. The gaps identified from the literature review can be listed and categorized as gaps in:

(a) The conception and design stages for strategies, programs and projects

For example, unclear objectives or goals lead to incoherent planning and conception of transportation infrastructure project at the strategic, program and project levels. The objectives of accomplishing a certain goal therefore need to be well defined and in sync at all levels. This gap can result in the full information and statistics requirements being not met in some of the cases or in improper flow of information from one level to another. This is to say that project can sometimes satisfy the need of a particular program but not satisfy the need of a particular strategy in an overall sense.

Another gap in this stage is the ineffective co-ordination of the transportation sector with other sectors of the society such as health care, education, recreation, markets etc. that

leads to design of inappropriate strategies and programs for the overall development in a region.

(b) Identification stages for the need of a particular project

One of the examples of gaps related to incorrect identification of requirements for transportation infrastructure investment in a region or prioritizing the needs of the region and population in a wrong sense of importance is that rural development and women transport needs are not given due consideration in the planning processes. This leads to gender inequity issues in the transportation planning and evaluation process. The traditional approaches usually do not account for gender differences in access, use and control of transport, or the different needs of women and men as transport providers.

(c) Development stage of different project options

Improper and incomplete understanding of the roles of various stakeholders in the transportation infrastructure planning, evaluation and implementation process is one of the gaps in this stage. As described before in prior chapters, one aspect of formal tools for project evaluation is that the outcomes of such evaluations can be used by various stakeholders to convey a false sense or picture of certainty of their respective positions. This does not lead to the identification of certain options that may be available and possible for a given project.

(d) Evaluation of the several project options

There are no relevant planning and evaluation procedures available to accommodate the needs for rapidly growing population and also accommodate the trends of depleting resources from time to time. This results in incomplete and inappropriate assessment of options carried out in technical, economical, financial, social, political and environmental context due to incomplete understanding of the interaction between the transportation infrastructure and the economy, the society as well as the environment (natural resources) and other factor inputs. Some of the factors are related to

- Globalization of Trade
- Demographics and Income Disparities
- Rapid Urbanization

- Shifting Development Paradigms
- Decentralization and Governance

One of the other gaps in transportation project evaluation process is the unrealistic estimate of costs and benefits over a period of time and/or incorrect estimates of completion time frame of the project. As described before, conventional evaluation practices tend to overestimate the overall benefits of the transport solutions since they usually ignore indirect costs and also they tend to underestimate the full benefits of transport planning and management strategies. The cost-effective analysis approach is practical to use only when benefits cannot be translated into equivalent monetary amounts and the least cost approach can be used only when no attempt is made to quantify the benefits associated with the available options.

Sometimes what happens in cost benefit analyses is that IRR (Internal Rate of Return) does not distinguish between projects of different scales since it involves only the rate of return on an outlay irrespective of its size. Another disadvantage that occurs at certain times is that IRR in some cases has no unique value and for a project whose time path for SNB (Social Net Benefits) changes signs frequently, multiple and imaginary IRRs can result. High discount rates sometimes do not predict the future adequately and lead to misleading results.

Also one of the problems with the benefit-cost ratio criterion is that during comparison of projects with different sizes with similar BCRs, the projects may have dissimilar SNBs. Another problem is that some effects of policy can be classified logically in either benefits or costs categories. Since adding values to the numerator and subtracting the same values from the denominator do not have the same effects on the ration, a policy maker could creatively categorize policy effects and adjust BCR to achieve the desired results.

Another gap is the planning and evaluation procedures not taking account of sprawling effect associated with transportation infrastructure development. *“The increased use of private vehicles has resulted in falling demand for public transport and a consequent*

*decline in service levels. Sprawling cities are making the journey to work excessively long and costly for some of the very poor.”*¹⁰⁴

This implies that the existing project evaluation methodologies and planning mechanisms are not considering and dealing directly with urban sprawl that is now being seen as a major issue related to metropolitan areas in developing countries. This can have devastating effects on the overall development, growth and economic well being of a city.

(e) Risk and Impact Assessment stage of the different project options

Project Evaluation in developing countries is much more complex than in developed countries and it is very critical to accurately identify and evaluate the risks involved in a project and to measure the degree of mitigation-if any. The transportation planning and evaluation procedures are not having all appropriate data, indicators, and assessment techniques to analyze the distribution patterns of various impacts of transport on the economy, the population and the environment completely. Since the environment effects are more varied and diffusely distributed, and perhaps more likely to raise moral issues, there are even greater challenges for the policy makers to account for such effects and deal with the health effects on individuals.

Another gap in this assessment is on the measurement front. Most of the information available is not measurable in same units and there occur several challenges in determining the risk associated and the precise extent the impacts of these changes offset one other. This leads to risk evaluation and assessment that is not very thorough and complete.

(f) Multi-criteria analysis/Ranking of the Options and final decision-making process

Use of outdated or bad criteria for project evaluation or not identifying some of the available alternatives along with “do nothing” option due to several constraints is one of the major gaps associated with the planning and evaluation process. Usually what

¹⁰⁴ Gwilliam, Ken (2002), “*Cities on the Move*”, A World Bank Urban Transport Strategy Review, World Bank, Washington D.C.

happens is that transportation planners traditionally consider a limited set of alternatives and their impacts and focus primarily on certain attributes of an option such as immediate expenses, travel time, associated risk, operating costs etc. As described before, conventional analysis often tends to ignore other significant impacts and fail to consider whether they support or contradict the overall strategic land-use objectives and account for other costs associated with the implementation and operation of the project.

Several specific issues arise while applying this unifying principle in multi-criteria evaluation and analysis for transportation situations: issues in measurement of costs and benefits, issues related to capital intensity and long lifetime of many of the transportation projects, issues in proper accounting for various externalities and so on.

The role of institutions and intervening political forces in the decision-making and planning process is also important. There are a lot of political forces acting behind the decision for a project and the value of any particular evaluation technique such as cost-benefit analysis depends on how it informs that political process.

(g) Implementation stage of the final selected project option

Not having the flexibility for mid-course corrections or making changes in the project [supply-demand differences according to the needs of time] or not having the provision of sensitivity analysis tools in the evaluation process is one of the major gaps in this stage of the project evaluation. Certain policy instruments and government procedures sometimes restrict the implementation of the project according to the planned ways.

Also there are certain technological issues and resource constraints in developing countries regarding the incorporation and implementation of other modes and advanced forms of transportation. For example: Sky Bus, ITS, Maglev, etc. These are not readily incorporated in the planning frameworks of metropolitan regions.

Another situation is that most of the transportation infrastructure in developing countries is still regulated by public sector in spite of severe financial constraints and poor management. Hence this poses some burden on the implementation of the final project option. Public-private partnerships as described, serve to be an attractive and efficient means to develop, operate and manage new transportation infrastructure in developing countries faced by severe budgetary constraints from the government.

(h) Maintenance/Operation/Monitoring phase of the project

The question as to whether to invest properly in adequate maintenance and monitoring arrangements over the life of the project or to have the option of rebuilding it after a certain number of years is of important concern, particularly in developing countries. The current gaps in this stage relate to not having suitable monitoring mechanisms to provide constant feedback on the progress of a project, the problems it faces and the efficiency with which it is developed and thus incapability of suggesting appropriate improvements in its design and functioning.

(i) Feedback links from the project

The feedback loop is important since it can help to conceive and develop new and appropriate strategies, programs and projects by providing important information about the left-out steps from the current use/operation of the transportation project.

The major gap is how to continuously and effectively feed back information from the existing transport networks into the planning and conception stages and other stages of project development. This can relate to developing and having a consistent or single integrated planning and evaluation framework due to remarkable differences in the needs and characteristics of various transport projects or taking into account of long-term maintenance requirements of capital assets in an adequate manner to avoid crisis in future. The feedback is also necessary since sometimes solutions implemented to solve one problem give rise to other problems, and thus more integrated transport solutions that provide multiple benefits are left out i.e. not accounting for other externalities of the transport infrastructure projects, for example, increasing road capacity over the long run

tends to increase accidents, energy consumption and pollution due to induced vehicle travel. The necessary feedback links between different projects or different parts of the same project may sometimes be missing, and this may lead to important information being left out causing unexpected consequences.

4.3.2 Gaps in Project Evaluation Methodologies in Developing Countries- Identified from ADB, World Bank and other Websites

It can be seen from the case examples that there do exist some gaps and shortcomings in the project evaluation and analysis methodologies of transportation infrastructure projects in developing countries. It can also be seen that most of these gaps are similar in nature and follow a certain pattern across the different stages or cycles of transportation projects. Another thing to be noticed is that some of the gaps identified from literature review are clearly visible in the case study projects. This means that there is some overlap occurring between the weaknesses in the evaluation and analysis methods of transportation improvement projects and the current state of some of the transportation infrastructure projects. They can be categorized into several areas according to the framework developed for project identification and evaluation. Some gaps are more frequent in some kinds of projects than in others.

The problems these gaps represent have a major impact on the performance of the overall transportation infrastructure planning and evaluation process. The gaps in project evaluation methodologies identified from the review of the case studies from the ADB and WB Website can be categorized and structured as follows: -

(a) The conception and design stages for strategies, programs and projects

Planning skills and paradigms that are more relevant to industrial countries have been deployed in developing countries and this has meant that priority has been given to the provision of high mobility, rather than basic accessibility.

As one of the case example suggests, designs and evaluation processes often fail to take into full consideration the complexity of the transport sector, trade patterns and the rapid evolution of different technologies globally to avoid design deficiencies associated with engineering design and safety standards. That is to say that the choice of strategies, programs and projects for transportation infrastructure development in developing countries does not meet the corresponding needs of a given metropolitan region and this leads to inadequate solutions in the project evaluation framework.

One of the case studies also suggests that there is a need for more rigorous review of technical features at appraisal and during implementation to avoid design deficiencies associated with engineering and safety standards. There is also the need to make the project rationale more clear and to have a plan to achieve the project objectives so that there is a clear basis for monitoring and evaluating the project impacts and benefits

(b) Identification stages for the need of a particular project

This gap is related to the identification and prioritization of needs to build and implement a particular transport project or reviewing the existing situation clearly, for example, whether to upgrade the existing infrastructure facilities or build totally new transport networks to meet the rising travel demand or to handle accessibility problems first or give more importance to mobility situations in a given network.

One of the other shortcomings in most of the transportation planning practices in developing countries is not addressing the women needs of transport. It is evident from most of the studies done by World Bank and other authorities that the investment in transport has not brought equal benefits to women and men and that the failure to account for gender relations in the design of transportation infrastructure and services can lead to inappropriate allocation of resources. It is generally assumed that well-designed transport strategies, projects and programs will be gender-neutral. The failure to improve the gender awareness of sector programs in transport can also result in their incapability to promote sustainable economic growth and may also undermine the equity objectives of program support in different sectors. The Spatial Mobility and Women's Empowerment

case study from Bangladesh also clearly suggests that men and women due to their different constraints, options, incentives and needs have different transport priorities and are affected differently by transport interventions. Hence gender equity is an important issue that is normally neglected in transportation planning in most of the developing countries.

(c) Development stage of different project options

The transportation planning and evaluation procedures rarely consider the alternative options or modes of transportation in a balanced and integrated manner as suggested from some of the examples from ADB. As a result of these modes become less accessible and hinder the mobility of transport systems. Also sometimes certain project options may not be identified or developed for project evaluation to counter a particular transportation need or problem. For example, the non-motorized transport options are sometimes left out.

(d) Evaluation of the several project options

The gaps here relate to the traditional method of project evaluation that have accordingly focused on the savings in the transport costs due to a project related increase in handling capacities and this poses a number of serious problems related to both the method of calculation and the relevance of derived benefits to economic development. As discussed before, conventional evaluation practices tend to overestimate the overall benefits of the transport solutions since they usually ignore indirect costs and also they tend to underestimate the full benefits of transport planning and management strategies.

Also for example, conventional road appraisal methodology focuses more on the quantification of direct road user benefits. The expected benefits of improvement usually come through increased socio-economic opportunities that increase traffic, which in turn are difficult to forecast and quantify in monetary terms for the case of rural access roads.

It is understandable that achieving targets in one sector requires significant contributions from other sectors as well. One of the examples that can be cited here is that infant

mortality is affected by access to safe drinking water as well as mother's education and proper access to transport. Infrastructure development in areas like water, energy, transport, sanitation, housing etc provides key inputs into the production functions for the poverty, education, health and gender equality issues. Thus evaluation of these multi-sectoral linkages and strategies and appropriate allocation of resources have to play an important role in achieving the set objectives. Also stronger bonds need to be established between the local and national programs of development.

(e) Risk and Impact Assessment stage of the different project options

This gap relates to the current system of assessing and evaluating a future transportation project that is prominently based on the financial implications of implementing the project and categorizes any other areas of impact such as environmental and social into an externalities group. The basic disadvantage of this strategy is that the externalities are only taken into account into in the final stages of the evaluation process. Therefore the impacts of implementing such transport infrastructure project upon these areas are not fully accounted for within the design and conception phases that eventually result in negative impacts on the environmental and social well being of the country.

Also as described in one of the case examples, sometimes these processes do not address all the impacts beyond the transport industry and are usually not responsive to various changes that occur or have occurred in the transport sector. Sometimes risks associated are not identified properly and no suitable contingency or mitigation measures are planned for these risks.

It is to be noted that sustainable transportation planning practice is different than traditional planning approach due to the fact that social, economic and environmental objectives are an integral part of sustainable transportation planning, rather than the constraints or the focus of mitigation efforts.

Also an accurate assessment of project efficiency, that is, actual and expected project benefits or impacts in relation to project inputs is somewhat problematic because of the

lack of baseline data, the delays in project implementation that causes a shift in project scope, and the general difficulty of formulating a more verifiable counterfactual scenario.

(f) Multi-criteria analysis/Ranking of the Options and final decision-making process

One of the major situations in this stage happens when the criteria and analysis procedures to evaluate certain options are not completely or clearly established by the transportation planning and evaluating officials. Consideration of several criteria such as safety and long-term sustainability issues and provision of adequate attention and evaluation of the subprojects and project components and their quality design, implementation and maintenance, is very important.

Some of these case studies demonstrate that the project evaluation methodologies do not promote the idea of multi-criteria integrated transport planning and assessment that is based around the idea that the transport infrastructure not only has achievements and impacts within the transport industry but also beyond it, having impacts on the economic, environmental and social elements of the society. The overall decision process usually is very complex since the various alternatives differ a lot with respect to the multiplicity of attributes such as functional performance, cost, reliability, durability, appearance, maintainability, safety, financing options and so on.

(g) Implementation stage of the final selected project option

One of the problems is inadequate funds available for implementation of transportation infrastructure projects and their inefficient coordination in developing countries. Therefore decisions regarding regulation/deregulation of the transport sector in the developing countries pose a major situation; some of them have a transport sector mainly regulated by the public sector whereas in some countries, private sector also has a major role to play in transport development.

“The Experience in Implementation of Infrastructure Projects” study by Jha¹⁰⁵ indicates that some of the bottlenecks in implementation of transportation infrastructure projects include: -

- Inadequate financing arrangements,
- Lack of commitment and support from Government organizations towards the project implementation process and
- Unavailability of adequately qualified and experienced personnel for the implementation and monitoring of the project.

(h) Maintenance/Operation/Monitoring phase of the project

The gaps here relates to some of the evaluation processes not adequately addressing the issues relating to the maintenance and monitoring as well as the financial performance of public transport infrastructure. This has also to do with the provision of suitable budgets and funds for operation, maintenance, management and support of the transport infrastructure in the developing countries. The premature breakdown and suboptimal operation may lead to reduced ERRs (Economic Rate of Return) and FRRs (Financial Rate of Return) and thus weaken the performance and viability of the overall project.

(i) Feedback links from the project

Most of the evaluation strategies and methodologies do not promote social equity such as accessibility to various users of the system and thus do not benefit the entire sections of the community. This is very important since most substantial benefits come from the link between transport, trade and national economic development and the link between the local economic development and the accessibility provided by the transport.

A case study on Krakow city (Poland) done by Rudnicki¹⁰⁶ describes that -

- Some of the existing project evaluation methodologies strengthen urban sprawl which has unfavorable impacts on the transport system and also

¹⁰⁵ Jha, R. K., “*The Experience in Implementation of Infrastructure Projects*”, Presented in TPMDC 2002 Workshop IIT Bombay, India, Mr. Jha is Executive Director of Maharashtra State Road Development Corporation, URL: www.civil.iitb.ac.in/~tpmdc02

¹⁰⁶ Rudnicki, A. “*Real Development and Operation of Infrastructure in the Face of Approved Transport Policy-Experiences of Krakow City*”, Presented in TPMDC 2002 Workshop IIT Bombay, India, URL: www.civil.iitb.ac.in/~tpmdc02

- Have legal constraints that prevent many potential means of transport from being applied. Thus feedback information becomes very important to analyze the after-effects of a given transport project.

4.3.3 Other Ideas on Gaps

The gaps in transport planning and evaluation approaches can result due to a number of other reasons too.

Sometimes what happens is the scope of the project is not adequately defined and agreed by the different stakeholders. In some of the cases, the expectations of the end users are not met either because they were unrealistic or changed during the life of the project, i.e. the users were at considerable distance from the project development front and as a result, their requirements were inadequately specified at early stages and they were not involved in approving the choice important and useful for them.

Many transportation plans do not have anything laid out for the post-implementation phase of the transport projects that can lead to excessive usage of the infrastructure by the users or exceeding its capacity before the stipulated time frame or its deterioration over a due course of time. The overall monitoring process may be systematically designed in such a way so as to provide important information that yields a sound and continuing basis for informed and quality decision-making and learning not only about the project but the program and strategy as well.

A large number of people die or get injured in urban road accidents in developing countries every year that leads to huge economic costs and majority of them are pedestrians or bicyclists. The transportation planning and evaluation procedures need to handle this gap of not providing some concrete means or measures to prevent so many deaths. The numbers can somewhat be reduced by improving road / intersection design and incorporating better traffic control measures. Also suitable policy instruments need to be devised and adopted to counteract insecurity among urban travelers.

At other times, the gaps result due to the bad organization of the project with poor channels and communication and control systems and possibly lack of motivation. This may result in improper dissemination of responsibilities among the various personnel. One of the gaps occurs when the planning is inappropriate to the scale of the project and stages are not clearly identified with the agreed deliverables. One of the most crucial causes of various gaps and problems is an inappropriate organization of the project, i.e. having the wrong people in key positions with important roles and responsibilities being not defined properly or understood.

4.4 Ways and Suggestions to bridge the 'Gaps' in Project Evaluation and Appraisal Methods

A careful study and analysis of the case projects can help us in making appropriate recommendations to the planning organizations in the country which they can duplicate in the future supply mechanisms or successful strategies employed and also learn from the past experiences to guide the future transport infrastructure development. Some of the guidelines or ways that can be recommended to handle or overcome the gaps in project evaluation and appraisal methods after going through the literature review, the case example reviews and the framework for project identification and evaluation can be suggested as:-

- (a) One of the ways is by making the transportation planning and evaluation framework more integrated and comprehensive in nature. The level of detail and complexity of transportation planning procedures needs to be reassessed. Smaller urban areas can opt for simpler planning and evaluation processes that are commensurate with their fewer problems and less complex planning context. The larger areas have many more problems to address, options to evaluate and organizational procedures and arrangements to use.
- (b) Any given improvement or development in transportation does change land use patterns and land value, displace the urban poor, allow more women or rural population to participate in the labor market, and lower production costs of landowners, manufacturers and transportation firms. Transportation planning, evaluation and analysis

procedures can thus be better integrated now with the land-use planning, at least at the site level to start with.

(c) The new approach of evaluation should involve strengthening design capabilities of the local institutions in building well-designed roads, financing procurement of required maintenance equipment, and extending support for policy reforms.

Often, the lack of government funds was cited as the major reason for the low level of or lack of systematic and appropriate road maintenance activities in developing countries. As commercialization continues to be a key response for strengthening the management and financing of roads, there is a need to complement it with stabilizing financing for road projects, clarifying responsibility for organization and management of road maintenance and providing effective systems and procedures and strengthening managerial accountability.

(d) Planning and evaluation has to be more responsive to the needs of local decision makers and citizens and therefore adjusted to the realities of long-term budget or whatever constraints in the urban areas. It is recommended that in the final design of projects, the engineering focus should be placed on improving performance and reducing the cost of individual activities. Also there is a need to capture the real-life situations that often have a major impact on the project design and evaluation assumptions.

(e) Another guideline is identifying the transportation strategies, programs, projects and methods that are recommended for advancement of the community during a specified period of time, prioritizing these projects in order of importance, and including realistic estimates of costs and revenues for that period. This enables the transportation planning organizations to prepare annual recommendations and a planned program of transportation improvements drawn from the long-range transportation plans. One of the steps can be to maintain an appropriate balance between the short-term and long-term planning of transportation infrastructure development. This is very important from the strategic perspectives.

(f) Another means can be devoting more effort to system expansion, infrastructure rehabilitation, system management or removing certain facilities or routes that are no longer of any use to match the population growth, travel demand and financial resources.

(g) The use of innovative financing techniques such as joint infrastructure development and increased participation by the private sector can play an important role in offsetting shortfalls in public sector funds.

(h) As suggested by the World Bank, introduce and focus on long-term system wide approaches rather than project approaches to investment in urban metropolitan areas and develop a better understanding of:

- The relevant type of transportation infrastructure investment and the location or the area where it is made
- The characteristic data necessary to study, analyze, understand and assess the economic, social and environmental impacts
- The appropriate methodology and process to analyze these impacts
- Results and the knowledge of the various stakeholders as to the economic effects of transportation

(i) Transportation planners, for example, sometimes may want to compare the incremental benefits and costs for the construction of a new pedestrian bridge or an additional highway to expand the capacity or improve the public transit network services. In such types of evaluations, it is therefore seldom necessary to evaluate the total value of a transportation project or the total value of benefits accrued from the travel of population using that transportation facility or service. This can be simply accomplished by the conduct of marginal evaluation and analysis.

4.5 Summary

The chapter identifies several gaps in project evaluation methodologies from the literature review and the given case examples from different websites and structures them according to the developed framework for project identification and evaluation. It then

makes a conclusion that the gaps identified from different sources are overlapping in one sense or the other with some of those identified from literature review. The chapter prioritizes and categorizes the identified gaps into a few major areas that need the most amount of attention and consideration in the overall project evaluation and analysis process. In the end, the chapter suggests some ways and suggestions to overcome the identified gaps to improve the overall transportation planning and evaluation process.

Chapter 5

Summary and Conclusions

5.1 Overview

The final chapter concludes by giving a brief summary of the research done and ideas presented in the thesis on project identification and evaluation of transportation infrastructure, particularly in metropolitan areas of developing countries. Then it presents several conclusions made from the research on the topic along with the issues and ‘gaps’ identified in project evaluation methodologies from the literature review, the different transportation infrastructure project case examples of developing countries and the framework developed for project identification and evaluation. It then recommends several suggestions and steps in order to overcome these gaps and shortcomings in the project evaluation process so as to make the overall transportation planning and management process more comprehensive and efficient and thus make significant contribution towards economic and social development of a nation. Lastly it presents scope for further research in the area of project evaluation methodologies and gaps identified in them.

5.2 Summary of the Research

The research basically starts with the problem description that transport policies and procedures that work reasonably well when cities are small fail as they grow big and thus the transport related problems become more pressing. The project evaluation and analysis procedures seem to neglect some of the most important areas and are unable to address the issues of most concern to decision makers and policy planners. The first chapter therefore establishes the need for the proper role assessment of the project evaluation methodologies of large-scale transportation infrastructure projects in the metropolitan areas of developing countries and identifying the gaps in those procedures so that suitable steps and better requirements can be recommended to improve the overall transportation planning and evaluation process.

The second chapter reviews the literature available on project evaluation and appraisal methods for transportation infrastructure projects in general. It then basically illustrates the different criteria used for project evaluation and the various strategic considerations taken during the project evaluation and implementation process. Also a critique on the project evaluation techniques by different authors is presented in the end along with a review on sustainability issues of transportation infrastructure development.

The third chapter presents a short overview of the transportation planning process and then reviews several case examples from different websites such as those of Asian Development Bank, the World Bank etc. to identify the important 'gaps' and shortcomings in the project evaluation methodologies of major transportation infrastructure projects in developing countries.

The fourth chapter presents an outline of the methodology and the framework used for project identification and evaluation and describes how it is used to categorize the different gaps identified from the literature review and the case examples in the prior chapters. It also presents the identified gaps according to the several steps of the project identification and evaluation process.

5.3 Conclusions and Recommendations

It can be concluded that certain gaps do exist in project evaluation methodologies for transportation infrastructure projects in developing countries. Also the project evaluation methodologies applied in developed economies of the world cannot be applied just like that in the developing countries since there are a lot of differences in the economic and social set up of these countries. It can be seen that some of the most important gaps are in the conception, implementation and design process of the selected project alternatives- that includes:-

- Definition of problem or objectives and accurate identification of the needs (for example, accessibility vs. mobility) for the given metropolitan region

- Consideration and development of other scenarios and alternatives and their analysis with importance given to all the relevant criteria
- Assessment and evaluation process of the various available alternatives
- Identification of the best alternative among the available options, that is, whether the alternative that has been selected is the best alternative project or not?

Most transportation projects are complex involving a great degree of uncertainty and possibilities and hence the planning, evaluation and analysis approaches need to be much clear and capable of resolving the problems at hand. Also the fast-growing population with rapid urbanization in an area often poses significant problems to the analysis procedures that fail to keep up with the changing statistics and information.

Other gaps are in the identification phase of the alternative options and strategies. The transportation planning and evaluation processes of developing countries do not promote integration among different modes of transport. Transportation planners traditionally consider a limited set of alternatives and their impacts and focus primarily on certain attributes of an option. In this process, the big picture tends to lose out. Conventional analysis often tends to ignore other significant impacts and fails to consider whether they support or contradict the overall strategic land-use objectives and account for other costs associated with the implementation and operation of the project.

The transport project to be implemented in metropolitan areas of developing countries now-a-days need to be integrated with several other available modes of transportation, land-use planning, promote intermodalism and multi-modalism depending on the travel choice behavior and the income levels of the population. So the other modes have to be given due consideration during the planning and evaluation approaches in general.

Monitoring and Maintenance of the project during implementation and operation is also an important phase in the overall planning and evaluation process. Once the project has been implemented and is open for use to the public, it faces several challenges with the operation and maintenance aspects. These may be either due lack of proper planning

approaches or lack of suitable equipment, personnel or technology. This is the area that accounts for a large portion of the capital investment in future time periods. It has to be taken into account that the long-term maintenance of capital assets requires adequate sustainability of the various facilities and the cost of constructing and maintaining excessively ambitious highways and other large-scale transport networks or attempts to provide transport as a subsidized social service frequently imposes unsustainable fiscal burdens on the economy, particularly in the low-income developing countries. Also insufficient provision of budget for operation and maintenance has been among the major problems of various projects in almost all the sectors of the developing member countries. This has resulted in the premature breakdown and suboptimal operation of many completed project facilities leading to reduced economic and financial internal rates of return and weakened overall project viability.

It can also be noticed that the investment in transport has not brought equal benefits to women and men and that the failure to account for gender relations in the design of transportation infrastructure and services can lead to inappropriate allocation of resources. It is generally assumed that well-designed transport strategies, projects and programs will be gender-neutral. The failure to improve the gender awareness of sector programs in transport can also result in their incapability to promote sustainable economic growth and may also undermine the equity objectives of program support in different sectors. The decisions about resource allocation to the sector and sub-sectoral activities are driven largely by narrowly defined commercial motives and with insufficient attention given to broader aspects and views of economic development.

The existing approaches adopt narrowly defined notions of efficiency and do not have the sector wide review to make decisions about the most efficient and equitable ways for allocation of a mix of public and private resources to the sector as a whole. Also there is little opportunity to benefit from inter-sectoral complementarities from the perspective of household providers and users of transport services when there is no co-ordination among the ministries of transport, planning, health, agriculture, rural development, industry etc in defining the sector priorities.

Another basic problem lies in the definition of sustainability since sustainability is a much broader concept having economic and social as well as environmental dimensions. Sustainable development is now being viewed as development, the objective of which is to improve service quality, the standard of living and quality of life, while at the same time protect and enhance the natural environment and honor local culture and history. Almost every stage from conception to implementation of transport projects deals with issues related to sustainable transport development. This is because every step does have some impacts either on the economy, society or the environment of the region. The problem is most of the analysis is based on the financial implications of certain impacts and any other areas of impact such as environmental and social are characterized into an externalities group. So there do exist gaps in planning methods that relate to sustainable issues of transport development and a lot of these have already been described earlier. But a point to be noted is that sustainable transport development is much different than traditional transport development. The increased dependence of transport on fossil fuels tends to aggregate energy consumption and generates air pollution and has other adverse effects on the surrounding environment. These impacts though not always cumulative and irreversible in nature, are nevertheless not sustainable since they do not represent the intended outcomes. Recently the importance of the so-called “external effects” has come to be realized as crucial to transportation planning policy formulation.

Transport sector in most developing countries is somewhat more controlled by the public sector and hence suffers from inefficient management and budget deficits. Private investments in the transportation infrastructure therefore have fairly been limited and a large share of these investments has been predominantly taken by road projects followed by rail and port projects in developing countries.

It can be noticed that the gaps in project evaluation not only relate to the methodology or planning issues but there are other subtle issues also that need to be looked at. For example, some of the other gaps can be attributed to the weaknesses in the educational curriculum and personnel training defined in most of the institutions and other organizations of the developing countries. The technical knowledge imparted in the

various courses and the practical things that happen in the field do not seem to be in total alignment with each other. There exist some major gaps in the theoretical knowledge base and the application of that knowledge in the real world context. This may be due certain technical assumptions made in theory and also because of other factors that come into play when things are applied into real existence. This can be overcome in some way by making the academic curriculum more dynamic and adaptive to the real world situations rather than be based on extensive standardized way of doing things.

Out of these gaps, the areas that need the most and immediate attention are:-

1) Consideration of integrated means of transport and intermodalism as possible ways and solutions to the existing problems posed by rapid population growth and urbanization in metropolitan areas of developing countries. The integrated approach allows transportation to be considered an important component along with other sectors as well as different modes within the transport sector. The approach can even be integrated with land-use design and planning. The rapid expansion of the urban areas has resulted in the existing transport systems being already stretched to capacity levels and thus transportation services are not able to meet the needs of the users. In the developing countries, some of the extreme issues like the existence of different motorized and non-motorized transport modes, low vehicle ownership levels and non-uniformity in the availability of choice opportunities usually results in capacity shortage and several transportation sectors and projects competing for funds at the same time.

2) Consideration of provision of more accessibility to the women users of the transport infrastructure facilities. This basically means providing more reliable, safer and comfortable means of transportation taking into account the needs of women. The failure to do so can lead to unsustainable economic growth and promote inequitable objectives. Steps can be taken to provide at least Non-motorized means of transport and increase the number of public transport vehicles serving them with better managed schedules.

3) Adequate provision of infrastructure for the rural transport. This is one of the most important issues that need to be tackled with, particularly in developing countries where

the economy is predominantly agricultural in character and women play a major role in performing various income-generating and household activities. Pedestrian and other non-motorized transport (NMT) continue to be poorly served in such areas. Increased use of private vehicles in rural areas is expensive and unsafe.

4) Satisfying the long-term monitoring and maintenance requirements of transportation infrastructure. Adequate attention needs to be paid during the implementation to subproject selection and civil works quality of construction, followed by adequate maintenance and evaluation. Also the problems of maintenance are compounded due to unclear institutional responsibilities for the different transport projects.

5) Planning Procedures to account for sustainable transport development, economically, socially and environmentally. This is not an easy task since sustainable development has broader objectives and is much different than the conventional transport development practices. Another thing noticed is that the economic benefits attained are different for different socio-economic groups and users that make the characterization of different impacts and benefits even more difficult.

This is because often planning methods have not been available when needed to adequately support planning and project decisions. Also they have not been responsive to the needs of local planning officials and the resident population. The planning methods and policies have now become more complex and extensive and sometimes conflicting in character. There is increasing decentralization of authority and responsibility that leads to new challenges to urban transportation planning and evaluation. Most of the urban areas struggle with using transportation to foster economic development while still providing mobility. On the other hand, lack of suitable financing capabilities owing to regulation by the private sector is another problem to implementation of such projects.

Some of the steps recommended to overcome these gaps have already been discussed in the previous chapter. There is a need to capture the real-life situations that often have a major impact on the project design and evaluation assumptions. Inappropriate

assumptions about design, implementation issues and external events could lead to significant changes in the original scope of the project. A systematic and objective-oriented approach towards project evaluation can then help in early analysis of outcomes from the concurrent activities and allow for various processes and actions to be adapted in light of the emerging outcomes. It is suggested to embed the entire process of evaluation in a public-decision making process that includes interactive sensitivity analysis and open discussion of the merits of assumptions used in the analysis. It proposes combination of more transparent technical tools of evaluation along with educational and consensus building tools.

Public-private partnership seems to be an attractive and efficient means to develop, operate and manage new transportation infrastructure in developing countries faced by severe financial and resource constraints. Scenario analysis is a potentially powerful instrument that can help in representing the type of uncertainty encountered in strategic transport planning. Steps must be taken in strengthening design capabilities of the local institutions in building well-designed roads, financing procurement of required maintenance equipment, and extending support for policy reforms. The design and evaluation process should not be too rigid and impractical. This can be accomplished by dividing the full project into subprojects to be implemented on a rolling basis.

One of the important steps that can be taken to implement better transport projects is to strive for consideration and analysis of alternatives so as to advocate various transportation options as solutions to vast array of problems and concerns. This can help to evaluate trade-offs among major investment options so as to finally come with best option to accomplish the desired objectives.

In essence, strategic transport planning should become an integral part of the overall transport developmental planning of a developing country or region. The vision should be up to 15 to 20 years with intermediate horizons. The process needs to retain some flexibility in the longer term to adapt to changing circumstances and should include all forms of transport to provide an integrated and optimal result. It should be able to

provide an overall framework of major links, the interdependence between transport modes and establish priorities. This should also include any needed institutional changes and guidance on the policy issues related to the government and the role of the private sector involvement.

Also recent advances in information technology are radically changing all aspects of planning, evaluation, implementation and operation of transport infrastructure projects and these need to be incorporated and anticipated in all programs and policy-making procedures.

5.4 Scope for Further Research

Project identification and evaluation is a very broad and multi-dimensional process and involves a lot of other steps that are in turn, small processes by themselves. Here an attempt was made to develop a methodology and outline a framework for project identification and evaluation in order to characterize the gaps in project evaluation methodologies in developing countries from different websites. There is ample scope for further research to be done in each of the gaps or challenges that are identified in project evaluation and planning methodology. This can help us to have a better understanding of the gaps and also new and more efficient ways of overcoming them can be developed. Another area is to research into the gaps existing into the academic institutions, where there may be considerable differences between theoretical knowledge and applications to real situations. In the public workplaces or organizations, the best steps are not always followed due to several factors. Further research can also be done in developing better ways of analyzing the different impacts of transport project development right from the conception phase to the implementation phase or searching for better and more feasible means of financing a given transport option. Also the outcomes of combining several different evaluation and analysis approaches together can be analyzed and researched further.

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1) The World Bank Group

About: The World Bank is among one of the world's largest organizations acting as a source of development assistance to various countries. It is an international organization of more than 180 members that provides loans to borrower countries in accordance with its goal of fighting poverty. It works in more than 100 developing economies with the primary focus of helping the poorest people and the poorest countries. The website of World Bank provides an overview of how the Bank uses its financial resources, its highly trained staff, and its extensive knowledge base to help the developing countries onto paths of stable, sustainable, and equitable growth. The site also provides useful information regarding various project evaluation methodologies and examples of transportation projects in several developing countries that can serve as a basis for identifying the current state of evaluation of transport projects in several developing countries.

URL: <http://www.worldbank.org>

2) The Asian Development Bank

About: The Asian Development Bank is a multilateral development finance institution dedicated to reducing poverty in Asia and the Pacific region. The studies done by the ADB include performance audits and evaluation reports of specific projects in various countries, reviews of all completed ADB-financed transport projects and programs within a country and several broader multi-country evaluations of selected projects. These studies present the major findings, lessons learned and issues involved in various transport projects relevant all over the world and thus contribute to substantial improvements in future transportation infrastructure development. This website is a very useful source for information regarding project evaluation methodologies and different transportation infrastructure projects in developing countries.

URL: <http://www.adb.org>

Asian Development Bank also presents a number of different Project Performance and Evaluation Reports in Developing Countries. These serve as a useful means of identifying the gaps in project evaluation methodologies for transportation infrastructure projects.

URL: <http://www.adb.org/evaluation/reports.asp>

3) The Transportation Research Board

About: The Transportation Research Board (TRB) is a unit of the National Research Council, a private, nonprofit institution that is the principal operating agency of the National Academy of Sciences and the National Academy of Engineering of USA. The Board's mission is to promote innovation and progress in transportation by stimulating and conducting research, facilitating the dissemination of information, and encouraging the implementation of research results. The Board is supported by state transportation departments, the various administrations of the U.S. Department of Transportation and other federal agencies, industry associations, and other organizations and individuals interested in the development of transportation.

URL: *<http://www.trb.org>*

4) The Victoria Transport Policy Institute

About: The Victoria Transport Policy Institute (VTPI) is an independent research organization dedicated to developing innovative and practical solutions to transportation problems. TDM Encyclopedia (2002) is a comprehensive source of information about innovative management solutions to transportation problems. It provides detailed information on dozens of demand management strategies, plus general information on TDM planning and evaluation techniques. It is produced by the Victoria Transport Policy Institute to increase understanding and implementation of TDM. The website serves as a source of useful information about various procedures of transport project evaluation and transportation planning and management.

URLs: *<http://www.vtpi.org> and <http://www.vtpi.org/tdm>*

5) The World Bank Gender and Transport Thematic Group (GTTG)

About: GTTG is a cooperative venture of the Gender and Development Network and the Transport Technical Department of the World Bank. It facilitates the integration of gender into transport policies and projects. This site provides some useful case studies for rural and women transport in some of the developing countries.

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This section of Asian Development Bank presents several guidelines for economic analysis of projects.

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Asian Development Bank Project Performance and Evaluation Reports in Developing Countries

This section from the Asian Development Bank gives information about different project performance and evaluation reports prepared by ADB in developing countries.

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Sustainable Transport.org.uk is collaboration between Wastebusters and Sd3 Ltd. This website is aimed to provide practical information to the public, to businesses and to Local Authorities to enable improved decision making about transport use in order that we might reduce our negative impacts on the environment, society and the economy.

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The Operations Evaluation Department (OED) of the World Bank is an independent unit within the World Bank and its goals of evaluation are to learn from experience, to provide an objective basis for assessing the results of the Bank's work, and to provide accountability in the achievement of its objectives. It also improves Bank work by identifying and disseminating the lessons learned from experience and by framing recommendations drawn from evaluation findings

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UK–Sustainable Transport Website

This section of the website is aimed to provide practical information to the public, to businesses and to Local Authorities to enable improved decision making about social aspects of transport use in order that we might reduce our negative impacts on the environment, society and the economy.

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