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Critical Evaluation of Cross-Border Infrastructure Projects in Asia

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Abstract

This paper attempts to fill gaps faced by policymakers and practitioners in the evaluation of cross-border infrastructure projects. It first defines what constitutes cross-border infrastructure projects, and then outlines an analytical framework and criteria to evaluate them. The criteria identify additionalities and externalities specific to cross-border infrastructure projects that need to be stressed in covering broader and indirect impacts that are not usually captured in the analysis of national projects. Then the paper examines to what extent the defined criteria are applicable in evaluating recent cross-border infrastructure projects. It also reports on emerging impacts patterns evidenced in relevant studies. The paper draws lessons and implications for design and implementation of cross-border infrastructure projects.

JEL Classification: H41, O22

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1. INTRODUCTION

Demand for infrastructure development in Asia far exceeds the available funding. Regional development institutions including the Asian Development Bank (ADB) extend funds to support many cross-border (also termed subregional or multi-country) projects to promote socioeconomic development in participating countries.

At the policy level, there are two major economic justifications for regional cooperation between two or more countries: (i) the need to deal with project-related additionalities and positive and negative externalities and (ii) the potential to derive economies of scale in pursuit of national goals. By pursuing these, all participating countries benefit from regional cooperation. However, removing physical and nonphysical barriers in order to realize these benefits requires investment as well as harmonization and simplification of relevant policies and procedures.

Regarding the first justification for regional cooperation, cross-border projects may bring additional concessional and non-concessional funds. Positive externalities (e.g., benefits such as time and cost savings, environmental protection, and trade facilitation) and negative externalities (e.g., costs such as environmental pollution, trafficking, and the spread of communicable diseases) arise when the consequences of one or more countries' actions spill over national borders. If the concerned countries do not make cooperative arrangements, too few positive externalities and too many negative ones will arise.

As to the second justification, regional programs and cross-border projects can produce economies of scale in provision of public or private (marketable) goods and services above and beyond what any country could achieve alone. As such, regional cooperation can facilitate the achievement of national goals.

Regional economic cooperation can also be conceptualized through club theory. Any collective endeavor (or club) must satisfy two basic conditions: (i) it must be self-sustaining and (ii) it must provide enough net benefits for each of its members. The success of a club depends on its benefits derived from reduction in unit cost from pooled productive capacities exceeding the cost of collective action. The cost is often influenced by physical distance between the countries. In the Pacific, for example, adding more remote countries entails higher diseconomies of isolation. This tension between scale benefits and distance costs of collective action determines the size of an "optimal club" (in this case, a group of countries). The composition of the "optimal club" may vary significantly according to the issue or service under consideration.

Reduction in trade costs is among the most important expected outcomes of cross-border infrastructure projects. Trade costs are often defined as the range of costs involved in moving a product from a point of production to a market. As such, they can refer to both national and cross-border transactions. For an analysis of regional cooperation, the focus must be on the cross-border aspects of such costs (or "international trade costs"), since these raise barriers to trade and restrict the return on investments in export goods (although they raise it for import substitutes). Declines in such costs make goods more cost competitive and raise the return on investment.

While the benefits associated with cross-border infrastructure projects and the rationale for regional cooperation are well recognized by policymakers and practitioners, evaluation practice suffers from analytical difficulties as well as inadequate data because of the elusive nature of such data for infrastructure projects whose benefits and costs go beyond national boundaries. This paper attempts to fill this gap.

Section 2 defines cross-border infrastructure projects and provides the framework and criteria for evaluating them. Section 3 examines the extent to which such criteria can be applied in evaluating recent cross-border infrastructure projects. It also describes emerging

impact patterns observed in various relevant studies. Section 4 draws out lessons learned and Section 5 provides recommendations for design and implementation of cross-border infrastructure projects.

2. EVALUATION FRAMEWORK

2.1 Concept and Definition

For the purpose of the study on Infrastructure and Regional Cooperation, a "cross-border" infrastructure project is defined to be either an infrastructure project with activities spanning two or more countries, or a national infrastructure project that has significant cross-border impact. Examples of national projects with significant cross-border impacts include transport infrastructure (land, sea, and air) projects that create international traffic, power projects involving sales of electricity to neighbor countries, and cross-border telecommunications networks.[1]

In the context of ADB, its Regional Cooperation and Integration Strategy (ADB 2006a) does not explicitly define "cross-border infrastructure," but it articulates its distinguishing feature as cross-border externalities that would not be caused by a collection of national projects. The strategy also requires that such infrastructure create "additional" net benefits that constitute some form of positive spillover effects accruing to all participating countries (i.e., regional public goods). That is, the net benefits of cross-border projects would be larger than those that would be obtained by national projects alone.[2] The current practice of project benefit-cost analysis is typically limited to quantifying direct impact in the nature of partial equilibrium. The analysis of cross-border projects needs to cover broader and indirect impacts in the nature of dynamic general equilibrium to the extent reasonable.[3]

The larger are these cross-border positive externalities, the stronger is the case for regional public goods, and therefore, the stronger is the economic rationale for regional cooperation. Another rationale for regional cooperation derives from coordination failure among national governments. National governments may not be willing to contribute their share of costs of providing regional public goods. This may be because they think that the partner countries might not match their contribution. Such a failure to contribute would not necessarily be strategic (because neighbor countries are aware that they will interact again in the future), but could be due to a combination of resource constraints and institutional weakness. The larger is the extent of such coordination failure, the stronger is the economic rationale for public intervention (see Appendix 1 for a discussion on regional public goods).[4] The rule of

[1] ADB operations refer to "subregional" instead of "cross-border" projects. The World Bank defines a subregional project more restrictively as having more than two countries involved directly in the project; a two-country project is defined as a bilateral cross-border project. The latter case can be considered as having subregional impacts on the condition that bilateral borders are part of economic corridors. The working definition of a "subregional" project at ADB accommodates any projects that can be described by one or more of the following: (i) involving two or more countries but excluding bilateral projects; (ii) single country project but linking subregional transport corridors; and (iii) those included in Regional Cooperation Strategies and Programs.

[2] A clear case of divergence between aggregate net benefits and the sum of national net benefits is evidenced by an example in Roy (2000) of the high-speed Paris–Brussels–Cologne–Amsterdam–London rail project. He points out that conventional evaluation from the national perspective omitted cross-border benefits accruing to non-resident users traveling in each national section and led to underestimation of aggregate net benefits by 27%.

[3] This issue is not unique to cross-border projects. However, the larger scale of cross-border projects requires, for example, the addition of various corridor investments in infrastructure facilities to road investments, and correspondingly the inclusion of benefits from these investments in the overall analysis.

[4] In this regard, donors that support regional cooperation are justified in earmarking some portion of their financial resources for cross-border projects. ADB has a "set-aside" portion of about 10% in its concessional funds (called the Asian Development Fund).

the game in regional cooperation is that all participating countries benefit (a win-win result for the club).

2.2 Project Cycle and Evaluation

In general, project evaluation requires that a consistent framework is applied at all stages of the project cycle. The process starts with analytical work that identifies potential investment projects. Then a country-level or sector-level program selects the projects to be financed. Then each project is formulated by financiers including external donors and executing agencies of the client country. After approval by all stakeholders, the project agreement is signed and its implementation commenced. A project performance report is prepared by the project officers as part of the monitoring of the project's implementation. After the project's planned activities are completed, the project officers produce a project completion report. This provides an opportunity for self-evaluation of the process of implementation, identifies success factors and problems encountered, checks all the assumptions made at the appraisal stage, recalculates financial and economic rates of return, and reports on compliance with social and environment safeguards. It also identifies lessons and follow-up actions, where appropriate, to ensure that project benefit streams continue. Further monitoring and progress reporting is carried out by executing agencies of the client country. After a few years, the project is post-evaluated. This involves rating project performance in relation to contribution to development impact using a set of criteria such as relevance, effectiveness, efficiency, and likely sustainability of the project outputs and outcomes.

2.3 Project Design and Monitoring Framework

At the project design stage, some logically consistent framework is required that can be carried through to the later stages of project cycle. Such a framework provides causal links between inputs or activities and outputs, and between outputs and outcomes (short- and medium-term outcomes and long-term impact). The framework also provides a basis for project monitoring and evaluation at the implementation and operation stages. For example, benefits to be monitored associated with cross-border project benefits can be related to the following categories of gains:

(i) Market gains such as domestic market extension and economies of scale (e.g., power), connectivity and access to markets (e.g., transport);

(ii) Efficiency gains (cost saving) such as reduction in time and vehicle operating costs, reduction in physical barriers to trade (e.g., better roads, railways); reduction in non-physical barriers to trade (e.g., reduced transaction costs due to trade facilitation, harmonized customs, and border formalities); and

(iii) Welfare gains such as contribution to trade creation, benefits to all participating countries and subregional community, and increased regional and global integration.

2.4 Ex Ante Evaluation

Projects are pre-evaluated looking at project rationale and strategic links, alternatives, costs and benefits, and risks and uncertainties. For example, ADB's guidelines for project appraisal (ADB 1997) provide project appraisal concepts and step-by-step methods. In addition, there are sector-level handbooks for project economic analysis and also a methodology note and handbook for economic analysis of subregional projects.

While economic analysis of national projects is concerned primarily with whether the overall net economic benefits are positive and generally helping the poor, the economic analysis of cross-border projects goes a step further to analyze how their benefits and costs are

distributed across participating countries. As multiple governments must agree on and coordinate the institutional and financing arrangements of cross-border projects to ensure all stakeholders can anticipate net gains from the project in question, analysis of benefit-cost distribution helps to alleviate coordination failure and ensure project sustainability. In particular, it is important to identify possible net losers and build in necessary adjustments for socioeconomic and environmental externalities. Most obviously, for example, such adjustments can include compensatory arrangements for relocated residents and for participating governments to ensure operation and maintenance and to address unintended negative impacts.

In principle, project analysis, whether national or cross-border, should care about externalities and distributional aspects in order to better inform decision makers and stakeholders. ADB's guidelines (ADB 1997) dedicate one appendix to distribution analysis. Adhikari and Weiss (1999a, 2004) extended this framework to cross-border aspects with the stakeholder breakdown between participating countries. Therefore, a basic methodology of distribution analysis for cross-border projects has been put forward (see Box 1).

Box 1: Key Steps in Economic Analysis of Cross-Border Projects

(i) Identify the market (demand) both within and outside the country and subregion;

(ii) Establish the project's financing plan and identify any project-specific additional and concessional funds;

(iii) For commercial projects, estimate the financial net present value (NPV) (at a 10% or 12% discount rate) and internal rate of return (IRR) at constant United States dollars and show how the income of different groups and countries is affected;

(iv) Estimate the benefit of project-specific finance as the difference between the present value of the inflow of funds and the present value of the outflow under the terms specified;

(v) For non-commercial projects and for commercial projects with significant side effects, quantify and value the external effects (e.g., environmental impacts and cost saving/consumer surplus);

(vi) Allow for any important market distortions by applying national conversion factors to adjust financial values relating to expenditure in a country to economic prices;

(vii) Where a financial analysis has been carried out, adjust the financial NPV and IRR to obtain the corresponding economic NPV and IRR;

(viii) For non-commercial projects, compare economic benefits (externalities) directly with economic costs to obtain the economic NPV and IRR;

(ix) Allocate the economic NPV between participating countries and show the gainers and any losers—and consider whether any compensating arrangements are required to offset loss to any of the participating countries; and

(x) Undertake risk and sensitivity analysis.

Source: Adhikari and Weiss (1999b).

As discussed above, a successful cross-border project should offer benefits for all participating countries. To determine this, analysts and evaluators need to look at project outcomes and impacts, i.e., short- and long-term benefits, and their distribution at local, national, cross-border, subregional and regional (extra-subregional) levels. Complementary investments can create additional demand and increase project benefits. For example,

economic corridors complement transport corridors and also mitigate costs (e.g., to environment and public health). Benefits arise from cost savings, time savings, efficiency gains because of the larger scale of operations, and welfare gains because the subregional society as a whole benefits. However, estimation needs to be carried out carefully to avoid double counting of such benefits as vehicle operating cost (VOC) savings and time savings vis-à-vis growth in transport sector activities, better quality roads vis-à-vis road safety (time savings of passengers and cargo, savings of lives and injuries), and additional economic activities vis-à-vis better access to market (not included in the cost savings).

Equally important is to identify risks to sustainability of outcomes and impacts. Important considerations for this risk identification include operation and maintenance by transit countries or locations and revenue generation or special funding for that purpose. Common project risks and sustainability factors relate to financial returns and revenue generation of the project, sharing of costs among participating countries, technical upkeep (operation and maintenance), foreign exchange risk (e.g., in cases of power purchase), and complementary investments.

2.5 Post-Completion Evaluation

Upon its completion, the project's performance is evaluated based on *relevance*, *effectiveness*, *efficiency*, and *sustainability*. Relevance refers to the adequacy of the design and the consistency of the project's impact and outcome with the government's and donor's development strategies at the time of approval. Effectiveness refers to the extent to which the project outcome as designed and approved has been achieved. Efficiency refers to how economically resources have been converted to results, typically expressed as the economic internal rate of return or cost-effectiveness indicators. Sustainability refers to the likelihood that human, institutional, financial, and other resources are sufficient to maintain the project outcome over its economic life.

2.6 Impact Evaluation

Impact evaluation involves systematic identification of a given development activity's effects—positive or negative, intended or not—on individual households, institutions, and the environment. It helps us to better understand the extent to which activities reach the poor and the magnitude of their effects on people's welfare. Tools for impact evaluations can be large-scale sample surveys in which project populations and control groups are compared before and after the intervention and possibly at several points during it. Evaluations can also be done through small-scale rapid assessment and participatory appraisals where estimates of impact are obtained from combining group interviews, key informants, case studies, and available secondary data.

There are two basic approaches to impact evaluation: non-experimental and random experimental. The non-experimental approach uses statistical techniques to construct the counterfactual outcome. These techniques, though frequently used, are often subject to biased results that may lead to incorrect development impacts. Random experimental methods are common in the pharmaceutical and other industries but are new to the economic development field. In the medical field, random assignment to treatment and control groups (also called a "randomized control trial") is implemented depending on the nature of the medical intervention, who the beneficiaries are, or what the benefits are. Thus, as in the medical field, the unit of randomization in the economic development field could be individuals, groups (e.g., schools, primary health care centers), or geographical areas (e.g., villages, cities). The random selection of the treatment (under the project) and control (outside the project) groups ensures that in general, these groups are identical at the outset. Any difference in the socioeconomic or environmental outcomes between the two groups after the project is taken to be attributable to the project.

Random experimental assignment is considered to be the most reliable approach to measuring net impact of development assistance. As Duflo, Glennerster and Kremer (2008) have pointed out, only properly implemented randomization can solve selection bias completely. For example, the PROGRESA program (now called Oportunidades) in Mexico is one of the best known examples of a randomized evaluation in developing countries. The program was launched in 1998 with a deliberate built-in evaluation design in which half of the households in target communities were selected to receive the program, and baseline and subsequent data were collected for both treatment and control communities. Actual evaluation of the program was contracted to International Food Policy Research Institute and the data was shared via their website. The evaluation had a demonstration effect and was replicated in many other Latin American countries.

The nature of randomization requires that the treatment groups (areas) as opposed to control groups (areas) be fairly disaggregated, such as at the level of individuals, villages, or at most districts. Randomized experiments are therefore more suitable for "targeted" projects such as education and health programs than infrastructure projects because the "treatment" (or influence) of the latter is by nature diffused geographically. Furthermore, while the main purpose of targeted interventions is to deliver direct benefits to the intended beneficiaries, much of the benefits of cross-border infrastructure projects are indirect and diffused with varying influence over beneficiary groups, making it difficult to design randomization even at the project design stage. Nonetheless, a carefully carried out impact evaluation can be useful in many important ways. Box 2 summarizes the scope of usefulness, as well as the strengths and drawbacks, of rigorous impact evaluation.

Box 2: Rigorous Impact Evaluation of Cross-Border Infrastructure Projects

Scope of usefulness:

- Measuring outcomes and impacts of an activity and distinguishing these from the influence of other, external factors.
- Helping to clarify whether costs for an activity are justified.
- Informing decisions on whether to expand, modify, or eliminate projects, programs, or policies.
- Drawing lessons for improving the design and management of future activities.
- Comparing the effectiveness of alternative interventions.
- Strengthening accountability for results.
- Strengths:
- Provides estimates of the magnitude of outcomes and impacts for different demographic groups or regions over time.
- Provides answers to some of the most central development questions: To what extent are we making a difference? What are the results on the ground? How can we do better?
- Systematic analysis and rigor can give managers and policymakers added confidence in decision making.
- Drawbacks:
- Some approaches are very expensive and time-consuming.
- Reduced utility when decision-makers need information quickly.
- Difficulties in identifying an appropriate counter-factual.

Source: Compiled from the World Bank Independent Evaluation Group Website (www.worldbank.org/ieg).

Given the special characteristics of cross-border infrastructure projects, their impact evaluation must strike an appropriate balance between theoretical rigor and practicality of implementation. Most likely, the best option is to apply a quasi difference-in-difference approach by comparing "before" (baseline) and "after" (post completion) situations between the areas (people) under project influence (e.g., along the designated economic corridor) and those located relatively farther away from project influence.[5]

Economy-wide general equilibrium modeling such as the use of computable general equilibrium (CGE) models has the advantage of capturing indirect effects through forward and backward linkages within and across economies given the rigorous economic structure built in the models. However, it has a high data requirement that may not be normally available at disaggregated levels in developing countries. Also, CGE analysis tends to be simulation or scenario exercises based on certain assumptions that dictate changes in exogenous or policy variables. This type of analysis may be more suitable for macro- and sector-level analysis, which is left to other discussion papers in this research project.

2.7 Evaluation Criteria

With the above framework in mind, we can develop a set of practical evaluation criteria specific to cross-border infrastructure projects applicable at various stages of the project cycle. These stages are (i) preparation stage (project rationale and inputs); (ii) implementation stage (process of deployment of inputs to produce outputs); (iii) implementation completion stage (physical outputs and initial outcomes); and (iv) post-completion stage or operation (ultimate desired outcomes and impacts). A particular focus should be on the identification of cross-border externalities—both positive and potentially negative. Table 1 presents the kinds of criteria applicable in evaluating cross-border infrastructure projects.

[5] For example, Singh and Mitra (2006), in attempting to assess the poverty impact of GMS regional integration initiatives, selected Saravan Province in Lao PDR as a "non-corridor" comparator as opposed to the other corridor-influenced provinces. They made a practical compromise by resorting to a diagnostic approach over a rigorous statistical treatment of causality in the face of "multiple treatments" ongoing simultaneously in the GMS and in the absence of baseline data in most cases.

Table 1: Evaluation Criteria at Different Stages of Project Cycle

Positive		Negative	
Quantitative	Qualitative	Quantitative	Qualitative
Preparation stage (project rationale and inputs)			
- Additional funding mobilized (public and private) - Adequate distribution analysis - Fair regulatory and pricing arrangements	- Economic rationale for public intervention (in relation to aggregation technology of RPGs) (see Appendix 1) - Shared vision and strong commitment by participating countries/governments - Alignment of national and regional development goals - Alleviation of coordination failure - Enhanced inter-governmental dialogue and coordination - Cross-border transport agreement/ power trade agreement signed - Adequate planning of mitigation/ compensation arrangements	- Inadequate funding - Inadequate distribution analysis - Unfair regulatory and pricing arrangements	- Increased distrust and tension - Inadequate planning of mitigation/compensation arrangements
Implementation stage (inputs and process)			
- Physical infrastructure built successfully - Financiers adhering to their commitment - Adequate capacity building support	- Cross border transport agreement/ power trade agreement implemented - Adequate implementation of mitigation/compensation	- Time delay - Cost overrun - Shortfall in financiers' delivery - Inadequate support for capacity building	- Inadequate mitigation *Transport sector* - Noise - Pollution
Completion stage (physical outputs and initial outcomes)			
- Projected economic benefits are being realized or exceeded - Adequate revenues or public expenditure for O&M *Transport sector* - Reduced cross-border transport cost (distance- transport cost diagram) - Saved cross-border transit time (distance-lead time diagram)	- Trained government personnel in regional cooperation (learning-by-doing) *Energy sector* - Less air pollution (by introducing clean coal power plants or diverting coal-fired plants to hydropower	- Projected economic benefits not being realized - Inadequate revenues or public expenditure for O&M - Inadequate compensation for displaced/resettled people	

Positive		Negative	
Quantitative	Qualitative	Quantitative	Qualitative
Completion stage (physical outputs and initial outcomes)—*continued*			
- Increased flow of goods/people across border towns/cities - Lower prices of traded goods in participating economies *Energy/ICT sectors* - Lower price in importing countries - Higher revenues in exporting countries		*Transport sector* - More accidents *Energy sector* - Loss of livelihood for local people	
Post-completion stage or operation (medium-term outcomes and long-term impacts)			
- Growth of border towns/cities - Increased income of local residents through labor migration - Economic agglomeration at the existing "nodes" and then dispersion along economic corridors subsequently (see Appendix 2 on dynamics of agglomeration and dispersion) *Transport sector* - Increase in goods/people traffic going beyond border cities/towns - Increase in tourism revenues - Increase in regional and extra-regional trade (including transit trade) *Energy sector* - Increase in power and gas trade between contract countries - Increase in regional and extra-regional power and gas trade	- Successful coordination in O&M - Positive gender impact (better income opportunities for women in cross-border trading, etc.) *Transport sector* - Improved access to public services *Energy sector* - Improved regional energy security (particularly for power importing countries)	*Transport sector* - Illegal migration and unprotected migrant workers - Increased incidence of communicable diseases - Increased trafficking of vulnerable people - Increased drug smuggling	- Failed coordination in O&M - Negative gender impact (higher exposure of women to vulnerable situations) - Environmental degradation - Loss of cultural diversity

ICT = information and communications technology; O&M = operations and maintenance; RPG = regional public good.

Note: Stylized for illustrative purpose. The list of project externalities and effects is not exhaustive.

Source: Authors.

3. REVIEW OF CROSS-BORDER INFRASTRUCTURE PROJECTS

The review in this section draws on available documents from inside and outside ADB and interviews with ADB officers. The framework and criteria suggested in the previous section are applied in the review to the extent possible.

ADB's lending to explicitly "subregional" projects came on full stream only after the late 1990s beginning with the Greater Mekong Subregion (GMS) Program, followed by other regional cooperation initiatives such as Central Asian Regional Cooperation (CAREC) and South Asia Subregional Economic Cooperation (SASEC). As a result, a limited number of cross-border infrastructure projects have been completed and can be evaluated ex post. Therefore, our review covers both completed and ongoing projects.

The list of the 26 projects we reviewed is provided in Appendix 3. They were selected from the projects either completed or ongoing in the transport, energy, and information and communications technology (ICT) sectors that are at least partially financed by ADB. Of the projects, 10 have been completed and the other 16 are ongoing. We summarize findings from our review of these projects along several key aspects below. (The numbers in parentheses indicate serial numbers used in Appendix 3.)

3.1 Quality at Entry

3.1.1 Inadequate Presentation of Rationale as a Cross-Border Project

With a few exceptions (e.g., Establishment of Pacific Aviation Safety Office, Number 26), project appraisal documents generally fall short of articulating cross-border externalities and rationale for collective action in a multi-country perspective. While the rationale from the viewpoint of individual countries is relatively well established, presentation on the rationale for regional cooperation and coordination is often weak. Positive cross-border effects to neighboring countries seem to be given secondary importance. This would be unfortunate for projects where financing requirements are large and an explicitly regional perspective could help in mobilizing funds from a wider circle of donors, particularly for transport projects for which private sector funds are hard to mobilize. For example, (i) the Lao People's Democratic Republic (Lao PDR) section of the North–South Economic Corridor in GMS seems to be the "weakest link" as categorized by the supply characteristics of regional public goods (see Appendix 1) and could have been articulated in the project document (Number 5); (ii) the Cambodian section of the Southern Economic Corridor in GMS seems to be the "weaker link" (Number 6) (also see Appendix 1); (iii) the Cambodian section of the Singapore–Kunming railway link seems to be the "weakest link" (Number 7); and (iv) the Viet Nam section of the Kunming–Haiphong railway link seems to be the "weaker link" (Number 8).

For power projects that are designed to sell electricity from one country to another, the bulk of the benefits accruing to both countries can be considered cross-border benefits because they would not arise if the power generated could not cross the border and exploit economies of scale in a regional perspective. For a selling country, cross-border benefits derive from additional sales revenue for the operating entity and additional tax revenues for the government. For a purchasing country, cross-border benefits derive from additional consumer surplus by receiving lower-cost power compared with alternative energy sources. Their cross-border "net" benefits are obtained by subtracting the construction and maintenance costs incurred by each country.

3.1.2 National Orientation Taking Focus Away from Benefits Distribution

Out of the 26 projects reviewed, 13 included some form of distribution analysis across countries and identification of cross-border benefits separate from national benefits while the others did not include distribution analysis nor separate cross-border benefits in their economic analysis at the project preparation stage (see Box 3). Of the former group, 8 projects are loans provided to multiple countries while 12 projects in the latter group are loans provided to a single borrower country. While the lack of distribution analysis may be partly due to data and resource constraints, it may also be due to political or strategic considerations within multilateral donor agencies like ADB in dealing with borrower governments. An incentive to carry out distribution analysis might be weak when an assistance loan is extended to a single country. However, such a tendency would be unfortunate because showing additional cross-border benefits accruing to neighbor countries would enhance further cooperation and promote better alignment of national and regional development goals. Assessment of whether there are benefits for all participating countries is very important for the successful preparation of cross-border projects.

Box 3: Inadequate Distribution Analysis

- No account of subregional benefits despite the project's subregional nature (Number 1).
- No attempt was made for distribution analysis, but given the nature of the project, identification of cross-border benefits and explicit distribution analysis would have strengthened the project rationale (Number 3).
- Initial analysis of the project did not include distribution analysis due to the perceived sensitivity of the inequitable benefit distribution among the three affected countries (Number 5).
- Subregional benefits associated with the road's contribution to increased integration of the economies of Thailand, Cambodia, and Viet Nam along the Southern Economic Corridor were discussed but not quantified due to the "long-term" nature of these benefits (Number 6).
- Distributional analysis was done only within the borrowing country even though the project title includes "GMS" explicitly. The project was categorized as a "single-country, regional project" as the road is located strictly within the Lao PDR but it connects with the already existing road on the Thai side (Number 10).
- Even when a power project is designed to sell electricity from one country to another, the economic analysis often lacks benefit distribution across countries (Numbers 12, 13).
- When a poverty reduction objective is combined with a regional cooperation objective, analysis of benefit distribution across countries seems to be neglected or receives low priority (Numbers 6, 14).
- While the project involves Cambodia's power purchase from Viet Nam, cross-border benefits to Viet Nam associated with economies of scale and additional sales were not quantified (Number 16).
- While all net benefits accruing to participating countries can be considered cross-border benefits in the ICT project, the project document kept the distribution analysis as an internal document due to concern over potential political sensitivity (Number 25).

Source: Authors' compilation.

3.1.3 Additional Funding Specific to Cross-Border Nature

Most project documents do not explain adequately about additional funding of a concessional nature that may have been provided specifically due to the cross-border nature of the project in question.[6] Some donors may have strategic as well as commercial interest in supporting certain projects (e.g., Malaysia's support to the railway project in Cambodia) and others including bilateral donors may prefer to allocate a certain portion of their funds to cross-border projects. As these funds are considered to be net benefits flowing into the participating countries as a whole in the form of net resource transfer, a clearer articulation of this aspect is warranted (see Box 4).

Box 4: Project-Specific Concessional Finance for Cross-Border Projects

- The Northern Economic Corridor Project, initially presented as a purely domestic project, was later presented as a subregional one. This may have helped in mobilizing cooperation and additional funds from the Thai and PRC governments. The project document could have articulated this financing arrangement more clearly (Number 5).
- Funding from OPEC may be specific to the project's regional nature (Numbers 6, 18).
- Funding from OPEC and Malaysia may be specific to the regional nature (Number 7).
- Funding from France may be specific to the regional nature (Number 8).
- Funding from OPEC, Australia, and Korea may be specific to the regional nature (Number 10).
- Funding from Australia may be specific to the regional nature (Number 11).
- Funding from JBIC may be specific to the regional nature (Numbers 13, 16).
- Funding from the World Bank and Norway may be specific the regional nature (Number 14).
- Funding from EBRD and TRACECA are considered specific to the regional nature (Number 17).
- ADB grant and funding from Korea and the PRC may be specific to the regional nature (Number 20).
- Funding from IsDB and Saudi Arabia may be specific to the regional nature (Number 21).
- Grant specific to regional project was provided by USAID in the amount of US$0.5 million. In addition, funding from OPEC and EBRD may be specific to the regional nature (Number 23).
- Funding from OFID and IsDB may be specific to the regional nature (Number 24).
- Funds from New Zealand, ICAO, and APEC were due to the regional nature (Number 26).

APEC = Asia–Pacific Economic Cooperation; EBRD = European Bank for Reconstruction and Development; ICAO = International Civil Aviation Organization; IsDB = Islamic Development Bank; JBIC = Japan Bank for International Cooperation; OFID = OPEC Fund for International Development; OPEC = Organization for Petroleum Exporting Countries; TRACECA = Transport Corridor Europe Caucasus Asia.

Source: Authors' compilation.

[6] See the previous footnote. Multilateral development banks like ADB also play the role of an investment catalyst or a finance mobilizer as their participation in a project reassures other co-financiers including those in the private sector.

3.2 Monitoring and Evaluation of Project Implementation

3.2.1 Inadequate Compensation for Displaced and Resettled People

Although the issue of displacement and resettlement is a concern not only for cross-border projects but also for national projects, it has a potential of being on a larger scale in the case of the former. Some external studies have reported cases in which adequate compensation was not being made. For example, a nongovernmental organization in Cambodia reported that during the implementation of the Phnom Penh–Ho Chi Minh City (HCMC) Highway Project, there was no compensation on land or inadequate compensation was given to affected families along the project road in Prey Veng Province (Thi 2008). The improvement of National Roads 5 and 6, part of which was under the Cambodia Road Improvement Project, involved relocation of around 2,100 households with more than 3,400 people. Household interviews and focus group discussions in Banteay Meanchey and Siem Reap provinces revealed that most of the affected people owned some form of cottage stores along the roads and felt that the monetary compensation provided was not adequate to reopen their businesses in new sites. Also, they had not been informed about the compensation rate (Ritty 2008).

3.2.2 Incomplete Connectivity Penalizing Outcome

When road construction along an expected transport corridor is left incomplete, the outcome is penalized to the extent of such incompleteness. For example, although it was observed that since completion of the Champasak Road Improvement Project, the number of trucks going from southern Lao PDR toward the Cambodian border increased sixfold, very few trucks actually cross the border due to the absence of the final 6.9-kilometer link road. Therefore, trading of goods by river from the border jetty is more common for now. This happened because there was a conflict between Lao PDR and Cambodia as to the location of the border demarcation. This is a case in which an incomplete border link prevents full realization of expected cross-border benefits. The PRC government has expressed its support to complete the missing part of the road.

There is also a case in which a time lag between different donor assistance projects has created a temporary missing link in a transport corridor. For example, the Phnom Penh–HCMC route is currently incomplete with the remaining bottleneck being the upgrading of the Phnom Penh–Neak Leoung section (61 kilometers) and construction of the bridge over the Mekong River (under construction with Japanese aid and expected to be completed by 2010). There is heavy traffic from HCMC westward toward the Cambodian border and many industrial estates along the road are developing outward from HCMC. However, noticeable cross-border industrial linkages do not appear to have developed between the Phnom Penh and HCMC economies. Obvious economic integration so far seems concentrated at the Moc Bai–Bavet border areas (Fujimura 2008).

3.3 Impact Monitoring During Operation

Capacity and resource constraints tend to be a persistent issue in impact monitoring starting with the baseline survey and benchmarking. The area of environmental impact tends to be most affected by these constraints. For example, during the implementation of the Theun-Hinboun Hydropower Project, the Theun-Hinboun Power Company (THPC) established the Environmental Management Committee Office comprising local staff to manage mitigation and compensation issues. However, its staff capacity was low and received inadequate supervision from the international specialists. As a result, THPC had to deal with impacts as they occurred, rather than in a strategically planned manner. This became a serious issue from the start of project operation.

3.4 Analytical Rigor in Project Evaluation

The quality of project evaluation in different stages of the project cycle depends critically on the initial analytical rigor in project preparation. In the case of cross-border projects, a crucial part of the analysis is the identification and quantification of cross-border benefits. Most of the project documents reviewed in the transport sector did not adequately analyze cross-border benefits beyond national benefits, although good attempts were made in some projects. Table 2 summarizes the review on this aspect.

Table 2: Analysis of Cross-Border Benefits in Transport Projects

Project	Comment
Champasak Road Improvement	Broader impacts on trade and tourism were discussed but not quantified.
Phnom Penh to Ho Chi Minh City Highway Improvement	The EIRR for the overall project is 26% when “subregion benefits” are considered and 23% when they are not. Cross-border benefits are based only on projected traffic diverted from other transport modes and do not consider wider external impacts through trade and investment.
Southern Yunnan Road Development	Traffic projection accounts for an increase in cross-border traffic from 2005 onward after completion of the Northern Economic Corridor Project, the connecting road from the project road. However, estimation of cross-border benefits did not account for this.
East–West Corridor	Cross-border traffic formed the basis for subregional benefits in the calculation of EIRR. Overall, EIRR was estimated to be 19% without and 23% with subregional benefits. While this is the first clear case of explicitly presenting cross-border benefits above the sum of national benefits, the analysis did not go further in capturing wider benefits associated with increased trade flows, which were discussed but not integrated into economic calculation.
Northern Economic Corridor	Two types of distribution analyses were done: that between countries and that within Lao PDR by different functional groups. However, additional cross-border external benefits beyond the sum of national net benefits were not identified. Also, wider impacts through changes in trade, investment, and tourist flows were not captured.
Rehabilitation of the Railway in Cambodia	Distribution of project benefits was discussed qualitatively but not quantified. No distinction of cross-border benefits despite explicit Singapore–Kunming link.
Kunming–Haiphong Transport Corridor: Yen Vien–Lao Cai Railway Upgrading	Subregional benefits associated with increased trade and reduced transport costs to coastal ports were discussed but not quantified.
Kunming–Haiphong Transport Corridor: Noi Bai–Lao Cai Highway	Subregional benefits associated with reduced travel time between Kunming and Haiphong, alleviation of traffic congestion in cities and towns, and generation of employment opportunities were discussed but not quantified.
Northern GMS Transport Network Improvement	Traffic forecasts were made partly based on analysis of regional trade and tourism patterns, but cross-border benefits were not quantified.
GMS Southern Coastal Corridor	Distribution analysis was done for each country component (Cambodia and Viet Nam) and for the project road as a whole, but did not distinguish cross-border benefits that national road projects would not have separately obtained, despite reference to

	"enormous potential" to facilitate movement of goods and people between the two countries.
Almaty–Bishkek Regional Road Rehabilitation	Subregional benefits were not calculated due to lack of origin and destination data and quantities and types of freight and passenger traffic.
Dushanbe–Kyrgyz Border Road Rehabilitation I	International generated traffic was separately treated in EIRR calculation but not made the basis for estimating cross-border benefits.
Dushanbe–Kyrgyz Border Road Rehabilitation II	Interesting attempt made on distribution analysis based on expected increase in four types of trade flows: Tajikistan–Kyrgyz Republic, Tajikistan–PRC, PRC–Afghanistan, and transit trade through Pakistan.
Regional Road Development	The appraisal analyzed domestic and international trade flows, associated benefits due to the project, and their distribution among Mongolia, PRC, and Russia. However, "additional" cross-border benefits beyond the sum of national benefits were not separated.
Project	Comment
East–West Highway Improvement	Cross-border benefits were not identified or quantified despite the obviously regional nature of the road.
CAREC Regional Road Corridor Improvement	"International traffic" based on generated and diverted traffic was distinguished in quantifying cross-border benefits, but it is unclear how wider impacts on trade and investments are related to this traffic.

CAREC = Central Asian Regional Cooperation; EIRR = estimated economic rate of return; GMS = Greater Mekong Subregion; Lao PDR = Lao People's Democratic Republic; PRC = People's Republic of China.

Source: Authors' compilation.

It should be noted, however, that some road projects do not have adequate clues with which to benchmark cross-border traffic. For example, in the case of the Northern Economic Corridor Project, the project road was impassable for several months of a year and traffic projection had to be based on the traffic in the areas where the existing traffic was considered proximate to how the traffic might be generated after project completion. Similarly, in the case of the GMS Southern Coastal Corridor Project, the Viet Nam–Cambodia border was closed to international traffic prior to the project, making quantitative benchmarking for cross-border traffic impossible. Practitioners face a practical problem of weighing the accounting of benefits to demonstrate economic viability, e.g., beyond certain cutoff criteria of economic rate of return, against the corresponding cost of collecting additional data and information. As a result, benefit quantification tends toward conservative estimates.

3.5 Patterns of Emerging Outcomes and Impacts: Macro- and Micro-Level Evidence

Mindful of the numerous pitfalls and subtleties listed above, many studies, albeit less than the ideal of randomized evaluation, have produced interesting results indicating emerging outcomes and impacts of cross-border infrastructure projects implemented in Asia. At the macro level, cross-border infrastructure reduces trade costs, leading to more trade and investment, and then to growth. At the micro level, cross-border infrastructure can benefit the poor by improving their income opportunities and access to labor markets and social services. Here, we summarize notable findings based on the review of available project documents and studies undertaken by ADB and others. They are mainly related to cross-border infrastructure projects in the transport sector.

3.5.1 Macro-Level Evidence

Two types of approaches have been used in analyzing the macro impact of regional infrastructure development: econometric analysis using panel data and simulation analysis using CGE models. While these studies have limitations in isolating the impacts of individual projects, they offer insights on the aggregate-level impact of infrastructure development. For example, Edmonds and Fujimura (2008) used a gravity model using panel data from GMS countries to analyze the determinants of regional trade and foreign direct investment (FDI) flows. The study found that cross-border road development (expressed in road density) has had a distinctively positive impact on regional trade flow, controlling for other factors. Menon and Warr (2008) constructed a multi-sector, multi-household general equilibrium model to quantify the effect of rural road improvement on poverty incidence in the Lao PDR. They found different impacts depending on the type of road improvement. For example, upgrading of no-access roads to dry-season-access roads has a far larger impact on household poverty compared with upgrading dry-season-only roads to all-weather roads. This implies that given the Lao PDR's landlocked location, improving rural road networks, which would practically connect to either one of its neighbor countries (e.g., Champasak Road Improvement Project), can significantly enhance the welfare of poor households.

In a forward-looking study of the CAREC region, ADB (2006c) used a multi-sector CGE model to simulate the economic impact of regional cooperation in transport, transit, and trade policy, focusing on the Kyrgyz Republic. Its results indicate that the cumulative increase in the country's real gross domestic product in 2006–2015 would be far higher than the baseline scenario without regional cooperation and that the average cumulative increase in the incomes of poor households could be almost doubled over the same period.

3.5.2 Micro-Level Evidence

Micro-level studies use primary and secondary data collected from qualitative and quantitative surveys (e.g., baseline and post-implementation surveys) and related methodologies such as rapid pilot assessments, case studies, and participatory assessments. Findings from these studies are summarized here in the order of short- to medium- and long-run impacts, and from positive to negative impacts, that are observed at the micro level.

Reduced Travel Time and Transport Cost

An immediate outcome of building cross-border transport infrastructure is reduction in travel time and transport cost. In the case of the Champasak Road Improvement Project, travel time from the Thai–Lao PDR border at Vung Tau to the Lao PDR–Cambodia border of Veun Kham via Pakse was reduced by more than half, and travel costs fell for those using private transport. Also, the cost of public transport decreased by more than 20% in real terms (ADB 2008). In the case of the Phnom Penh–HCMC Highway Project, the average time required to reach local health care services has fallen by about 30%, while travel times to schools and markets are down by about 40% (Phyrum, Sothy, and Horn 2007). In the case of the East–West Corridor Project, travel time from the Lao PDR–Viet Nam border of Dansavanh to Khanthabouly on Road 9 was reduced from about 12 hours in 2001 to 2.5–3.0 hours (Rattanatay 2007). In the case of the North–South Economic Corridor via the Lao PDR, after the completion of the Lao PDR road section, travel time from Bangkok to Kunming was reduced from 78 hours in 2000 to 51 hours in 2006, and is projected to be further reduced to 30 hours in 2015. Correspondingly, the cost of transporting one ton of rubber products from Bangkok to Kunming was reduced from US$563 in 2000 to US$392 in 2006, and is projected to be further reduced to US$210 in 2015 (Banomyong 2007). In the case of the Almaty–Bishkek Regional Road Rehabilitation Project, travel time was reduced by at least 50% from 5–6 to 2–3 hours (ADB 2008). Transport costs for exporting fruits and vegetables from Bishkek to Novosibirsk decreased from US$3,700–3,900 in 2001 to US$3,500–3,700 in 2004 (Ganiev 2005).

Increased Traffic

Reduced transport costs generate increased traffic. After the completion of the Champasak Road Improvement Project, traffic volume on the project route grew at an average annual rate of 22% against the projected growth rate of 5.0–7.5% (post evaluation in 2005). The number of passenger buses on Road 9 in the Lao PDR along the East–West Economic Corridor increased from about 600 buses in 2000 to around 1,560 buses in 2005, while the number of freight operators also doubled over the same period (Rattanatay 2007). Traffic volume on the route of the Almaty–Bishkek Regional Road Rehabilitation Project grew by 25% after 2007 (ADB 2008).

Expanded Trade

Increased traffic is explained by the expansion of regional trade due to the reduced transport costs, particularly over land in the case of road projects. For example, trade between Cambodia and southern Viet Nam along the Southern Economic Corridor increased by about 40% per year between 2003 and 2006 (ADB 2008). For Savannakhet Province as a whole, which is Lao PDR's transit province along the East–West Economic Corridor, the amount of exports and imports increased by 24 times and 39 times, respectively, in 2001–2005 (Rattanatay 2007). Exports from the Kyrgyz Republic to Kazakhstan increased by 160% between 1998 and 2007, presumably due in part to the completion of the Almaty–Bishkek Regional Road Rehabilitation Project (ADB 2008).

Induced Investments

Improved cross-border transport infrastructure induces investments for new economic activities. In anticipation of a closer economic link between Viet Nam and Cambodia, industrial districts on the Viet Nam side along the Southern Economic Corridor are developing, such as the Trang Bang Industrial Park, which is generating many jobs for the local population (ADB 2008). In a field survey on the corridor, 70% of the respondents showed an interest in owning a small business or expanding their current one in the post-development period, 12% showed an interest in expanding their agricultural activities, and 9% expected to work in a factory job if available (Phyrum et al. 2007). FDI is attracted to places where transport costs are low and resource complementarity is high. The value of FDI and joint ventures in Savannakhet Province increased from only US$96 million in 1995–2000 to US$250 million in 2001–2005. Of these FDI projects, 53% are in agriculture, and villagers in the province have been engaged increasingly in activities sponsored by these projects such as silk and cotton production, weaving, and handicrafts (Rattanatay 2007).

Enhanced Tourism

Part of the increased traffic volume is related to the increased number of visitors and tourists. There was a 128% increase in the number of tourists visiting Champasak Province of the Lao PDR between 1998 and 2004 partly due to the Champasak Road Improvement Project (post evaluation in 2005). The number of visitors including tourists crossing the Cambodia–Viet Nam border at Bavet–Moc Bai, rose at an average annual rate of about 53%, and vehicles crossing the border increased at an average annual rate of 38% between 2003 and 2006 (ADB 2008). In Savannakhet Province, the number of tourist arrivals increased from 90,910 in 1999 to 222,063 in 2006. Following the opening of the Second Mekong International Bridge, the number of tourist arrivals increased by 8% in the first two months of 2007. More than half of such tourism involves regional tours covering Thailand, Lao PDR, and Viet Nam (Rattanatay 2007). Tourists visiting Kyrgyz Republic increased by 50% to about one million between 2005 and 2007, partly due to the Almaty–Bishkek road improvement and its associated border facility improvement, and partly due to the complementary private sector investments in accommodation and services at key tourist destinations in the country. A similar development is likely to happen along the Southern Economic Corridor because the route passes through all of Cambodia's designated tourism zones (Angkor, Phnom Penh, and coastal zones).

Enhanced Movement of People and Income Opportunities

Enhanced movement of people leads not only to increased short-run tourism but also to increased long-run labor mobility. For example, magnitudes of labor movement in GMS have been significant. Even Saravan Province in the Lao PDR, which is off the direct East–West Corridor route, has sent significant numbers of cross-border workers to Cambodia and Thailand—implying a far reaching impact of wage-differential incentives. Enhanced labor mobility improves household income opportunities. Overall, the situation for cross-border workers in GMS seems to have improved over 2001–2005 as their perceived changes were largely for the better in terms of working conditions, ease of crossing the border, and wage level (Singh and Mitra 2006).

Increased Income and Improved Living Standards of Households

Evidence is emerging on increased income and improved living standards of households under the influence of cross-border transport infrastructure projects. About 46% of households in the influence area of the Champasak Road Improvement Project increased their agricultural output for sale at local markets and increased their incomes (post evaluation in 2005). Of the respondents to the survey on the Southern Economic Corridor, 70% claimed their living standards had improved while 23% said there had been no changes and 7% complained of being worse off, amounting to a generally favorable perception of the developmental impact (Phyrum et al. 2007). Between 1994 and 2000, gross domestic product in the six municipalities and counties in the influence area of the Southern Yunnan Road Development Project increased by 1.9 times on average, significantly higher than the national average of 1.4 times. During the same period, US$390 million was paid to the workers as wages. The number of tourists in the project area also rose fivefold, leading to significant spillover effects (ADB 2008). These are considered to be the initial impacts of various investments along the North–South Economic Corridor on the Yunnan side. The majority of people living in districts along the East–West Economic Corridor, who previously depended on subsistence farming and shifting cultivation, are now engaged in commercialized agricultural production of such products as livestock, poultry, sugarcane, cassava, bananas, watermelon, and tree plantations for domestic and international markets. As the East–West Corridor Project included rural access road components, its benefits also reached households located far off Road 9, contributing to wider poverty reduction (Rattanatay 2007).

Growth in Border Cities and Towns: Agglomeration Effects

As movement of goods and people across borders becomes easier, the diversity of resource endowments among neighboring countries tends to magnify agglomeration effects in which entrepreneurs exploit new arbitrage opportunities and combine resources with varying competitive advantage across borders. While it is still too early to detect the extent of agglomeration effects attributable to specific projects, one can safely associate noticeable developments at border areas at least partly with the progress in cross-border infrastructure, in terms of both physical infrastructure and accompanying institutions and regulatory arrangements. For example, the garment industry at Poipet border areas is likely to further flourish due to easier movement of goods and people: “In its most basic form, the process begins with Thai wholesalers selling Thai fabric to traders in the large Rong Kleung market. These traders then subcontract or outsource the production to Cambodian manufacturers living in the Poipet area, these manufacturers or subcontractors are usually households with tailoring equipment and employing 10–40 garment workers…” (Singh and Mitra 2006: 95). A similar development has been observed at the Thailand–Myanmar border at the western end of the East–West Corridor. Labor-intensive industries are becoming concentrated in Mae Sot District of Tak Province, where Thai garment firms employ labor from Myanmar on a large scale (Kudo 2007). Also in other border areas in the GMS such as Bavet (Cambodia)–Moc Bai (Viet Nam) and Mae Sai (Thailand)–Tachilek (Myanmar), initial agglomeration effects are observable.

Dispersion along Economic Corridors to Some Extent

In some economic corridors, dispersion of economic activities from existing nodes seems to be emerging. For example, district towns along Road 9 in the Lao PDR are growing fast where new concrete houses, markets, guesthouses and restaurants, trade and service activities such as petrol stations, automobile repair shops, and other micro enterprises never observed before in these remote areas have been mushrooming (Rattanatay 2007). The East–West Economic Corridor is starting to see some dispersion effects along Road 9 after the initial agglomeration effects at the border nodes such as the Mukdahan (Thailand)–Savannakhet (Lao PDR) and Dansavanh (Lao PDR)–Lao Bao (Viet Nam) borders. When complementary institutions and regulatory aspects of cross-border goods movement improve, the dispersion of cross-border benefits will accelerate. (See Appendix 2 on the dynamics of agglomeration and dispersion.)

Dispersion Effects Depend on Complementary Investments

While cross-border benefits are expected to spread over time, the speed of such diffusion and its perception by households depends on complementary investments off the trunk routes of transport corridors. For example, 45% of the survey respondents from the Southern Economic Corridor believed that in addition to developing the main corridor, rural infrastructure as well as basic education and health care should be addressed in order to improve rural livelihoods. Responses included rural roads and electricity (88%), factories (74%), irrigation (45%), and health and education infrastructure (37%) (Phyrum et al. 2007).

Road Accidents

One initially observable negative outcome of cross-border transport infrastructure is an increase in accidents. Increased speed and easier border crossing can cause more frequent and more severe accidents. Along Road 8 in the Lao PDR, there were around 5,000 accidents with more than 7,300 injuries and around 500 deaths in 2005. Along Road 9 in Savannakhet Province, there were around 1,000 accidents and 2,000 injured with almost 100 deaths in the same year (Rattanatay 2007).

Casino Prevalence

Initial agglomeration effects at border areas, ironically, often begin with quick-cash businesses such as casinos, which typically locate at the side of the border where law enforcement is weaker, e.g., the Mong Cai (Viet Nam) side of the Viet Nam–Guangxi border; the Poipet (Cambodia) side of the Thailand–Cambodia border; the Bavet (Cambodia) side of the Viet Nam–Cambodia border; the Tachilek (Myanmar) side of the Thai–Myanmar border; the Maila (Myanmar) side of the Yunnan–Myanmar border; and the Boten (Lao PDR) side of the Lao PDR–Yunnan border. At Mong Cai, an investor based in Hong Kong, China opened a casino hotel in 2002 to serve tourists from the PRC. At Poipet, nine casino hotels were operating by 2006 to serve Thai tourists. At Bavet, five or six casino hotels opened by 2006 to serve Vietnamese tourists. At Boten, a PRC company has recently been given a 30-year right to build and operate the Boten Economic Development Zone in which reportedly the main draw so far is a casino, which is to serve tourists from the PRC and is off limits to Laotians.

While these casino businesses in border areas have some positive effects in terms of cash revenue to the host partners (private and public sector) and employment creation effects for local residents (in unskilled jobs presumably), unfavorable social spillover effects including those described below can be expected not only for the host country but also for the tourist-sending country. In fact, at Maila (Myanmar), where the Shan State allowed PRC investors to establish casino hotels in the 1990s, crowds of tourists from the PRC flowed into the previously quiet town and concern raised by the PRC authorities over the reckless behavior of the PRC visitors and their increasing debt led to the closure of the casino hotels by 2005 (Kudo 2007).

Smuggling

Poor people are often used as intermediary porters in smuggling networks. In just two examples, poor border villagers are paid to drive smuggled motor bikes and cars across rice fields and forest trails along the Cambodia–Thai border; and poor Cambodian women and children living in border areas are paid to wear as many Thai clothes as possible and walk across the border along informal gates. They are exposed to a considerable risk (especially so for women) because, if caught, they are often abused verbally and sometimes physically. In the case of drug smuggling, the carriers tend to be poor and vulnerable groups living in the corridor provinces, such as street children in Poipet. They take the highest risk in becoming porters and peddlers in drug smuggling for small sums of money. Young migrant workers are vulnerable to drug abuse because often their employers force them to take amphetamines for "strength" so that they can work longer hours (Singh and Mitra 2006). In the CAREC region, drug smuggling is a serious issue, especially along the road corridors involving Afghanistan.

HIV/AIDS

Among the most serious forms of negative cross-border externalities is the spread of communicable diseases, especially HIV/AIDS. The number of HIV carriers in Tay Ninh Province in Viet Nam reached 1,316 by October 2005 with a marked increase during recent years. Among Vietnamese commercial sex workers in Svay Rieng, as many as 40% are considered HIV carriers. Out of 1,400 HIV-infected people in Lao PDR in 2001, 872 were found in Savannakhet and Saravan provinces alone. Most of these cases are found along the Thai border and along Road 9 (Singh and Mitra 2006). Most of outbreaks of HIV/AIDS and sexually transmitted diseases are found in the integrated areas along the Thai–Lao PDR border, such as Roads 9 and 13 (Thi 2008).

Human Trafficking

Human and drug trafficking was the most-cited concern among the survey respondents from the Southern Economic Corridor (68% response rate) (Phyrum et al. 2007). There are three broad degrees of trafficking: (i) cheating cross-border workers into low standard jobs; (ii) cheating children and vulnerable groups into doing risky and demanding tasks such as smuggling, begging, and drug peddling; and (iii) trafficking for prostitution or sex work. All three forms of trafficking are commonplace along the GMS corridor provinces and are more concentrated in areas near the border as there is more labor migration from there. Even when authorities know who traffickers are in their jurisdiction, they lack the evidence to bring them to court. Witnesses are difficult to find and victims are afraid of coming forward for fear of being looked down on by their fellow villagers (Singh and Mitra 2006).

Illegal Logging and Deforestation

Opening of regional transport corridors can lead to more illegal logging and deforestation. Migration from outlying villages to areas adjacent to the project road in the Champasak Road Improvement Project is resulting in clearing of forest buffer zones using slash-and-burn techniques. Migrants tend to clear the forest area to build their houses and to create paddy fields. This forest encroachment issue needs to be better understood before a comprehensive solution can be found (post evaluation in 2005). Given that the bulk of wood processing industries in the Lao PDR are concentrated in the central region and particularly in the provinces along the East–West Economic Corridor, it is likely that the easier transport stimulates more illegal logging (Singh and Mitra 2006). It was reported that landslides and deforestation increased in Xishuangbanna in Yunnan Province along National Road 3 of the North–South Economic Corridor. Forest cover decreased in the buffer zones of the road while rubber plantations increased dramatically along the road, causing concerns about environmental degradation. Similar development has been observed on the Lao PDR side of the North–South Economic Corridor: cutting of forest trees on both sides of the road to be replaced by monoculture crop production such as rubber and coconut plantations (Thi 2008).

However, it can be argued that the extent of illegal logging depends on the initial quality of the road and the change in the quality due to the project. For example, if a project is upgrading from gravel to sealed road, it would not make a difference in the extent of logging or smuggling. If the existing quality of the road already enables the transport of illegal logs, further improved road quality would not have an incremental negative impact.

4. LESSONS LEARNED

Based on the review and evidence collected above, this section draws lessons and implications for the design and implementation of cross-border infrastructure projects.

4.1 Characteristics of Successful Projects

We can detect several factors that contribute to successful preparation and implementation of cross-border infrastructure projects.

4.1.1 Clear Rationale in Articulation of Economic Corridor Concept

For the East–West Corridor Project in the GMS, ADB's approach was to pursue a broader set of cross-border trade and investment impacts including the promotion of special production and trade zones that will support the concept of economic corridors. The project rationale was based on long-run cross-border benefits along the line of agglomeration and dispersion, making clear the economic rationale of the project from a regional perspective. Similarly, project documents for road projects in CAREC countries (Numbers 17, 19, 20, and 22 in Appendix 3) have been relatively well articulated regarding the nature of cross-border impacts. This may be partly owing to the fact that these countries are all landlocked and it is relatively easy to put road sections in these countries in a larger picture of regional and inter-regional corridors. As the CAREC transport sector master plan identifies six economic corridors across member countries, road projects included in these corridors would all be considered cross-border road projects.

4.1.2 Use of Distribution Analysis as a Guide for a Win-Win Design

A properly prepared distribution analysis can help adjust project design for a win-win direction. For example, the appraisal analysis for the Northern Economic Corridor Project indicated a disproportionate share of the benefits from saved vehicle operating costs in favor of Thailand and the PRC and against the Lao PDR. Particularly the benefits associated with diverted traffic were projected to accrue to Thai and PRC stakeholders. However, two implicit compensation mechanisms assumed in the project arrangement make up for the otherwise unfavorable distributional outcome for the Lao PDR. The first is the transit fee to be collected by the Lao PDR government from the road users including those originating from Thailand and the PRC. The second is the concessional loans (net financial transfer due to the favorable terms of the government loans compared to commercial loans) provided by the Thai and PRC governments to the Lao PDR government. These arrangements counter project costs disproportionately borne by the Lao PDR government and potential social and environmental effects that would mainly accrue to people in the Lao PDR. Given that they help ensure a win-win outcome, the project document could have elaborated more on these compensating arrangements in project design.

4.1.3 Fair Chance of Success in Public–Private Partnership in the Energy Sector

In the energy sector, where potential private demand and supply can meet across borders, there is a fair chance of forming a "club" without having to mobilize extensive resources from the public sector. Cross-border power projects can capture economies of scale and be attractive to international private sector investors. Exportability means bankability for private

sector financiers. For example, the Theun-Hinbon Hydropower Project can serve as a model for a successful public–private partnership. It has achieved its intended purpose and is currently the largest foreign exchange source for the Lao PDR. Sales revenues for the Theun-Hinbon Power Company (THPC) increased from US$42 million in 1998 to US$57 million in 2005 and are expected to maintain that level in the future. THPC's dividend payments in 2003–2005 amounted to US$78 million, of which US$47 million went to Electricite du Laos. In 2004, THPC started to pay taxes at about US$3 million a year. The project is rated highly relevant, highly efficacious, highly efficient, and likely to be sustainable (ADB 2006b).

4.1.4 Some Aspects of Transport Infrastructure Can Bypass Various Constraints

Even where diseconomies of scale prevail, as in the case of the Pacific countries, some types of transport infrastructure services can be provided collectively. The fee-based professional services by the Pacific Aviation Safety Office can be considered a club good. An appropriate model of governance is easier to achieve when there are no incumbent providers to oppose reform. The Pacific Aviation Safety Office is the first example of a regional organization that Pacific developing member countries have been willing to set up on a self-financing basis without donor grants. It is likely to serve as a model for future intergovernmental regional cooperation, particularly in transport and regulation infrastructure and services (Guild 2008).

ICT Sector Has a Chance of Successful Cross-Border Coordination if Not Finance

The ICT sector is primarily private sector-oriented and the services involved are close to pure private goods. Therefore, public intervention is not much required. However, regional context may necessitate coordination by a regional public agency like ADB. The SASEC Information Highway Project is a case in point. Several favorable conditions helped the successful formulation of the project: (i) ICT is a new sector for cooperation and did not involve as much political economy as in the energy and transport sectors; (ii) ICT does not involve visible movement of people and goods, so it poses little perceived threat and anxiety; and (iii) the physical network had been laid and the project is simply to connect the national network across borders. With this first concrete cross-border infrastructure project in place and learning effects in cooperation, the SASEC program may advance further in the future.

Institutional Learning-by-Doing in Regional Cooperation

Preparation of cross-border infrastructure projects with multilateral facilitation can have positive institutional learning effects. For example, in the process of preparing road projects associated with the North–South Economic Corridor, multilateral cooperation promoted a cooperative relationship between the PRC (particularly Yunnan and Guangxi) and the neighboring countries. The second GMS Summit held in Kunming in July 2005 was preceded by several senior officials' meetings and symposiums. This not only helped in keeping the commitment to regional cooperation among governments but also has been effective in attracting international attention and support (Cao 2008). Learning-by-doing in coordination between central and provincial authorities should also be highlighted. The Northern Economic Corridor Project, for example, provided the venue for better coordination between Yunnan Province and Beijing, Chiang Rai Province and Bangkok, and Bokeo and Luangnamtha provinces and Vientiane. As the project preparation progressed, according to ADB staff, provincial authorities took proactive roles over the central authorities and enhanced local ownership of the project.

4.2 Ensuring Quality at Entry

It is important to ensure project quality at the entry point of the project cycle. In this case, this means ensuring quality specific to cross-border projects at the project preparation stage, as it will be carried through to the subsequent stages of the project cycle.

4.2.1 Ambiguity over Project Objective Leading to Inadequate Analysis

When poverty reduction is emphasized as an overarching objective, it often appears to overshadow the regional or subregional nature of projects. In such cases, analysis of net benefit distribution is often neglected or given low priority (see Box 1 above). More consistency is required.

4.2.2 Need for Clearer Account of Cross-Border Externalities and Improved Distribution Analysis

For road projects that are critical parts of economic corridors, projection of generated international traffic should be translated into “additional cross-border benefits” even under the conventional VOC and time savings framework. For those that form transit routes in economic corridors, generated transit traffic and trade are presumably additional cross-border benefits that would not occur with national roads alone. For example, in the case of the Northern Economic Corridor Project in the Lao PDR, transit traffic between Thailand and Yunnan that is forecast to be newly generated is clearly part of the cross-border impacts national road investments would not have achieved alone. Even for roads that are not in transit routes, part of the generated international traffic that would not occur unless investments had explicit cross-border implications should be estimated and translated into cross-border benefits. As an extension, wider impacts on trade, investment, and tourism should be identified and quantified to the extent practical.

4.2.3 Need for Inter-Modal Analysis

Due to limited geographical advantages, some transport corridor routes such as the Southern Economic Corridor in GMS might face competition with sea transport. Even when the physical and non-physical bottlenecks are eliminated, the advantage of the land transport along this corridor may be limited unless flows of traffic between Bangkok and HCMC become very smooth and time savings become significant. While short-distance journeys along the road corridor will maintain their competitive advantage, long-haul journeys will face competition with alternative transport modes. Long-term projection of agglomeration and dispersion effects along economic corridors should account for the alternative routes and, if necessary, consider the most efficient inter-modal transport systems for private businesses to follow up with complementary investments.

4.3 .Baseline Survey and Benchmarking of Outputs, Outcomes, and Impacts

Resource constraints often make baseline data unavailable for post evaluation. Baseline indicators are often at best collected by supervision consultants at the beginning of project implementation. This can cause a serious problem later because the government executing agency often lacks the capacity or incentive to monitor the progress on the indicators. For example, as virtually no baseline data were available in the Lao PDR during the elaboration of the environmental impact evaluation for the Theun-Hinbon Hydropower Project, much of the environmental investigation was left to local personnel with limited experience.

It is often impossible to measure project impacts in a regional perspective. Sometimes separate project completion analyses are done instead of one coherent analysis of national- and regional-level impacts (e.g., Phnom Penh–HCMC Highway Project). The problem usually goes back to inadequate identification of measurable indicators and collection of baseline data. While benchmarking of impacts (e.g., traffic and trade) may be difficult for new road projects, it is easier for road rehabilitation and upgrading projects.

4.4 Impact Monitoring and Risk Management

4.4.1 Measurable and Quantifiable Performance Indicators for Cross-Border Effects

Performance targets in the design and monitoring framework for cross-border projects should be easily measurable and quantifiable to be compatible with the resource and capacity constraints of the executing and implementing agencies. For example, the CAREC Regional Road Corridor Improvement Project offers some good examples. Impact indicators are bilateral trade volume by origin and destination, and outcome indicators are daily international freight traffic; traffic accidents on the corridor; travel time between border points; number of children in the project area attending secondary school; and agricultural, horticultural, and livestock production in the project area.

4.4.2 More Care Required in Monitoring of Negative Externalities

Negative socioeconomic impacts often do not receive adequate attention at the time of project design and implementation. Project administrators often react to what happens on the ground rather than take preemptive actions. For example, in response to the perceived higher risk of HIV/AIDS at road construction sites and the neighbor communities, they mobilize nongovernmental organizations and women's groups to monitor and mitigate the impact. FDI projects attracted by cross-border road projects might deprive people in the host country of sources of their livelihood, such as forest resources (the Lao PDR is one such case). Cross-border road projects also run the risk of a large influx of migrant laborers from neighbor countries that might settle permanently and cause social friction. Preventive and mitigation measures against these risks need to be considered well in advance.

Hydropower projects involve unique risks. Trans-basin projects such as the Theun-Hinboun Hydropower Project, even when quasi-run-of-river in design and operation, can have significant environmental and social impacts. Their implementation should not proceed without developing adequate baseline data and designing a comprehensive mitigation plan. Sufficient time and staff should be allocated for this purpose. In order to mitigate resource constraints on the part of the developing countries, donors could provide funds for environmental and social mitigation after plant operation and to specify clear and measurable performance indicators.

Lessons drawn from the evaluation of power projects during preparation of the Nam Theun 2 Hydroelectric Project included the following:

(i) Early comprehensive assessment of economic and social impacts is necessary;

(ii) Baseline data needs to be established;

(iii) Downstream impacts of trans-basin projects are often underestimated;

(iv) Livelihood restoration should be emphasized more;

(v) A comprehensive monitoring mechanism is needed during implementation and operations;

(vi) Sufficient funds are needed for environmental and social mitigation; and

(vii) Strengthened capacity is needed to implement and monitor the project effectively.

4.4.3 Crowding Out of Informal Businesses by Cross-Border Transport Infrastructure

As evidenced in Singh and Mitra (2006), there seems to be a trade-off between formal and informal trade. Owing to the nature of formal trade, which makes it easier to sustain larger and more formal enterprises, the smaller border traders are at risk of being crowded out.

Bigger foreign retailers come into the border markets to sell their brands directly, outperforming petty traders. Similarly, increasing formalization of cross-border trucks not having to transship freight at borders would allow large logistics companies to crowd out petty transport operators such as cart pushers and loading and unloading laborers who generally belong o the poorer economic strata. While this may be somewhat inevitable, associated risks and possible mitigation measures might be considered.

4.5 Policy and Institutional Challenges

4.5.1 Need for Complementary Policy Development in Border-Crossing Procedures

When physical construction of cross-border infrastructure is completed, institutional and regulatory aspects involved in moving goods and people across borders become the largest constraint to fully realizing cross-border externalities. The effectiveness of a given corridor for private sector businesses depends on the cost of crossing borders. For example, Banomyong's (2007) analysis indicates that as much as 60% of the total transport cost between Bangkok and Kunming in 2006 was related to two border-crossing and transit fees.

4.5.2 Need for Flexibility in Preparation and Implementation

Even a small conflict between participating governments, for instance over the location of border demarcation, can cause an incomplete connectivity and reduced impact, as was the case in the Champasak Road Improvement Project. In the case of the Almaty–Bishkek Regional Road Rehabilitation Project, making effective bilateral cross-border transport agreements a prerequisite for investments temporarily stalled project advancement. In the case of GMS, while the Cross-Border Transport Agreement has been signed by all member governments (which took nine years), its smooth implementation faces political resistance by some parties and often inter-agency rivalry among the transport ministry, agricultural ministry, customs office, immigration office, and security authority. While institutions and regulatory aspects are necessary complements to physical construction of roads, issues involved in cross-border movement of goods and people can be complex and politically sensitive. A flexible approach is advised.

4.5.3 Role of Regional Agency in Mitigating Investment Risks and Avoiding Unfair Contracts

Even when power projects can be wholly funded by private sector investors and financiers, regional agencies like ADB play a critical role in mitigating perceived risks by supporting regulatory reforms as well as ensuring fair purchase contracts among the stakeholders.

In the case of the Theun-Hinboun Hydropower Project, a power purchase agreement was signed with the Electricity Generating Authority of Thailand in 1996 guaranteeing an offtake of 95% of THPC estimated to average 1.645 gigawatt hours per annum. But the power purchase agreement proved to have both positive and negative features for THPC. While the quantity of electricity sold was guaranteed, the sales revenue depended on two key factors: (i) annual tariff increase of only 1% in nominal terms implied a decrease in real terms if the United States inflation rate was higher and (ii) the Asian financial crisis had drawn attention to fluctuations in exchange rates. Donor agencies like ADB should, if requested, provide assistance in drafting and negotiating power purchase agreements.

In the case of the Nam Theun 2 Hydroelectric Project, with support from the World Bank and ADB, the Lao PDR government has formulated a public expenditure management strengthening program in order to enhance efficiency and transparency. Previously, dividends from government investments in the power sector have remained with Electricite du Laos to subsidize electricity tariffs instead of supporting poverty reduction programs.

4.5.4 Entangled Political Issues May Stall Projects

Even with good rationale and analysis of cross-border benefits, a regional project may be stalled by context-specific political problems. This was the case with the Regional Power Transmission Modernization Project between Tajikistan and Uzbekistan, which was canceled after a few years of preparation because the power purchase agreement was not signed. Issues that may not be specific to the project could complicate consensus making. Commercial arrangements between governments are often dictated more by political than economic considerations. In contrast, in the case of the Regional Power Transmission Project between Afghanistan and Tajikistan, the signing of the power trade agreement did not face much political complexity because Afghanistan does not share the problems specific to the Former Soviet Union and is heavily supported by donor assistance in institutions and regulatory aspects as well. This underscores the importance of putting project analysis in a proper institutional and political economy context and sequencing appropriate forms of interventions in stages.

5. RECOMMENDATIONS

Major recommendations drawn from our review and lessons learned include the following:

(i) Rationale as a cross-border project should be articulated during project preparation. This is important when the financing requirement for the project is large. An explicitly regional perspective could help in mobilizing funds from a wider circle of donors.

(ii) More time and resources should be allocated to distribution analysis in order to clarify the project rationale and mitigate coordination failure, as well as to help mobilize funds. In particular, regional benefits beyond the sum of domestic benefits should be identified and estimated to the extent possible. For projects in the transport sector, the analysis done for the CAREC Regional Road Corridor Improvement Project seems to be a good start (see Table 3 for an illustration). For projects in the energy sector, the analysis done for the Nam Theun 2 Hydroelectric Project seems to be a good start (see Table 4 for an illustration). Even when a project is located within a single country, showing additional cross-border benefits accruing to neighbor countries would enhance inter-country cooperation and promote better alignment of national and regional development goals. A properly prepared distribution analysis can help adjust project design for a win-win outcome. Detailed distribution analysis by disaggregated stakeholders across is desired, as illustrated in Appendix 4.

(iii) Completing different sections of a transport corridor in a timely manner is important in assuring maximum developmental impact. When different donors are involved in assisting construction of a transport corridor, careful coordination is required. The number of donors involved and associated uncertainties should be minimized. When recipient governments' capacities for coordination are weak, donors might together co-finance sector-wide technical assistance for capacity building.

(iv) In the energy and ICT sectors, regional development agencies such as ADB should focus more on their role as an "honest coordinator" in preparation of cross-border projects as they have a fair chance of public–partnership in financing.

(v) Where political tensions tend to stall inter-country cooperation in preparing cross-border infrastructure projects, regional development agencies such as ADB should play an "honest mediator" role based on the historical background of the parties involved.

(vi) To the extent possible, measurable indicators for evaluating cross-border benefits should be identified in the project preparation stage and monitored throughout the project cycle. For example, transport projects should collect the following categories of baseline information: (i) traffic count by vehicle type, origin, and destination; (ii) freight movements by type of freight, origin, and destination (through a survey of freight forwarders); and (iii) trade impact (by gathering time series customs data on major commodities being moved along corridors). In order to mitigate resource constraints on the part of developing countries, donors could attach to project support piggy-backed technical assistance specific to evaluation purposes for selected projects aiming at collecting baseline data and monitoring critical cross-border impact indicators. For positive externalities, such indicators could include trade and investment as well as household income along the economic corridors. For negative externalities, indicators could include incidence of infectious diseases, human trafficking, and forest areas cleared.

(vii) In complementing physical construction of transport corridors, the necessary regulatory aspects of cross-border trade, especially transit trade, should be put in place as early as possible. For example, a region-wide standard similar to the Transport International Routier Convention should be put in place along with cross-border transport agreements, as suggested by Banomyong (2007).

(viii) Preventive and mitigation measures should be prepared against some of the easily predictable and potentially large negative impacts of cross-border transport projects. For example, the Dushanbe–Kyrgyz Border Road Rehabilitation (Phase II) Project includes a grant-financed component on HIV/AIDS and migration to support Tajikistan's Ministry of Health's National HIV/AIDS Center in developing an integrated, community-based, gender-responsive approach to HIV/AIDS and sexually transmitted diseases. The Mongolia Regional Road Development Project includes technical assistance for awareness and prevention of HIV/AIDS and human trafficking on the North–South Road Corridor in the CAREC program.

Table 3: Stylized Benefit-Cost Distribution for a Cross-Border Road Project[a]

Benefit/Cost Item	Net Economic Benefit (In Present Value)[b]	Distribution of Net Economic Benefit (US$ Million at Base Year Constant Prices)													
		Tajikistan						Kyrgyz Republic						PRC	Afgha-nistan
		Producer	Freight Con-signor	Local User	Vehicle Owner	Labor[h]	Govt and Economy[i]	Producer	Freight Con-signor	Local User	Vehicle Owner	Labor[h]	Govt and Economy[i]		
Producer surplus[c]	17.65	17.65	—	—	—	—	—	—	—	—	—	—	—	—	—
Normal traffic[d]	29.37	—	4.60	9.37	3.73	—	1.86	—	1.19	5.82	1.87	—	0.93	—	—
Generated domestic traffic[e]	2.01	—	0.44	0.89	0.35	—	—	—	0.04	0.22	0.07	—	—	—	—
Generated international traffic[f]	25.27	2.86	4.29	2.86	2.86	—	0.06	—	0.67	0.22	0.22	—	—	10.99	0.24
Construction and maintenance	–56.22	—	—	—	—	0.67	–40.07	—	—	—	—	0.18	–17.00	—	—
Concessional finance[g]	64.82	—	—	—	—	—	44.60	—	—	—	—	—	20.22	—	—
Net benefits	82.90	20.51	9.33	13.12	6.94	0.67	6.45	—	1.90	6.26	2.16	0.18	4.15	10.99	0.24
By country (Share %)	82.90 (100.0)	57.02 (68.8)						14.65 (17.7)						10.99 (13.3)	0.24 (0.3)

— = no data available.

ADB = Asian Development Bank; PRC = People's Republic of China; VOC = vehicle operating cost.

[a] This illustration derives from a road project located across Tajikistan and Kyrgyz Republic and connecting with the PRC and Afghanistan. The numbers in the table are illustrative and do not necessarily reflect real situations.

[b] Discount rate of ADB-standard 12% is used. Economic costs are indicated by a negative sign. Details on the conversion from financial to economic (shadow) prices are omitted in this table.

[c] These benefits are assumed to accrue to agricultural households in Tajikistan.

[d] Based on VOC saving associated with existing level of traffic.

[e] Based on VOC saving associated with generated domestic traffic in Tajikistan and Kyrgyz Republic.

[f] Based on VOC saving associated with generated cross-country traffic based on analysis of trade patterns in the region: specifically, Tajikistan–Kyrgyz trade, Tajikistan–PRC trade, Afghanistan–PRC trade, and vehicle imports from PRC.

[g] This benefit derives from the concessional terms of the loans provided by ADB relative to the terms available in the private capital market.

[h] A laborer's benefit derives from the difference between the project payment and the worker's opportunity cost.

[i] "Economy" represents the rest of the economy, composed of those who are not identified as key stakeholders, lumped together with government as tax revenues and expenditures accrue eventually to the general public.

Source: Modified from ADB (2007).

Table 4: Stylized Benefit-Cost Distribution for a Cross-Border Power Project[a]

Benefit/Cost Item	Net Economic Benefit (In Present Value)[b]	Distribution of Net Economic Benefit (US$ Million at Base Year Constant Prices)						
		Lao PDR			Thailand			External Investors
		Consumer	Labor[g]	Govt and Economy[h]	Consumer	Private Investor	Govt and Economy[h]	
Sales revenue[c]	863.1	—	—	215.8	—	129.5	215.8	302.1
Consumer surplus[d]	185.1	6.4	—	—	178.6	—	—	—
Construction cost[e]	–750.7	—	10.2	–681.3	—	—	–79.6	—
Maintenance cost	–65.8	—	—	–65.8	—	—	—	—
Concessional finance[f]	702.9	—	—	702.9	—	—	—	—
Net benefits	702.9	6.4	10.2	171.6	178.6	129.5	136.2	302.1
By country (Share %)	934.6 (100.0)	188.2 (20.1)			444.3 (47.4)			302.1 (32.3)

Lao PDR = Lao People's Democratic Republic.

[a] This illustration derives from a power project in which Lao PDR transmits and sells electricity to Thailand across the Mekong River. The numbers in the table are illustrative and do not necessarily reflect real situations.

[b] Discount rate of ADB-standard 12% is used. Economic costs are indicated by a negative sign. Details on the conversion from financial to economic (shadow) prices are omitted in this table.

[c] Based on incremental demand. Sales revenue is assumed to be distributed in proportion to equity contributions to the operating company (Nam Theun 2 Power Company): Lao PDR government, Thai private investor, Thai public power company, and external investors.

[d] Based on non-incremental demand for replacing existing energy supply and incremental demand.

[e] Includes construction of transmission line borne by Thai government.

[f] Concessional finance is provided by a consortium of development agencies and commercial lenders.

[g] A laborer's benefit derives from the difference between the project payment and the worker's opportunity cost.

[h] "Economy" represents the rest of the economy, composed of those who are not identified as key stakeholders, lumped together with government as tax revenues and expenditures accrue eventually to the general public.

Source: Modified from ADB (2005).

APPENDIX 1: AGGREGATION TECHNOLOGY FOR REGIONAL PUBLIC GOODS

Understanding supply characteristics of regional public goods (RPGs) can be helpful in determining the case for public intervention at the regional level and the appropriate form of financing. Sandler (2004) provides a useful framework in this regard (see Table A.1.1). The "aggregation technology" reflects divisibility and appropriability of the services deriving from the RPGs, which in turn determines individual members' free-riding incentives, which then determines the level of coordination failure in RPG provision.

Table A.1.1: Regional Public Goods: Typology and Examples

Aggregate Level of RPG Determined by:	Pure Public Good	Impure Public Good	Club Good	Joint Products
Summation: sum of countries' contributions	Cleaning a lake	Treatment of HIV/AIDS patients	Transnational park	Preserving rainforests
Weighted sum: differentially weighted sum of countries' contributions	Curbing spread of AIDS	Reducing acid rain	Power grid	Eliminating transnational terrorist threat
Weakest link: smallest contribution	Implementing international standards for financial practices	Surveillance of disease outbreaks	Airport hub-spoke network	Prevention and mitigation of natural disasters
Weaker link: smallest contribution, followed by the second smallest contribution, and so on	Forestalling spread of an agricultural pest	Maintenance of sterilization	Transport infrastructure	Internet connectivity
Best shot: largest contribution	Curing a disease	Agricultural research findings	Satellite launch facility	Regional peacekeeping
Better shot: largest contribution, followed by the second largest contribution, and so on	Discovering effective treatment	Uncovering intelligence on political instabilities	Biohazard facility	Bio-prospecting

Source: Sandler (2004: 21, Table 1.1).

In terms of the conventional characterization of public goods (the columns in Table A.1.1)—non-rivalry of benefits and excludability of non-payers—almost all cross-border infrastructure projects would fall within the club good category (Internet connectivity is categorized as a "joint product" in that it provides network externality as well as commercial user-specific benefits of a club nature). In principle, club goods can be efficiently provided through appropriate user charges such as differential tolls based on revealed road use, but equity concerns remain. For example, smaller members with less financial and institutional capacity might require cross-subsidization within the club or subsidy by external donors.

In terms of the supply characteristics (the rows in Table A.1.1), however, there exist differences in the optimal way of intervention by regional development institutions such as ADB. For example, a power grid falls within the weighted sum technology in which the overall level of regional power service is determined by a differentially weighted sum of the countries' contributions. National governments or private sector players would have an incentive to finance such infrastructure in "higher-weight" portions of the grid (e.g., topographically easier to build; large power surplus-deficit gap across borders) while "lower-weight" portions might require financing by external donors. Furthermore, the technical nature of power grids requires that all portions of the network adopt the same standards and

regulations for maximizing its services. External donors have a role in coordinating this aspect as well as supporting capacity building for institutionally weak members, preventing potentially unfair contracts and pricing between the countries exporting and importing the power, and assisting in dispute resolution.

Transport infrastructure projects would fall within either the *weakest link* technology, in which the smallest contribution fixes the effective aggregate supply level for the entire region, or the *weaker link*, in which smaller contributions determine the aggregate level. An example of the weakest link would be the least well-functioning transport infrastructure (or missing link) that may determine the reliability of the whole regional transport system (e.g., the Cambodian portion of the Pan-Asia Railway connecting Singapore to Beijing). An example of the weaker link would be portions of road networks that are located in landlocked countries (Lao PDR, Bhutan, Nepal, Central Asian republics). It seems that private sector players had inadequate incentive to finance transport infrastructure in these portions precisely because they are the weaker or weakest link, partly due to difficult geographical conditions and partly due to inadequate capacity of the governments. Therefore, these links have a strong case for public support by external donors in financing the physical infrastructure and associated institutional and regulatory arrangements, such as cross-border trade agreements, as well as capacity building of the institutionally weak members.

In addition to capacity building support for weak members, donor support to repeated interactions among club members also helps alleviate coordination failure. Bringing government officials together on a regular basis, while it would consume resources without concrete results in the beginning, would allow members to learn one another's preferences and concerns, thus reducing asymmetric information, as pointed out in Sandler (2004).

APPENDIX 2: DYNAMICS OF AGGLOMERATION AND DISPERSION

Two opposing economic forces work in the formation of economic nodes across borders with development of cross-border infrastructure. Table A.2.1 provides examples of such opposing forces. Initially, as centripetal forces dominate centrifugal forces, a few large economic nodes will be formed along regional transport corridors, leading to widening disparity. Then, as centrifugal forces dominate centripetal forces over time, economic activities will disperse and more small and medium-sized nodes will be formed, leading to shrinking disparity.

Table A.2.1: Causes of Centripetal and Centrifugal Forces

Centripetal Forces across Borders	Centrifugal Forces across Borders
- Increasing returns in production - Pecuniary externalities through backward and forward linkages - Network externalities in consumption - Knowledge spillovers and other positive externalities	- Immobile factors (land and, in some cases, labor) - Rise in factor prices/commuting cost - Congestion/pollution and other negative externalities

Source: Adapted from Fujita, Krugman, and Venables (1999: 346).

Figure A.2.1 illustrates such dynamics. Connectivity cost here broadly refers to all costs involved in private sector entities (e.g., manufacturers, traders, forwarders, tour operators) in linking their businesses across borders toward becoming seamless. It covers costs including transport costs, waiting time at borders, tariffs, customs procedures, and necessary telecommunications. In the new economic geography literature, these are often collectively referred to as “service link cost,” a concept similar to “transaction costs” used in microeconomics. It is conceivable that as the connectivity cost decreases over time, initially diverse economies in developmental stages and resource endowments will form the kind of sequential positive externalities that first go to a few of the existing nodes disproportionately, and then subsequently go to a large number of new nodes , leading to a win-win long-run outcome. This line of scenario can be simulated using a “geographical equilibrium” model. For example, a simulation by ERIA (2008) yielded a preliminary result in which, holding macroeconomic and demographic characteristics constant, improvement in transport speed and time along the East–West Corridor, for example, leads eventually to dispersion of population and economic value added along the route between Bangkok and Hanoi.

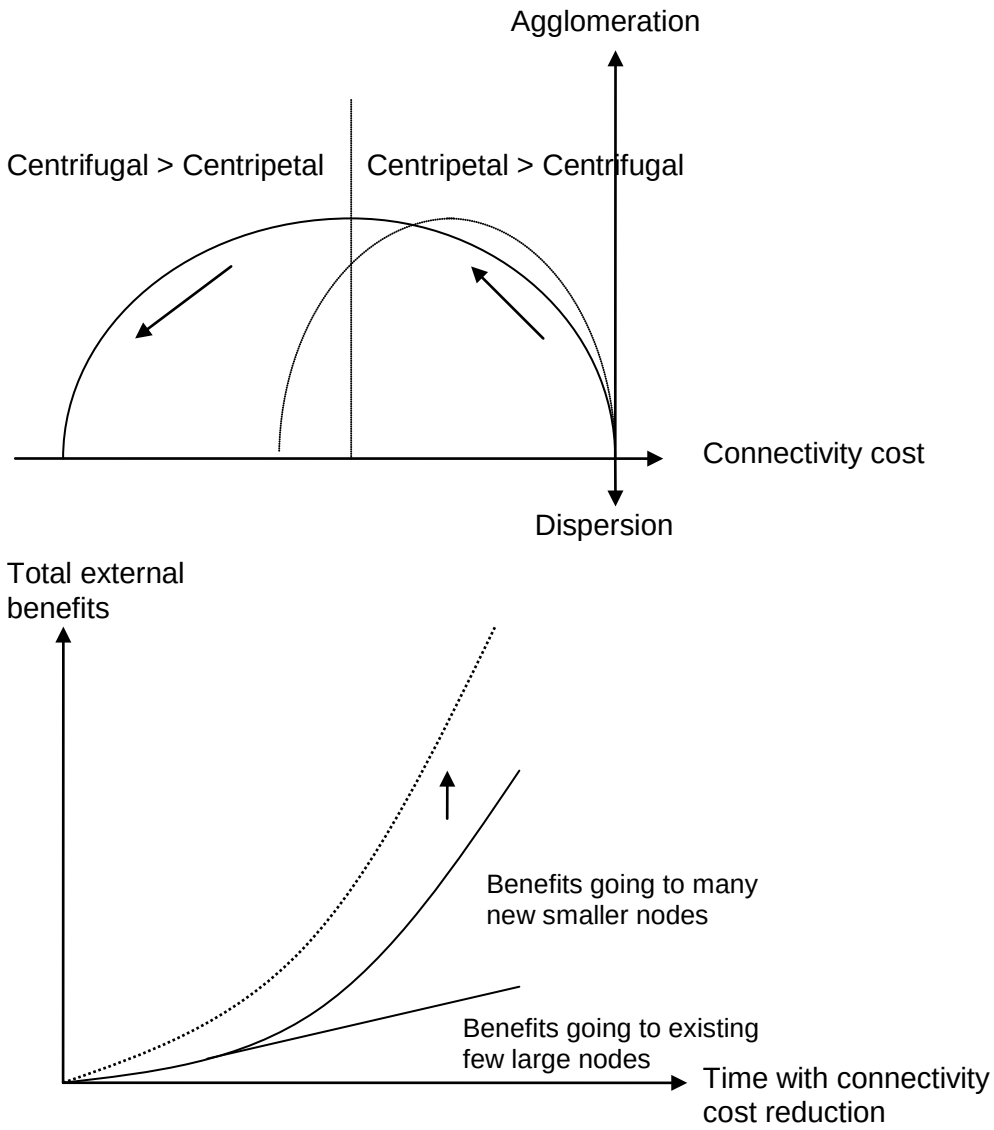
While this scenario is plausible in generally illustrating how cross-border infrastructure projects impact the participating economies, the benefit-cost distribution “profile” over time (in the lower half of Figure A.2.1) is influenced by complementary investments. For example, transit countries along economic corridors are well positioned to accelerate the centrifugal force for dispersion (i.e., condensing the curve horizontally in the upper half of Figure A.2.1) by setting up facilities such as special economic zones, industrial estates, and distribution centers in order to attract intra- and extra-regional foreign direct investment inflows. Various donors could join in providing analytical and financial assistance in this regard. Doing so would contribute to a successful formulation of cross-border infrastructure projects and their sustainability.

In fact, the concept of economic corridor borrows from the regional growth triangle paradigm. This paradigm refers to economic zones spread over relatively large but well-defined, geographically adjacent areas in which differences in the factor endowments of three or more countries are exploited so as to promote growth, external trade, and direct investment. An economic corridor consists of several elements: a defined location; economic activities, physical infrastructure including an economic and transport system around which economic

activities can be clustered, and soft infrastructure (including foreign investment regulations, incentives, and institutions) (ADB 1999). Therefore, it is necessary to anticipate these elements in planning cross-border infrastructure investments, and their development should be monitored and evaluated.

As transport costs decline, immediate supply responses are mostly domestic, such as new service establishments along the road. In order to achieve broad development impact such as increased cross-border trade and foreign direct investment, complementary interventions are needed such as special economic zones, investment incentives, and simplification and harmonization of border-crossing procedures.

Figure A.2.1: Dynamics of Agglomeration and Dispersion due to Cross-Border Infrastructure Development



Source: Authors; discussion with Peter Rimmer.

APPENDIX 3: LIST OF THE PROJECTS REVIEWED

Project Name (Borrower Country)	Loan Approval	Project Completion	ADB's Post Evaluation
GMS			
1. Champasak Road Improvement (LAO)	Aug 1995	Oct 2001	Nov 05
2. Phnom Penh to Ho Chi Minh City Highway Improvement (CAM/VIE)	Dec 1998	Dec 2005	Ongoing
3. Southern Yunnan Road Development (PRC)	May 1999	est. 2008	
4. East–West Corridor (LAO/VIE)	Nov 1999	Mar 2007	Ongoing
5. Northern Economic Corridor (LAO)	Dec 2002	Mar 2008	
6. Cambodia Road Improvement (CAM)	Nov 2002	est. Dec 2006	
7. Rehabilitation of the Railway in Cambodia (CAM)	Nov 2006	est. Dec 2009	
8. Kunming–Haiphong Transport Corridor: Yen Vien–Lao Cai Railway Upgrading (VIE)	Nov 2006	est. Jun 2012	
9. Kunming–Haiphong Transport Corridor: Noi Bai–Lao Cai Highway (VIE)	Nov 2007	est. Jun 2012	
10. Northern GMS Transport Network Improvement (LAO)	Sep 2007	est. Dec 2013	
11. GMS Southern Coastal Corridor (CAM/VIE)	Nov 2007	est. Dec 2014	
12. Theun-Hinboun Hydropower (LAO)	Nov 1994	Dec 2000	
13. Nam Leuk Hydropower (LAO)	Jul 1996	Feb 2002	Dec 2004
14. GMS Transmission (CAM)	Nov 2003	est. Jun 2008	
15. Nam Theun 2 Hydroelectric (LAO)	Mar 2005	est. Nov 2009	
16. Second Power Transmission and Distribution (CAM)	Sep 2006	est. Dec 2010	
CAREC			
17. Almaty–Bishkek Regional Road Rehabilitation (KAZ/KGZ)	Oct 2000	Dec 2006	Planned
18. Dushanbe–Kyrgyz Border Road Rehabilitation (Phase I) (TAJ)	Dec 2003	est. Dec 2007	
19. Dushanbe–Kyrgyz Border Road Rehabilitation (Phase II) (TAJ)	Oct 2005	est. Jun 2009	
20. Regional Road Development (MON)	Jul 2004	est. Jul 2009	
21. East–West Highway Improvement (AZE)	Nov 2005	est. Nov 2009	
22. CAREC Regional Road Corridor Improvement (KGZ/TAJ)	Oct 2007	est. Mar 2013	
23. Regional Power Transmission Modernization (TAJ/UZB)	Nov 2002	est. Dec 2007	
24. Regional Power Transmission Interconnection (AFG/TAJ)	Nov 2006	est. Jun 2010	
SASEC			
25. SASEC Information Highway (BAN/BHU/IND/NEP)	Nov 2007	est. Dec 2009	
Pacific			
26. Establishment of Pacific Aviation Safety Office	Sep 2005	est. Oct 2010	

AFG = Afghanistan; AZE = Azerbaijan; BAN = Bangladesh; BHU = Bhutan; CAM = Cambodia; CAREC = Central Asian Regional Cooperation; GMS = Greater Mekong Subregion; IND = India; KAZ = Kazakhstan; KGZ = Kyrgyz Republic; LAO = Lao PDR; MON = Mongolia; NEP = Nepal; PRC = People's Republic of China; SASEC = South Asia Subregional Economic Cooperation; TAJ = Tajikistan; UZB = Uzbekistan; VIE = Viet Nam.

Note: The dates in this table are indicative, as there are often difficulties in determining the dates for project completion. For example, financial and technical closing can diverge from physical completion of construction activities. Also, project completion reports go through internal review, editing, and approval at ADB.

APPENDIX 4: USE OF IMPACT DISTRIBUTION ANALYSIS: AN ILLUSTRATION WITH THE NORTHERN ECONOMIC CORRIDOR PROJECT

The Northern Economic Corridor Project constructed an all-weather road covering 228 kilometers in two provinces of the northwestern Lao PDR from the Thai border town of Houayxai to the People's Republic of China (PRC) border town of Boten. With the expected bridge construction over the Mekong River (to be completed by 2011), this road completes the Bangkok–Kunming North–South Economic Corridor in the Greater Mekong Subregion program. In the project appraisal carried out in 2002, the project's economic benefits were calculated based on the direct savings in estimated vehicle operating costs (VOC) associated with normal (or existing) traffic, generated traffic, and diverted traffic (from the river). The appraisal did not attempt to quantify indirect benefits through induced trade, investments, and new employment opportunities. The project costs considered consisted of civil works, project management and supervision, resettlement costs, environmental management plans, administrative costs, and recurring maintenance costs. Valuation of benefits and costs was based on an anticipated project life of 30 years and an ADB-standard rate of 12% was used to discount them to the present values in 2002 prices. The appraisal assumed workers for the road construction would be drawn from the project area and that the opportunity cost of labor for the project workers was equal to the prevailing local market wage rate (i.e., that there was no surplus labor in the project area). Therefore, there were no net direct benefits to laborers working on the project. Table A.4.1 illustrates the benefit-cost distribution based on these assumptions.

While the analysis indicates an overall positive outcome of the project, a disproportionate share of the benefits from saved VOC, particularly associated with diverted traffic, were projected to accrue to Thai and PRC stakeholders. This follows from the fact that the road would improve the transport link between these two larger economies and the majority of the diverted traffic on the road was expected to involve stakeholders based in the PRC and Thailand. However, two compensation mechanisms assumed in the project arrangement make up for the otherwise unfavorable distributional outcome for the Lao People's Democratic Republic (Lao PDR). The first is the transit fee to be collected by the Lao PDR government from the road users including those originating from Thailand and the PRC. The second is the concessional loans (net financial transfer due to the favorable terms of government loans compared with commercial loans) provided by the Thai and PRC governments to the Lao PDR government (captured in the "Finance" row in the table). These arrangements would counter potential unfavorable social and environmental effects that would mainly accrue to stakeholders in the Lao PDR and help ensure a win-win outcome of the investment in the project road.

In addition to direct impacts on VOC and project investment costs, attempts should be made to capture wider impacts through changes in trade, investment, and tourist flows, as well as anticipated social and environmental effects. While not all of these effects are quantifiable, they could be more substantial than what the conventional analysis could capture. Table A.4.1 illustrates the ranges of effects that could be covered. Conventional analysis captures mainly direct effects in the first four rows: concessional finance, construction and operation and maintenance, changes in traffic, and saved transport cost. The rest of the effects are of an indirect and long-run nature. Depending on data availability (e.g., time-series local customs data, disaggregated household survey data) and feasibility of stakeholder interviews, some of these effects could be analyzed and projected in a coherent way, e.g., using models for regional markets of representative traded goods that are transported increasingly due to the project.

Table A.4.1: Economic Analysis of the Northern Economic Corridor Project

Benefit / Cost Item	Net Benefit by Item	Lao PDR				Thailand				PRC			
		Corporation	Consumer	Labor [b]	Government/ Rest of Economy [c]	Corporation	Consumer	Labor [b]	Government/ Rest of Economy [c]	Corporation	Consumer	Labor [b]	Government/ Rest of Economy [c]
Saved VOC[a]													
Normal traffic	40.10	6.66	9.05		6.23	13.26	0.95		0.78	1.42	0.97	—	0.78
Generated traffic	12.21	6.64	0.87		2.21	0.59	0.18		0.40	0.63	0.21		0.48
Diverted traffic	33.92	—	—		—	4.04	7.10		5.82	4.04	7.10		5.82
Transit fee	30.2	—	—	—	30.2	—	—	—	—	—	—	—	—
Construction costs													
Labor	–7.3				–7.3								
Equipment	–20.8	—	—	—	–20.8	—	—	—	—	—	—	—	—
Material	–13.5				–13.5								
Other	–10.4				–10.4								
O&M	–7.6				–7.6								
Finance [d]	0	—	—	—	34.6	—	—	—	–17.3	—	—	—	–17.3
Net benefits	56.83	13.30	9.92	—	13.64	17.89	8.23	—	–10.3	6.09	8.28	—	–10.2
By country	56.83	36.86				15.82				4.15			
(Share %)	(100)	(64.9)				(27.8)				(7.3)			

ADB = Asian Development Bank; Lao PDR = Lao People's Democratic Republic; O&M = operations and maintenance; PRC = People's Republic of China; VOC = vehicle operation cost.

[a] Savings on vehicle operation cost are estimated based on projected traffic growth and the operating costs by vehicle type (various sizes of buses and trucks).

[b] To the extent that the project labor is drawn from "surplus" labor whose opportunity cost is lower than the paid wage rate, the project labor would have positive benefits. In this particular case, it was assumed that there exists no surplus labor.

[c] This can be considered the residual stakeholders who cannot be particularly identified. It is considered here that the benefits and costs accruing to the government are eventually borne by taxpayers or the rest of the economy.

[d] Without the knowledge of the loan terms, it is assumed that Thailand and the PRC share an equal amount of financial transfer. ADB also provides a concessional loan to the Lao PDR government but ADB's net benefit is not included in the table as it would not count toward economic criteria for the project decision.

Source: Modified from ADB (2003: 4–66)

Table A.4.2: Stakeholder Impact Distribution Analysis: An Illustration with the Northern Economic Corridor Project

Channel of effects	Lao PDR		Thailand		PRC	
	Stakeholders	Impacts	Stakeholders	Impacts	Stakeholders	Impacts
Concessional finance	Lao PDR government	Financial transfer inflow	Thai government	Financial transfer outflow	PRC government	Financial transfer outflow
Construction and O&M	Lao PDR government	Construction and O&M cost				
	Workers in Bokeo and Louang Namtha provinces	Income gain	Engineers and workers in Chiang Rai Province	Income gain	Engineers and workers in Yunnan Province	Income gain
Changes in traffic	Truck/bus operators	Income gain	Truck/bus operators	Income gain	Truck/bus operators	Income gain
	Boat operators	Income loss	Boat operators	Income loss	Ship operators	Income loss
	Lao PDR government	Toll revenue				
Saved transport cost	Passengers/freight forwarders	Income gain	Passengers / freight forwarders	Income gain	Passengers/freight forwarders	Income gain
Increased trade	Farmers, coal mine workers	Export to Thailand: lignite coal, wood products, corn, livestock	Firms in industries, workers	Export to Lao PDR: fuel, construction materials	Farmers, firms in industries, workers	Export to Lao PDR: agricultural tools, electrical appliances, fruit and vegetables
	Farmers	Export to the PRC: wood products, rubber, corn	Firms in industries, workers	Export to the PRC: processed food, fuel	Farmers, firms in industries, workers	Export to Thailand: fresh fruit, lighters, electronic products
	Consumers along the road	Gain from cheaper imports	Consumers in Chiang Rai Province	Gain from cheaper imports	Consumers in Yunnan Province	Gain from cheaper imports
	Some producers	Loss from competition	Some producers	Loss from competition	Some producers	Loss from competition
Tourism expansion	Tour operators, hotels/guesthouses	Income gain	Tour operators, hotels/guesthouses	Income gain	Tour operators, hotels/guesthouses	Income gain
	Some in Houayxai	Loss due to shorter stay	Some in Chiang Khong	Loss due to shorter stay		
Induced investments	Lao PDR domestic investors	Sand and gravel mining, salt factory, crushing stone, sawmills	Investors in Lao PDR	Sawmills, lignite mining, corn	Investors in Lao PDR	Mining, livestock, motorcycle assembly, rubber plantation
					Investors in Thailand	Industrial park in Chiang Rai
Better access to services	Residents in Bokeo and Louang Namtha provinces	Easier access to health, education, and labor market				
Social impacts	Residents along the road	Resettlement, accidents, communicable diseases	Residents near the road	Communicable diseases	Residents near the road	Communicable diseases
	Local government	Health sector burden	Local government	Health sector burden	Local government	Health sector burden
Environmental impacts	Residents along the road	Land use change, loss of biodiversity				
Aesthetic impact	Residents along the road	Trash				
Construction impact	Residents along the road	Soil erosion, water contamination, dust				

Lao PDR = Lao People's Democratic Republic; O&M = operation and maintenance; PRC = People's Republic of China.
Source: Authors.

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