Poverty Reduction and Road Projects: A Prospective Estimation Method

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ABSTRACT

This paper develops a model of competition in the transport services markets along a given road, e.g., the markets for moving passengers and freight, and estimates the key parameters of the model so as to estimate the share of benefits from rehabilitating the road that likely will go to the poor. The authors base this estimation on surveys of drivers, passengers, and freight shippers using the road.

The main benefit that arises from road rehabilitation is a savings in vehicle operating costs. If the passenger and freight transport markets are highly competitive, transport cost savings will be passed on in lower passenger fares and freight rates. Because the poor are users of transport services in most countries, lower passenger fares and lower freight rates (say to ship agricultural produce or inputs) caused by sharp competition in the transport services markets means that a higher share of benefits from rehabilitating a road will accrue to the poor. Conversely, a low degree of competition in the passenger or freight markets means that the benefits of rehabilitating the road will stay with the owners of the vehicles, and not be passed on in lower fares or freight rates. As a result, the poor will not much benefit from an improved road.

The paper presents this method of estimating the share of expected road rehabilitation benefits that accrue to the poor in the context of a study performed in Tajikistan. Drivers, farmers, and users of the road were surveyed to discover the structure and performance of the transport markets along the main road from the capital, Dushanbe, to the South eastern portion of the country. The surveys showed that the passenger and freight transport markets were very competitive; so that most of the expected cost savings would be passed on to users in the form of lower passenger fares and freight rates. The authors used the surveys to also determine the degree to which the poor use the road. With this information, the share of benefits expected was estimated from the rehabilitation that would accrue to the poor. The paper presents ways to use the survey results to make policy recommendations to enhance competition so that the poor will get a larger share of the benefits. The paper also presents a method to conduct a sensitivity analysis for the estimates in the analysis. The authors have applied this method to proposed road rehabilitation projects in The People's Republic of China, India, and The Kyrgyz Republic. All of these projects were funded by the Asian Development Bank (ADB). The method developed by the authors in these studies has been adopted by the ADB as the standard textbook method to be applied to determine the share of benefits likely to accrue to the poor for all road rehabilitation projects proposed to the ADB.

INTRODUCTION

This paper presents a model to estimate the potential to reduce poverty by rehabilitating trunk and secondary roads. It further discusses in detail the original application of this model in Tajikistan. With some modification, the general approach has been applied to road projects in many other developing and transition economies.[1] It relies on the outputs from traditional road project feasibility studies, along with the results of tailored small-sample surveys of road users. The method can be enhanced by including Participatory Rapid Appraisals (PRAs), as was done for a proposed roads project in Yunnan, China,[2] or Focus Group Discussions (FCDs), as was done in Madhya Pradesh, India.[3] Depending on the lending institution or potential supplier of development assistance, specific requirements for the application may vary. This paper focuses on the requirements usually requested by the Asian Development Bank (ADB).

This model is best applied by a small team of economists and anthropologists or sociologists supplemented by local specialists, all of whom are familiar with developing and/or implementing sample surveys. The use of local specialists is critical to provide the appropriate cultural context for the study, the survey designs, and if used, the design of the PRAs or FCDs. The model is flexible, can be applied with minimal resources, and completed in a relatively short time period. Alternatively, there are several steps in the model's application that can be expanded to enhance the accuracy of the estimates. Using this model helps identify policy and institutional reforms that will increase the share of project benefits that are likely to accrue to the poor

The "model" rests on the theoretical foundation of the basic partial-equilibrium neoclassical model of competition in the freight and passenger services markets on the route in question, combined with estimates of how the poor use the road. Results are sensitive to the given cultural and political-economic context of a particular application. Given the amount of technical research resources available for such studies, using this model does not involve estimating parameters of the underlying supply and demand relations.[4] Nonetheless, use of the model across countries and specific proposed projects illustrates the importance of competitive pressure for benefits to accrue to the poor.

[1] ADB TA Number 3168 – TAJ: "Poverty Impact Analysis, Republic of Tajikistan, Road Rehabilitation Project." Louis Berger International, Inc., Snowy Mountains Engineering Corporation, with Tajik Professionals. (Consultant's Final Report submitted October 2000).

ADB TA Number 3335 – KGZ: "Poverty Impact Analysis, Kyrgyz Republic, Third Road Rehabilitation Project, Feasibility Study, Volume 7." The Louis Berger Group, Inc. (Consultant's Final Report submitted August 2001).

[2] ADB TA Number 3642 – PRC: The People's Republic of China, Yunnan Provincial Communications Department, "Western Yunnan Roads Development Project." (Consultant's Final Report submitted to ADB May 2002).

[3] ADB TA Number 34263-01 – IND: "Poverty Impact Analysis: Madhya Pradesh State Roads Sector Development Program." The Louis Berger Group, Inc. (Consultant's Final Report submitted May 2002).

[4] Moreover, it is unclear how much extra value would be added if such parameters were estimated, given the cost of collecting the additional data. See: Hodgson, Geoffrey M. How Economics Forgot History: The Problem of Historical Specificity in Social Science. Routledge, Taylor & Francis Group, New Yoork and London, 2001.

The paper is organized into three parts: the first covers general methodological issues, the second the initial experience in Tajikistan, and the third details subsequent modifications of this method for application in other countries. It concludes with a discussion of the issues most important for future applications.

PART 1

GENERAL METHODOLOGICAL ISSUES

The objectives and tasks of a general transport infrastructure poverty impact analysis (PIA) are broken down into three interlinked analyses. This conforms to the ADB requirements set forth by its "Guidelines for the Economic Analysis of Projects", in particular, Appendices 25 and 26. These guidelines are followed throughout this working paper. The three main objectives of a typical PIA are:

1. An analysis that distributes a project's net benefits among the different categories of beneficiaries;

2. An analysis of the structural constraints to the participation of the poor in the transport sector and the recommendation of actions and complementary activities that would enhance the poverty reduction effects of a project based on the results of these analyses;

3. A poverty impact analysis that estimates the proportion of the net benefits likely to accrue to each of the beneficiary groups, including the non-poor, the poor, and the extremely poor. The analysis allows the researchers to calculate a project's poverty impact ratio (PIR).

Researchers must undertake a number of activities, including survey work and analysis of collected data, which are necessary to provide estimates of the key parameters for these analyses. Stakeholder input can also be used to help estimate non-monetary benefits of a project and the share of those benefits likely to accrue to the poor. An example of a non-monetary benefit affecting all beneficiaries, including the poor and non-poor, is a reduction in vulnerability to a weather-related disruption in the delivery of food due to the improved road.

The PIA should include a summary of national and provincial poverty reduction policies and poverty-reduction activities of the donors to provide a context for the analysis and complementary actions. The complementary actions (i.e., policy reforms) should be designed to fit with the existing strategies and policy to reduce poverty in the relevant country. Often, the most effective complementary actions become evident through implementing the surveys and when the researchers actually travel the road as part of the fieldwork.

The fundamentals of the method rely on basic economic principles and researcher judgment. The first step is to use surveys, PRAs and FGDs to estimate how and the degree to which the poor use the road in question. The next step is analyzing the data collected from these instruments to determine the degree of competition in the transport service markets (passenger and freight) on the road. Then the researchers should take the estimated net benefits from the economic feasibility study, that are primarily savings in vehicle operating costs due to the improved road, and estimate the share going to the poor and very poor. The estimated shares of benefits going to these groups will depend on the degree of competition in the transport service markets and how heavily the poor

use the road. For example, if passenger and freight service markets are very competitive, then a large share of the net benefits should be passed on to users in the form of lower passenger fares and freight rates. Using the estimated proportion of users who are poor, the researchers can then estimate the share of benefits that are likely to go to the poor. Because the method relies heavily on the results from small surveys, PRAs, FGDs and researcher judgment, the sensitivity analysis is a crucial portion of the overall analysis.

On a more detailed level, Figure 1.1 presents a diagram that illustrates the method followed to distribute a project's net economic benefits among users, and the poverty impact analyses. All costs and benefits should be presented in economic values (not financial values), using the conversion factors typically established in the general economic appraisal.

As can be seen in the figure, the general procedure followed is to first break down the aggregate net benefits estimated in the economic appraisal into different categories of beneficiaries. Tasks 1 through 5 outline the steps needed to carry out this process.

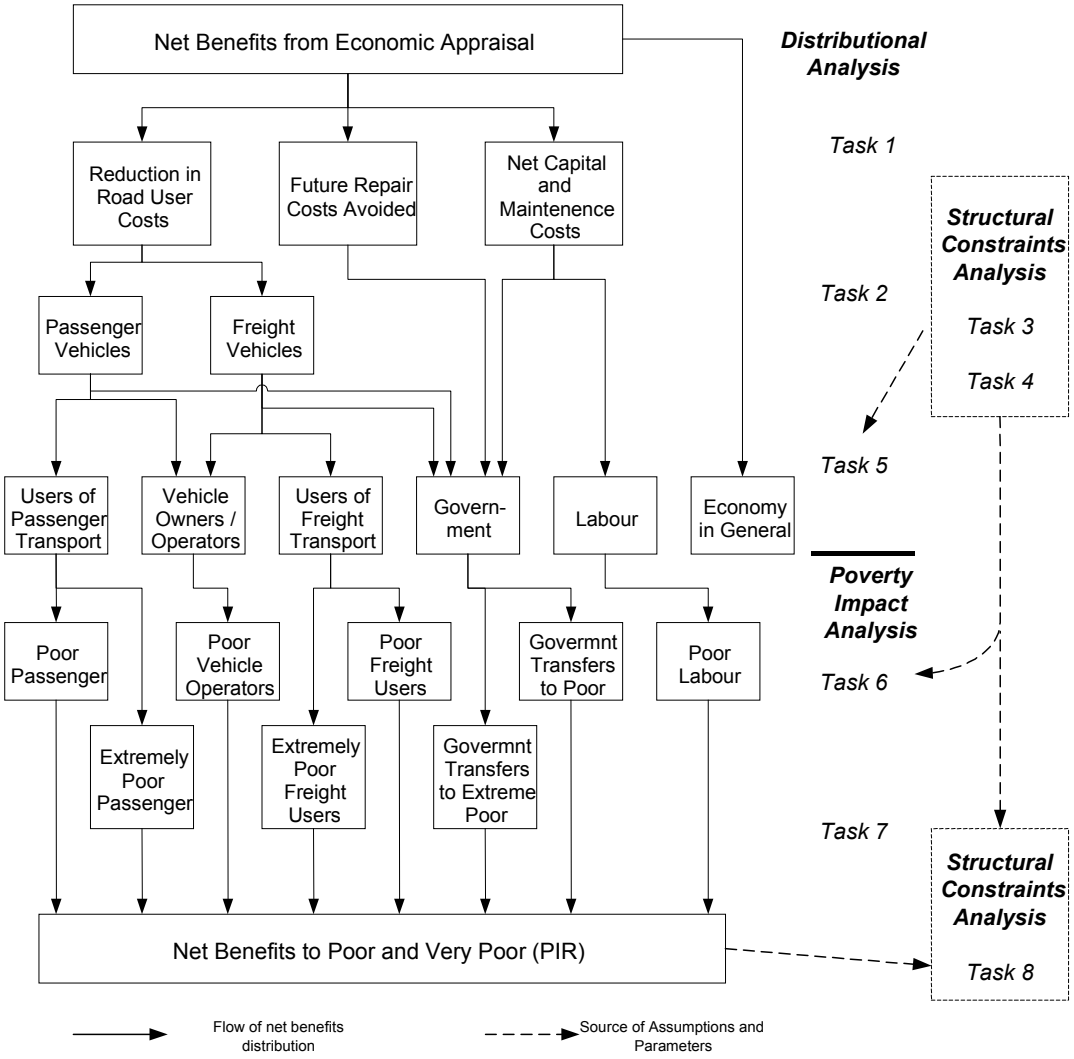
Once the share of the net benefits that goes to each of these categories of beneficiaries is estimated, the next task is to estimate the proportion of the benefits in each category that will go to the poor and the extremely poor (who are a subset of the poor). The benefits for each of these socio-economic groups should be summed up and compared to total benefits to derive the project's poverty impact ratio (PIR). Though it is not shown in the figure, it is also highly advisable to make additional estimates of the number of poor and extremely poor that likely will benefit from a given project.[5]

The analyses of structural constraints in the transport sector provides the basis for the assumptions and estimated parameters upon which the benefits distributed to each category of beneficiary are then further divided between the non-poor, the poor, and the extremely poor. This should be followed by a sensitivity analysis and an explanation of a cause and effect analysis.

Although not shown in the figure, the formulation of recommendations for complimentary actions to increase the share of benefits accruing to the poor should be made by the researchers throughout the course of the study. These complimentary actions often focus on ways to improve competition in the transport service markets. This is especially true in transition economies, where privatization may not have progressed to the point where the government is a regulator of markets, as opposed to a player in markets. In other developing countries, the complimentary actions often focus on ways to increase the use of the road by the poor. This can be done, for example, by assisting poor subsistence farmers to increase production through providing agricultural extension services and thus using the road to carry surplus production to market.

[5] The estimate of the number of poor benefiting is critical for the ADB to classify the project as being a "poverty intervention," or a "core poverty intervention," or an intervention that must be justified on other grounds, such as "economic growth." To do this, it is typically necessary to estimate, in conjunction with the Bank, the size of the Project Area (often defined as 10 kilometers wide on either side of the road's centerline), use an estimate of population density, and estimate the total number of people in the project area. The mutually agreed upon poverty lines should then be applied to estimate the number of poor and very poor people. See the text below for more on these issues.

Figure 1.1: Diagram of Methods Distribution of Net Benefits



1.1 Distributional Analysis

The distributional analysis is implemented based on the net benefits identified in the project's economic appraisal. These benefits are typically distributed among the following categories of beneficiaries: (i) users of freight transport, (ii) users of passenger transport, (iii) vehicle owners, (iv) direct labor, and (v) the government.

The following sections present an overview of each task.

Task 1: Disaggregation of Net Benefits

The economic appraisal estimates the stream of net costs and benefits that would result from project implementation over a specific appraisal period, usually 20 or 25 years for a

road project. The project appraisal estimates the following categories of costs and benefits:

Net Capital and Maintenance Costs: These are the investment costs of the proposed road, any bridge rehabilitation works, and resulting annual maintenance costs, net of the maintenance costs required if the rehabilitation was not carried out.

Reductions in Road User Costs (RUC): These are the reduced or avoided costs to road users that come from improving the condition of the roads. They include vehicle operating cost savings and timesavings.

Task 2: Division of Road User Cost (RUC) Reductions between Passenger and Freight Vehicles

Because the results of the economic appraisal are not generated to differentiate by type of vehicle, it is necessary to use the base data gathered to carry out the appraisal to estimate this distribution. This likely will include traffic forecasts and road user unit costs identified by class of passenger or freight vehicle.

The result of this task is an estimate of the stream of benefits over the project appraisal period that arise from RUC reductions for each class of vehicle, as well as aggregate flows for the group of passenger and freight vehicles.

Task 5: Distribution of Net Benefits among Categories of Beneficiaries

The RUC reductions are typically distributed among the following categories of beneficiaries:

- Users of passenger transport,
- Users of freight transport,
- Vehicle owners and operators (private sector), and
- Government.

This distribution is carried out using the following parameters, which are estimated in Tasks 3 and 4:

- The approximate percentage of RUC reductions that will be passed on to passengers and owners of freight.
- The ownership and operating characteristics for each type of vehicle (i.e., the poor peoples' and very poor peoples' ownership and use of each type of vehicle on the road).

These two factors are important because a reduction in the costs of using the roads will initially be absorbed by the owners and, in some cases, operators of the vehicles. Based on the authors' experience in implementing this method, it appears that very few if any poor own, or are commercial operators of vehicles. But to the extent that the road transportation market ***is competitive***, a portion of these savings will be passed on to the users of transportation services in the form of lower passenger fees and freight rates. And portions of the users are poor and very poor. The estimates of these parameters allow for the calculation of the number of poor beneficiaries (as required) and the PIR.

1.2 Structural Constraints Analysis

The structural constraints analysis aims to assess the structure and performance of the transport market within a project area. It requires extensive fieldwork, collection of secondary source information, and consultation with appropriate local government officials. This analysis critically relies on the use of surveys in a given project area. These surveys are designed to assess the degree to which owners pass on vehicle operating cost savings to users. Additionally, they are designed to allow the researchers to estimate the degree to which the poor and the extremely poor will benefit from a project, largely based on estimates of the proportion of poor and extremely poor that use the road.

The structure and performance of the regional and national economy will greatly influence the estimate of tertiary benefits that will accrue due to a project. An evaluation of secondary data and primary survey data helps the researchers estimate these tertiary benefits. Also, agricultural price data from along the road may shed light on how prices vary across the major markets served by that road, and the extent to which agricultural markets are developed and competitive. A review of agricultural policy and privatization proves useful for the structural constraints analysis, and developing recommended complementary actions.

Task 3: Survey Design and Implementation

Survey design should specifically aim to fill the data gaps needed to answer the critical questions required for this analysis:

- To what extent will cost savings be passed from vehicle owners to users;
- To what extent do the poor and the very poor use the road;
- To what extent will the project's benefits be passed on to the poor and very poor;
- What institutional constraints bar the poor and the very poor from receiving a larger share of the benefits from the project; and
- What complementary actions would best help the poor and extremely poor to increase their benefits from an improved transport system?

Completing this task involves drafting questionnaires, field-testing pilot questionnaires and making subsequent revisions, as well as conducting interviews. Given the information needed for the research, the surveying focuses on respondents residing in the project area, including those that use the project road, as well as the drivers of vehicles that use the road.

Task 4: Analysis of Constraints in the Transport Sector and Development of Assumptions

Again, the results of the surveys are the main source for the analysis of the constraints facing the transport sector. The results of driver surveys should reveal the structure of the bus and trucking markets and the extent of direct government involvement in providing transport services. Additionally, they should add insight into the fare structures of the various modes of transport. Passenger surveys should show the degree to which passengers encounter problems with access to common destinations, such as hospitals and schools. The estimation of the share of the poor and extremely poor who use the

road should be based primarily on these surveys. This estimation can also be supported by secondary data from larger scale surveys implemented by the particular country's government, including those supported by the World Bank and other donors.

Task 8: Complementary Actions and Activities

Recommended complementary actions and activities are developed towards the conclusion of the analytical work for the report. This task should focus on analyzing institutional and other constraints that hinder transport market competitiveness and keep the poor and extremely poor from receiving more of the direct benefits that arise from road improvement. In addition to addressing these issues, recommendations may also cover necessary actions for the poor and extremely poor to be able to capture a larger share of the induced or tertiary benefits from the project. Funding agencies can use some of the recommended complementary actions as policy reform conditions that the government must put in place prior to receiving financial assistance to rehabilitate the road.

1.3 Poverty Impact Analysis

The objective of the poverty impact analysis is to estimate both the percentage of the net benefits of the project which will reach the poor and extremely poor, as well as the absolute number of poor who will receive these benefits. Non-income benefits to the poor are also estimated, where possible; or at a minimum, they should be discussed in the study report. Additionally, the analysis may involve an estimation of the share of the tertiary benefits that accrue to the economy in general that go to the poor and extremely poor.

Task 6: Estimate Numbers of Poor and Extremely Poor who will Benefit and Proportion of each Category of Beneficiary

This task first requires that the following be estimated:

1. The number and proportion of poor and extremely poor that make up the population of the project area;

2. The percentages of poor and extremely poor that use road transportation services;

3. The proportion of poor and extremely poor that make up (or benefit from) each category of beneficiaries.

This process should culminate in the identification of poverty levels and a definition of the poor and extremely poor. This secondary data may be supplemented by project area survey results, which permit an approximation of the proportion of the poor and extremely poor who use and operate transportation services on the project road, and whether these are passenger or freight services.

Estimates are also made of the percentage of government benefits and costs that can be attributed to the poor.

The information outlined above is then used to allocate the benefits distributed in Task 5 among each category of beneficiary according to the following three income levels: Non-poor, poor and extremely poor.

Task 7: Estimate of Poverty Impact Ratios (PIR)

Poverty Impact Ratios, PIRs, are estimated for both the poor and the extremely poor. The procedure for estimating these ratios is as follows:

1. The net benefits from each beneficiary category estimated in the previous task are summed up to obtain the total net benefits for the poor and for the extremely poor (Sub-Task 7.1);

2. The net present value (NPV) of these total net benefits to the poor and extremely poor is then divided by the total net benefits for the economy as a whole so as to obtain the PIRs (Sub-Task 7.2).

This task concludes with a summary of the poverty reduction effects of the project, which provides the basis for Task 8 (discussed above as part of the structural constraints analysis).

The analysis and estimation of the PIRs is incomplete without a sensitivity analysis. In this concluding part of the work, this analysis shows what would occur to the number of poor and very poor beneficiaries as well as the associated PIRs if the structural constraints are either lifted, or if they become even more severe. Researchers should subject the basic two key parameters of the analysis to sensitivity testing. In particular, questions such as “What would occur if agricultural markets shrink, and the poor become less involved in commercial farming and subsequently decrease their use of the road?” and “What if the government privatizes all its freight vehicle fleet and the market for freight services becomes more competitive?” are addressed in this portion of the analysis.

PART 2

THE TAJIKISTAN EXPERIENCE

The following section looks at what is typically required in a prospective PIA for a roads feasibility study by the ADB. It includes a review of the general method and then a discussion of the original application of this method in Tajikistan.

This PIA was undertaken for the ADB in 2000 as an add-on to an already completed feasibility study, under the technical assistance grant classified as ADB TA–AJ-3168, for the Tajikistan Road Rehabilitation Project. The project included the rehabilitation or reconstruction of 87 kilometers of national highways and one bridge in the southwestern portion of the country, primarily in the Khatlon Oblast. The study analyzed selected road sections located on five national arterial roads that compose the southern corridor connecting Dushanbe to Kurgan Tyube, Dangara, Kurabansheit, and Kulyab, major cities to the south and southeast. Conducting the PIA was facilitated by the fact that the selected road sections were contiguous.

2.1 Definition of Project Area

2.1.1 Project Area

The project area included a road length of 254 kilometers. In defining the project area the study team followed the ADB's general guidelines, which consider road projects to have a Project Area or Zone of Influence (ZOI) of approximately ten kilometers on either side of the centerline of the road. Consequently the study team defined the project area as the 5,080 square kilometer track of land surrounding the project road. Since all the road sections incorporated into the project were contiguous, the project area comprised a single corridor.

This corridor stretches south from a point approximately halfway between Dushanbe and Obikiik (58 kilometers south of Dushanbe) through Uyali to Kizil-Kala; then eastward through Kurgan-Tyube, Dangara and Kurbansheit to Kulyab. This is a distance of about 225 kilometers. The road corridor falls almost entirely within the Khatlon Oblast, with the exception of the northern portion of A384. To some degree, these roads serve the majority of the Oblast's population and economic activities. Khatlon is the most populous of Tajikistan's four oblasts, with an estimated 35 percent of the country's total population of 6.3 million. It is predominantly agricultural.

Defined in terms of administrative units, the project area was comprised of portions of:

- Leninsky Rayon in the Region Under Direct Republican Control; and
- Six Rayons in the Khatlon Region (Ghozimalikskiy, Bokhtarskiy, Sarbandskiy, Dangarinsky, Voseyskiy and Kulyabskiy)
- The Oblast Center of Kurgan-Tyube.

2.1.2 Demography

The Khatlon Oblast had a reported 1999 population of 2.1 million, containing the country's third and fourth largest cities, Kurgan-Tyube and Kulyab, respectively[6]. The Oblast's annual population growth rate was reported as approximately 3.5 percent compared with a national growth rate of 2.0 percent. The area was originally populated through forced relocations during the Former Soviet Union (FSU) period, resulting in a mosaic of originally mono-ethnic villages that have subsequently evolved and are described as populated by mixed ethnic groups.[7] The average household size in the Khatlon Oblast was reported as 7.7 in urban areas and 7.8 in rural areas. This compared to national averages of 5.7 in urban areas and 7.6 in rural areas. Family sizes in the project area were generally similar or higher than the Khatlon average, with the exception of Sarband. The study team estimated that the project area had a total population of roughly 715,000, representing approximately one-third of the total Oblast population.

For 1998, the UNDP valued the minimum monthly consumption basket for a person at 21,883 TR (about $30). According to the data collected from the Tajikistan Living Standards Survey (TLSS) more than 80 percent of households in Khatlon could not afford this basic amount as of May 1999[8]. As a result, the poorest 80 percent of households in terms of per capita expenditures were considered to be "poor" for the purposes of this study. The poorest 20 percent of households were considered to be "extremely poor[9]."

2.1.3 Sociological Profile

The results of the study's surveys suggested that 60 percent of the users of the project road were poor. They further pointed to the fact that the poor use buses more often than the better off passengers. Their frequency of travel appeared to be about the same as the better off passengers. As with all passengers using the project road the vast majority, over three quarters, were men. The study team did not consider this to be surprising given the social structure in Tajikistan. The occupational profile of the poor passengers did not differ from the better off passengers. About 20 percent of the poor passengers reported they worked in the private sector, 20 percent for the Government, 6 percent were housewives, 6 percent were students, 10 percent were pensioners, and 6 percent reported they were jobless. The average age of the poor passengers was 41, about the same as for all passengers. Poor passengers had slightly higher household size, averaging 9 people, compared to 8 people for all passengers as a whole.

The project team also surveyed farmers who use the project road. Again, about 60 percent of them were poor. About 20 percent of all farmers said they sold their produce locally (no motorized transport). This proportion also held for poor farmers. About 70 percent of the farmers said they sold their produce more than once a week. Approximately 70 percent also said that they did not use a second-hand dealer because they were not satisfied with the prices these dealers offered. For those using motorized

[6] UNDP Development Report, 1999.

[7] UNDP Human Development Report, 1999 as reported by the ADB Memorandum of Understanding, 21 February 2000, Annex 6, page 2.

[8] This survey was designed in early 1999 and implemented in Tajikistan in June, 1999. The TLSS covered 2,000 households and 14,000 individuals and was designed to be representative of the country. The purpose of the survey was to collect data that could be used to assess household welfare and to evaluate the effect of various Government policies on the population.

[9] The study utilized these Khatlon level percentages instead of a fixed poverty line due to the lack of price data needed to calculate the minimum consumption basket for the project area.

transport, all reported that they lease the vehicles they use to bring produce to market. Farmers said transport costs represented 20 percent of the final price they received in the market. This did not differ for poor farmers. The average age for farmers was 41, and 80 percent were male. This was about the same for poor farmers. Surveys also addressed issues pertaining to female-headed households, damage due to civil unrest, access to basic health and educational services, and overall health and nutrition.

2.1.4 Economy

In general respondents from the Khatlon Oblast ranked the quality of their roads as better than those interviewed elsewhere in the country. This was especially true for small rural towns. According to the TLSS survey, Khatlon contained only 15 percent of the nation's petrol stations. With a third of the country's population, this was a somewhat surprising result. However, the Oblast accounted for half of the nation's airports with paved runways. It also contained a third of the markets, a third of the rail stations and a third of the bus terminals, which is in line with the Oblast's share of the national population. The TLSS shed some light on the employment picture in the Oblast. Two-thirds of the respondents in the Oblast said they were farmers, compared to 40 percent in the rest of the country. Moreover, 80 percent of the poorest households in the Oblast were supported by farmers, compared to 50 percent in the rest of the country. Not surprisingly, the specific economic characteristics of the project area were similar to those of the Oblast.

2.2 General Surveying Method

The study team developed pilot surveys for drivers, passengers, and farmers. The driver and passenger survey instruments were field-tested in Dushanbe. The farmer survey instrument was field tested in Leninsky, a small hamlet in the project area located about 20 kilometers from Dushanbe.

For the driver and passenger pilot appraisals, the project team tested these questionnaires at three places in Dushanbe on the morning of July 10. The first place was an "informal" multi-modal transport market, the second stop was the general market in Dushanbe and the third was the main formal Dushanbe bus terminal. The study team observed that buses carry substantial amounts of farmers' produce, although this was not taken into account in the measurement of total project benefits.

The test of the pilot questionnaire for farmers and passengers was implemented in Leninsky on July 13. Testing proved not to be easy partly because farmers were difficult to locate in or around the town. For the past three years, the area around the town had not had sufficient water to raise good crops. As a result, most of the farmers in the area had switched to other occupations. Eventually, the Study team located and interviewed 10 farmers and 10 passengers in the area.

2.2.1 Adjustments to the Questionnaires

The fewest adjustments were required for the drivers' questionnaire. Since virtually all drivers reported that they drive to destinations in Khatlon Oblast, the study team eliminated that question, leaving 25 questions. While questionnaires of this type that

exceed 20 questions are typically too long, in this particular instance a longer questionnaire was possible. The drivers did not object to answering a slightly longer questionnaire because they were waiting while in transit.

The study team made the most adjustments to the passenger questionnaire. The pilot questionnaire originally contained 28 questions. Even though passengers were in transit, this length was somewhat irritating to some of the interviewees. In addition, four specific questions posed difficulties to the passenger interviewees. After being asked which method of transportation they used most often to Dushanbe, they were confused by the questions, "which other methods of transportation do you sometimes use to Dushanbe?", "How often do you use these other types of transport?", and similar questions about travel to their most frequent destination, aside from Dushanbe. So, the survey team deleted these four questions for the remainder of the surveys.

On the pilot for the farmers, only a single question posed problems. Farmers did not offer very elaborate responses to the open-ended question —"What do you expect from an improved main road?" So, the project team eliminated the question from the questionnaire.

Because the adjustments to the questionnaires were relatively minor, the study team used the results of the pilots for representation in Dushanbe. In order to cover the project area, the project team implemented the surveys in Dangara on July 19, in Kulyab on July 20, in a small rural community, Kolkhoz Duraiv near Kurgan Tyube on the evening of July 20, and in Kurgan Tyube on July 21.

2.2.2 Implementing the Surveys

The survey team's first stop was at the main bus terminal in Dangara. A few drivers and passengers were interviewed at this location. Most of the drivers at this location did not use the project road for the Dangara-Dushanbe run. Instead, they used A385 as an alternate route because it is faster and cheaper.

In Kulyab, the survey team interviewed drivers and passengers at three locations: the "informal" transport market, the old main bus terminal and the nearby major open-air market of the city where farmers and truck drivers could be found.

The survey team then proceeded to Kurgan-Tyube on the project road. Much of the area was devoted to wheat. This had been a dry year, and the fields looked extremely dry. People were standing by the roadside holding empty water bottles begging for water in some places. There was no industrial activity evident on the project road. Indeed, the interviewees, after it was explained to them about the ADB's plans to rehabilitate the project road, said they did not need a better road, but a more extensive irrigation or water supply system. Water did not seem in short supply in the urban areas the survey team visited along the project road.

In order to get a different sample of farmers, the survey team went to a small village about 5 kilometers outside of Kurgan Tyube called Kolkhoz Duraiv. Here 10 farmers were interviewed in a very relaxed and peaceful atmosphere.

In the morning, the survey team proceeded to the primary transport market in Kurgan Tyube. This was the largest market visited by the survey team during the entire time of the fieldwork. This was the only location where a few people were reluctant to participate in the surveys.

At almost all locations of the pilot surveys and the final surveys, there was no evidence of police or other market controls. The only police or military presence observed was at the informal transport market in Dushanbe, where one police car went by the market and four military circulated in the market, but with no clear purpose.

2.3 Economic Appraisal

The economic appraisal was carried out within the framework of a social cost-benefit analysis, which focuses on maximizing the returns on investment. In the case of the specific road sections evaluated in the feasibility study, this objective was accomplished by determining the appropriate intervention strategies that lead to the minimum total transport costs, defined in this case as comprising two basic components:

- *Capital and Maintenance Costs of Road Rehabilitation Works* - the costs of the intervention strategies being appraised, as well as routine and periodic maintenance.

- *Road User Costs* - composed of vehicle operating costs (VOC) and travel time costs, which are estimated based on a projection of future traffic and road conditions.

In effect, the savings obtained in road user costs multiplied by future traffic was utilized to represent the aggregate benefits associated with the proposed road rehabilitation investments. The economic analysis was based on incremental costs and incremental benefits; i.e., comparing the total costs mentioned above in "with the project" and "without the project" scenarios.

The Study team used HDM-III in its 'HDM Manager' variant to compute[10]:

(a) Costs: the year-by-year cost of implementing each of five alternate road rehabilitation strategies for each road section, ranging from a minimal 'holding maintenance' regime to full reconstruction; and

(b) Benefits: road user cost savings, including estimated timesavings and vehicle operating cost (VOC) savings, under the different operating conditions that would result from those strategies.

HDM-Manager incorporates information collected on homogeneous road sections and carries out an economic evaluation of alternate possible interventions over time, based on a road deterioration model. It quantifies the investment required to rehabilitate each road section, according to the alternate intervention strategies, the year in which it is intervened and its current condition[11].

The cost and benefit streams generated by HDM were fed to RoadEc, an Excel spreadsheet-based model constructed specifically for this feasibility study. RoadEc was then used to organize this information and allowed the selection of the road sections to be included in the project and the strategy to be applied in each case. RoadEc was

[10] The Highway Design and Maintenance Standards Model (HDM) was developed by the World Bank's Transportation Department. It is designed to make comparative cost estimates and economic evaluations of different construction and maintenance options, including different time-staging strategies, either for a given road project on an alignment or for a group of roads on an entire network.

[11] HDM required data on current road conditions, traffic volumes, projected growth rates for normal and diverted traffic, and estimates for unit costs. This information was primarily collected through the previous general surveying efforts prior to the poverty analysis.

designed to compute total benefits, including those exogenous to the HDM model, and produce a set of economic performance indicators for each road section and for the package of selected project components as a whole[12]. In effect, RoadEc permitted the optimization of alternate investments so as to maximize economic benefits to the country, producing a net present value (NPV) and economic internal rate of return (EIRR) for each intervention and set of interventions. The study team also utilized RoadEc to carry out sensitivity tests to discover the sensitivity of each component's economic internal rate of return (EIRR) to changes in key variables; and the sensitivity of the proposed project package as a whole.

Thirty-one road sections on 5 national roads in the southwestern portion of the country, with a total length of 120 km, were evaluated in the economic appraisal. HDM and RoadEc were used to estimate the costs and benefits of each intervention strategy on each of these road sections. As a result of the economic appraisal, 26 road sections with a total estimated length of 86.5 km were selected for inclusion in the project.

Since HDM does not estimate benefits attributable to major bridge improvements, the study team excluded costs associated with bridges from the costs used to compute the economic performance of proposed road rehabilitation projects. Their inclusion would have meant disadvantaging road sections that happened to have more than the average incidence of bridges, or particularly costly works to be done. Therefore, the economic feasibility of proposals for major bridge works was tested exogenously to the main analysis using an additional Excel spreadsheet model, called BridgeEc.

2.4 Structure and Performance of the Transport Sector

The analysis of the structure and performance of the transportation sector in Tajikistan was based on the following data gathering activities:

- Surveys of drivers, passengers and farmers in the project area;
- A comparative survey of agricultural market prices in Dushanbe, Kurgan Tyube, Dangara, and Kulyab;
- TLSS data; and
- Other secondary information, including interviews with government officials.

The study team's assessment of the institutional barriers to competition in the freight and passenger transportation markets and the food markets provided the basis for developing the assumptions and estimated parameters required for estimating the distribution of the net benefits identified to different beneficiary groups.

2.5 Distribution of Net Benefits to Categories of Beneficiaries

The study team estimated total direct project net benefits at $21 million in net present value terms. The estimate of net benefits to the general economy for this project was

[12] Particularly, benefits derived from estimated generated traffic were calculated independently from HDM using the RoadEc model.

considered to be conservative since it only took into account the direct benefits of the project to the country as allowed through a traditional transport economic analysis.

It was possible that the project would lead to indirect benefits, such as increased trade and economic activity induced by the improved road. The size of these indirect benefits would also depend on how the regional and national economy grows over the project's time horizon. If the appropriate institutional, legal and public policy reforms were put in place in a timely manner as Tajikistan transitions to a more modern, market-oriented nation, these indirect benefits could reach as high as 2.5 times the direct benefits. This "multiplier" effect has been observed and estimated for regional economies similar to Khatlon found around the globe. At this stage in Tajikistan's transition to a modern market economy, however, it was felt that progress to date did not warrant estimating indirect benefits to the general economy.

The study team found that passengers and vehicle owners capture the largest portion of direct benefits. This reflected the nature of the traffic on the road. Also of particular interest were the net benefits captured by the government and by labor, which are highlighted below.

2.5.1 Net Benefits to the Government

The bridge repair costs avoided through project implementation clearly represented savings to the government, given that it would be responsible for rebuilding a collapsed or failed bridge. The government would also be responsible for covering the net capital and maintenance costs associated with the project through a combination of its own resources and loans from the ADB. As there were no toll roads or other mechanisms for direct cost recovery from road users in place at the time, these costs would not have been directly passed on to other beneficiary groups. From the government's point of view, the costs associated with implementing the project would be much larger than the benefits that would be received.

2.5.2 Net Benefits to Labor

As some of the project's capital expenditure would be used to employ local labor, the majority of whom fall below the poverty line (and virtually all are unemployed), it was also necessary to identify the economic benefits to this group. Total direct labor required for the project was estimated at 21,245 person days. Assuming an average daily wage rate of US$3.50, and that the labor would be used in direct proportion to the speed with which the project was implemented, benefits to labor were estimated at $55,000 in 2001 and $19,000 in 2002. It was argued that because the long-term unemployment rate was about 30 percent in Tajikistan, the opportunity cost of labor would be at or near zero. As a result, this labor could be viewed as not imposing a cost on Tajikistan's society. Moreover, most of these jobs would go to the poor.

2.6 Distribution of Net Benefits to Poor and Very Poor

2.6.1 Benefits Likely to go to the Poor

Results from the TLSS and study surveys supported a substantial share of the benefits from the road project going to the poor. The project team estimated that 30 percent of the project's net benefits going to users of passenger vehicles would accrue to poor

households. While this might seem high, findings within the context of the study's research supported such an estimate. The study's surveys found that the poor used taxis for some transport and the TLSS supported private passenger vehicle ownership among the middle three household quintiles in terms of per capita household expenditures.

Given that the project road would be rehabilitated with unskilled labor, the study team estimated that 80 percent of the benefits of the direct labor used to rehabilitate the road would go to the poor in the project area. Moreover, to address the gender issue, the project team identified the number of person-days of labor on the project by task that could be completed by poor female laborers. Out of the estimated 21,245 person days, only about 7 percent would be most appropriate for female laborers. There was mixed evidence that female-headed households experienced a higher incidence of poverty than the population as a whole. The project team recommended that the issue of which jobs were most suitable for females should be reviewed as a complementary action.

As per the ADB guidelines in Guidelines for the Economic Analysis of Projects, specifically Appendices 25 and 26, the study team assigned 50 percent of the net benefits accruing to the Government as being passed through to the poor. This assumption was subjected to substantial testing in the sensitivity analysis.

By user type, the study found that a little under half of the benefits would accrue to poor passenger users. This was consistent with the picture of the project's total benefits, which were dominated by benefits to passenger users. The project team found that passenger vehicles were the most common and frequent vehicle type on the road. Total benefits to the poor were estimated to equal US$9.5 million over 25 years, in net present value terms. According to this estimate, over the life of the project, the average poor household would receive about US$120 in benefits.

2.6.2 Benefits Likely to go to the Very Poor

In terms of lower transport costs for the region, some benefits would accrue to the very poor. Based on the information available, the project team estimated that 15 percent of the net benefits of the project would go to very poor passengers, 10 percent to very poor freight users, with 15 percent of the benefits to direct labor and 12 percent of the benefits from the government also going to the very poor.

The study team estimated total benefits accruing to the very poor to be about US$1 million over the 25 year life of the project, in net present value terms. It was estimated that there were no more than 10,000 very poor households in the project area. Because there were likely so few households in this category in the project area, the average very poor household would receive about $100 in benefits over the 25-year life of the project.

2.6.3 Poverty Impact Ratios

The poverty impact ratio (PIR), which represents the proportion of net project benefits that accrue to the poor, was estimated to be 0.44. For the very poor, the PIR was substantially lower, estimated at 0.05. It should be noted that the PIR was reduced by the assumption that the poor would bear 50 percent of the net cost of the project to the government passed on to users. The study team used a much lower percentage for the share passed on to the very poor.

2.7 Sensitivity Analysis

The study team performed a sensitivity analysis on two levels. First, the shares of the estimated project net benefits passed to all users, as opposed to just the poor, were varied. If transport markets were less competitive or more competitive than estimated, this analysis would show the implications of these variations on the poor and very poor. Second, the proportions of benefits that would be passed on to the poor and very poor were varied. The study team was especially aware that the government might not pass net costs onto the poor, so it explored the impact of the government imposing its net costs on the better off.

2.7.1 What if Transport Markets are not Competitive?

Transport markets by nature tend to be competitive. They have relatively low barriers to entry, since the cost of leasing a bus, car or truck is usually quite small. The key is of course the legal, institutional, and policy environment established by the government.

Tajikistan at this time had made substantial progress in allowing competitive transport markets to grow. In Khatlon Oblast and the project area, these markets were composed of massed vehicles and milling crowds of people, making control by a non-governmental groups much more difficult. The study team found absolutely no evidence that any person or group was trying to impose such controls. People and drivers were even free to choose if they wished to use the state owned bus terminals.

2.7.2 Increased Competition Sharply Improves the Situation of the Poor

Under this scenario, drivers and vehicle owners were assumed to pass on 85 percent of their cost savings in the form of lower fares and freight rates, which was more competitive than best estimate of the project team. If this were the case, the benefits to the poor would increase to US$13 million, and the PIR would rise to 0.60. The benefits to the poor would shift relatively more to passenger users and freight users, as opposed to owners. This reflected the sharp decrease in freight and passenger rates that would result. For the very poor, the benefits would also sharply increase, reflecting that they are only users of the system, and not vehicle owners. And with sharply lower fares and freight rates, more very poor would use the project road. Their benefits would rise to US$2.6 million, increasing their PIR to 12 percent, including the drag of government costs. If government costs were excluded, the benefits to the very poor would rise to almost US$4 million and the PIR to just over 0.15.

Such results may be expected if the complementary actions discussed below were implemented, and if the government took other actions to improve competition in the transport markets, such as continuing to corporatize and eventually privatize all state-owned truck and bus services.

2.7.3 Poor Benefit if Government Net Costs are Absorbed by the Better Off

The net benefits to the poor would rise to US$14 million and the PIR would rise to 0.66 if government net costs were not passed on to the poor. Since the poor represent such a large segment of society, it might not be possible for the government to avoid imposing some of these costs on poor users and owners. If 10 percent of the government's net costs were passed on to the poor, the benefits going to the poor would be US$13.4 million, with a PIR of 0.62. The effects of not passing on government costs would be even more dramatic for the very poor, with net benefits effectively doubling. Benefits would

rise from US$1 million to US$2 million, and the PIR would rise from 0.05 to 0.10. While the government might not be able to avoid passing some of the costs on to the poor as a whole, they certainly could avoid passing the costs to the poorest quintile of households.

2.7.4 Most Optimistic Case

In the case where the study understated the use of the road by the poor and very poor, the proportion of benefits accruing to the poor and very poor would rise. Using these most optimistic parameters, benefits to the poor would reach US$14 million over the life of the project in present value terms. This would put the PIR at 0.66. Excluding government would put the benefits to the poor at US$19 million, and the PIR would jump to 0.88. For the extremely poor, benefits would rise to US$3.7 million, and the PIR would rise to 0.17. Excluding government would put the benefits going to the extremely poor at US$5 million, and would push up their PIR to 0.23.

2.8 Complementary Actions

Many of the complementary actions recommended by the study team for Tajikistan addressed general issues faced by most former Soviet Union countries.[13] Particularly, the study recommended that:

- The roadside checkpoints of the State Motor Vehicle Inspectorate (GAI) be removed, or alternatively, that inspectors be stopped from charging "informal" tolls;
- State-owned truck and bus enterprises should allow qualified private drivers to lease state-owned buses and trucks at a market-determined lease rate, with maintenance and minor repairs provided by the lessee;
- State-owned bus terminals should stop setting the fares that bus drivers must charge if the drivers wish to use the terminals. Instead, the bus terminals should set a small rental fee for bus drivers who wish to use the terminals. The rental fee must be low enough to encourage buses to use the terminals, and eventually just high enough to cover the cost of operating and maintaining the terminals.
- A study conducted to develop a feeder road priority rehabilitation and development program that prioritizes roads for essential rehabilitation, the construction of new feeder roads if determined warranted, and their periodic and routine maintenance;
- All state-owned bus enterprises, truck enterprises, and bus terminals be corporatized as preparation for privatization; and
- State-owned bus corporations, truck corporations, and bus terminal corporations be privatized.

These complimentary actions would remove institutional barriers and improve competition in the transportation markets. As shown in the sensitivity analysis, increasing competition would have a large impact on increasing the share of project benefits that would go to the poor and very poor. Removing impediments to competition would be essential for the

[13] See Olson, Mancur. "The Devolution of Power in Post-Communist Societies." In Russia's Stormy Path to Reform. Robert Skidelsky, ed. Social Market Foundation. 1995, and: Olson, Mancur. "Why is Economic Performance Even Worse After Communism is Abandoned?" Ninth Annual Virginia Political Economy Lecture, The George Mason University. 1993.

government to even maintain the share of the project's benefits passed on to the poor, since the poor are less able to defend themselves against these imperfections compared to the better off households. Indeed, the highest income groups would be best able to take advantage of these imperfections.

Clearly, other activities would also be required to improve the well being of the very poor in the project area and the Oblast. Particularly in the case of subsistence farmers, more education and demonstration of improved farming practices would help them increase their production, perhaps to the point where they could participate in the agricultural markets. To jump-start the process, commodity aid, such as transfers of livestock, improved seed, and fertilizer should be targeted to the very poor farmers.

The study also found land tenure to be another key issue for the farmers. Privatization of state-owned farms would go a long way towards making farmers better off and agricultural markets more competitive, provided the privatization program was done correctly. Increasing private farm size would be a sure way to help small subsistence farmers out of poverty, provided they get the extra land.

Finally, another way to increase the benefits going to the poor would be to ensure that more than 80 percent of the direct jobs for the project go to the poor. This, however, might be impractical for the very poor, because they might be infirm or unable to perform the required tasks. Moreover, the requirements of the jobs needed a second review, because a finding that only 7 percent of the jobs were suitable for females would seem unrealistic. More of the jobs for the project's implementation should be targeted for women.

PART 3

MODIFICATIONS AND FUTURE APPLICATIONS

3.1 Subsequent Project Experience

Since the Tajikistan Project, this methodology has been applied with some variations to Poverty Impact Assessments (PIA) of potential road interventions in the Kyrgyz Republic, China, and India. The distinctive aspects of these applications are briefly highlighted below.

3.1.1 Third Road Rehabilitation Project, Kyrgyz Republic

The ADB TA-KGZ-3335 Third Road Rehabilitation Project, Kyrgyz Republic centered on the potential rehabilitation or reconstruction of about 320 km of the national highway connecting Bishkek, the capital, to Osh, the second largest city in the nation. It also focused on approximately 150 km of feeder roads. The economic, distributional, and poverty impact analyses associated with this study were conducted for each project-defined section of the national highway. In addition to surveying, this study relied on Participatory Rapid Appraisals (PRAs) and a Public Outreach Program that included participatory workshops, conducted at both the local and national levels. The study estimated a PIR of 0.27 for the main highway rehabilitation. While this PIR was significantly lower than the PIR of 0.44 estimated for the Tajik highway intervention, the study found that complementary interventions for feeder roads linked to the national highway could increase the overall project-related benefits accruing to the poor. The corresponding analysis of feeder roads relied on surveys of potential users of these roads to determine the enhanced economic and social activity that would likely result due to improving individual feeder roads.

3.1.2 Western Yunnan Roads Development Project, China

The ADB TA-3642-PRC Western Yunnan Roads Development Project assisted the Yunnan Provincial Communications Department (YPCD) to obtain a loan from the ADB to partially fund the construction of the of the Baoshan - Longling Expressway. The proposed Expressway link is 77 km, and will be the final link upgraded to Class II standards for the Shanghai - Ruili Expressway. The Project also included a local roads program specifically designed to maximize the poverty alleviation impacts related to the proposed expressway improvements. In addition to surveying, this study relied on PRAs. The study estimated a PIR of 0.17 for the entire project, including the expressway intervention and the local roads component. A rough estimate of the indirect or tertiary effects of the project on the regional economy was provided and this increased the estimated PIR to .33. The entire prefecture of 2.4 million people was treated as the project area, and it was estimated that 1.3 million would benefit in some way from the project. It was further estimated that 20 to 30 percent of these beneficiaries would be poor, slightly below the incidence of poverty in the project area.

The local roads analysis included a new approach to rank roads based on their ability to lift poor townships out of poverty through improved access. The analysis relied on an estimated relationship between township per capita income and access as measured by road distance to the nearest neighbor township which was then used to calculate the expected improvement in township per capita income should access be improved with a rehabilitated road. Then roads that connect the townships with the lowest per capita incomes were chosen as the highest-ranking candidates for the program, provided their estimated economic internal rates of return were greater than 12 percent.

3.1.3 Madhya Pradesh State Roads Sector Development Program, India

The ADB TA-34263-01-IND Madhya Pradesh State Roads Sector Development Program involved the proposed improvement of approximately 2,400 km of prioritized secondary roads. The associated poverty analysis concentrated on the five corridors selected as the highest priority road links by the World Bank in the June 2001 "Feasibility Study Report: Madhya Pradesh Road Infrastructure Development Project," as well as the road link from Jabalpur (central MP) to the border with the new state of Chattisgarth, at Amarantak. In addition to surveying, this study relied on Focus Group Discussions, which enhanced the ability of the study team to estimate the extent to which the poor use the roads and the degree of competitiveness in transport service markets. Since more detailed data on the population density of the Districts for the six corridors of the study sample was available than in many other case studies, the study was able to produce more accurate estimates of the number of beneficiaries and poor beneficiaries. The estimated PIR was 0.50, or 50 percent of the net economic benefits of US$ 148 million accruing to the poor in net present value terms, over the life of the project.

3.2 Future Applications

While this method has proven to be sound and easily adaptable over the course of many diverse projects, there remains room for improvement. Particularly, economic benefit estimates based on generated traffic projections understate the indirect and induced benefits to the economy, and hence the benefits to the poor. Road intervention PIAs need to move beyond traditional transportation economic analysis and attempt to capture the indirect benefits of such projects to regional and national economic activity and poverty reduction. This likely will involve different techniques for local and feeder road analyses as compared to estimating the potential economic and poverty impacts of national and regional corridor improvements. The authors of this paper believe that improving this aspect of road intervention impact analyses would represent a substantial contribution to the field.