

DEVELOPMENT
IN PRACTICE

Sustainable Transport

Other Recent Development in Practice Books

Improving Women's Health in India

Sustainable Transport: Priorities for Policy Reform

Priorities and Strategies in Education: A World Bank Review (also available in French and Spanish)

Better Urban Services: Finding the Right Incentives (also available in French and Spanish)

Strengthening the Effectiveness of Aid: Lessons for Donors

Enriching Lives: Overcoming Vitamin and Mineral Malnutrition in Developing Countries (also available in French and Spanish)

A New Agenda for Women's Health and Nutrition (also available in French)

Population and Development: Implications for the World Bank

East Asia's Trade and Investment: Regional and Global Gains from Liberalization

Governance: The World Bank's Experience

Higher Education: The Lessons of Experience (also available in French and Spanish)

Better Health in Africa: Experience and Lessons Learned (also available in French)

Argentina's Privatization Program: Experience, Issues, and Lessons

Sustaining Rapid Development in East Asia and the Pacific

Sustainable Transport

Priorities for Policy Reform



THE WORLD BANK
WASHINGTON, D. C.

© 1996 The International Bank for Reconstruction
and Development / THE WORLD BANK

All rights reserved
Manufactured in the United States of America
First printing May 1996

The *Development in Practice* series publishes reviews of the World Bank's activities in different regions and sectors. It lays particular emphasis on the progress that is being made and on the policies and practices that hold the most promise of success in the effort to reduce poverty in the developing world.

This report is a study by the World Bank's staff, and the judgments made herein do not necessarily reflect the views of the Board of Executive Directors or of the governments they represent.

Cover photo: Curt Carnemark, The World Bank.

Library of Congress Cataloging-in-Publication Data

Sustainable transport : priorities for policy reform.

p. cm. — (Development in practice)

Includes bibliographical references (p.).

ISBN 0-8213-3598-7

1. Transportation and state—Developing countries.
2. Transportation—Environmental aspects—Developing countries.
3. Sustainable development—Developing countries. 4. Environmental policy—Developing countries. I. World Bank. II. Series: Development in practice (Washington, D.C.)

HE148.5.S87 1996

388'.068—dc20

96-516621

CIP

Contents

PREFACE ix

ABBREVIATIONS xi

SUMMARY 1

- 1 Refocusing Transport Sector Policy 13
 - The World Bank Group's Experience in Transport Lending 15
 - Challenges for Transport Policy 21
 - Sustainability as the Basis of Transport Policy 28
 - The Need for Policy and Institutional Reform 31
 - Notes 32
- 2 Economic and Financial Sustainability 33
 - Competition in the Market: Private Ownership and Operation 35
 - Competition for the Market: Private Operation within a Framework of Public Control 37
 - Making Public Sector Management More Market Sensitive 44
 - Setting Efficient Prices 48
 - Notes 49
- 3 Environmental Sustainability 50
 - Combining Reduction of Transport Costs with Environmental Awareness 54
 - Priority Components of a Transport Strategy 55
 - Addressing High-Priority Problems 64
 - Notes 70

4	Social Sustainability	72
	Designing General Transport Policy to Help the Poor	73
	Addressing the Particular Problems of the Rural Poor	79
	Mitigating the Unwanted Social Effects of Transport Policies	82
	Note	84
5	Redefining the Role of Governments in the Transport Sector	85
	Establishing a Strong Institutional Framework	86
	Setting Charges for Use That Reflect Costs	87
	Strategic Public Planning to Complement the Market	93
	Community Participation: A Necessary Complement to Markets	99
	Notes	101
6	The Role of the World Bank Group in the Transport Sector	102
	Improving the Performance of Transport Sectors	102
	Partnerships in Transport Reform	112
	Learning Systematically from Experience	116
GLOSSARY		118
REFERENCES		121
TABLES		
2.1	Expanding the Scope for Private Sector Finance and Management in Transport	40
2.2	Privately Financed Transport Infrastructure, 1982–94	42
2.3	Potential for Private Financing of Transport Infrastructure in Developing Countries	46
3.1	Ambient Air Quality Indicators for Selected Cities, 1987–90	51
FIGURES		
1.1	Estimated Rates of Return on World Bank–Financed Projects	14
1.2	Modal Distribution of World Bank Lending for Transport, Funds Committed, 1947–94	16
1.3	Major Components of World Bank–Supported Highway Projects, 1988–93	17

1.4	Estimated Growth in Ownership and Use of Motor Vehicles since 1950	24
1.5	Three Dimensions of Sustainable Development: Synergies and Tradeoffs	28
3.1	Transport and the Global Environment: Carbon Dioxide Emissions, 1986 and Projected for 2010	53
3.2	Program to Reduce Air-Polluting Emissions from Transport in Mexico City, with and without a Gasoline Tax	56
3.3	Gasoline Consumption versus Urban Density	61
3.4	Road Accident Rates, by Country Income Group	65
4.1	Comparison of Vehicle Composition in Eight Asian Cities	75
5.1	Pump Prices for Premium Gasoline	92

BOXES

1.1	Institutional Reform and Railway Performance	21
1.2	Integrated Policy Development: Urban Transport in Tunis	22
1.3	Indirect Effects of Transport Investments: Lessons of POLONOROESTE	23
2.1	The Costs of Intervention: Maritime Transport Flag Protection	35
2.2	Designing an Effective Competitive System: Buses in Santiago, Chile	41
4.1	Overcoming the Problem of Financing Nonmotorized Transport: Some Possibilities	76
4.2	The Informal Transport Sector as an Economic Force: Rickshas in Bangladesh	77
5.1	Why a Strategic Government Role is Necessary: The Case of Bangkok	94
6.1	Selected Recommendations in Support of Economic and Financial Sustainability	104
6.2	Selected Recommendations in Support of Environmental Sustainability	106
6.3	Selected Recommendations in Support of Social Sustainability	108
6.4	Onlending Arrangements for Nonmotorized Transport	111
6.5	Collaboration among Donors	114

Preface

During the past twenty-five years, detailed policy studies have been prepared for specific subsectors, such as urban transport (World Bank 1986c), and on specific topics, such as road maintenance (World Bank 1988a). Since 1972, however, there has been no review of the transport sector as a whole. During this period, and in the past decade in particular, rapid changes in the global economy have increased the need for flexibility and reliability in transport services; growing individual aspirations for more access and mobility have generated the need for a greater variety of transport services; and mounting social concern about the degradation of the environment have increased the need to evaluate transport strategies more carefully. The Bank has already responded to some of these needs both at the project level (for example, by introducing the environmental assessment of projects) and at the policy level (for example, by expanding the role of competitive markets in transport).

This book distills the lessons of Bank experience and relates them to the emerging problems of developing and transition economies. There is a wide diversity of problems and experience; no simple solution fits all countries. Nevertheless, some generally applicable principles and best practices can be identified as the basis of a policy for more sustainable transport.

In preparing this book, a wide range of groups was consulted both inside and outside the Bank. Within the Bank the draft was circulated to professional staff for comment and to participants in a review meeting held in September 1994. The draft was also circulated to professionals and academics, to nongovernmental organizations (NGOs), and to other aid and lending organizations. Consultation with advocacy NGOs and operational organizations in borrowing member countries was greatly assisted by Dutch trust funds. Meetings were held in October and November 1994 in Bangkok, Brussels, Budapest, London, Nairobi, Paris, and Santiago. Consultation with U.S.-based international NGOs was facilitated by a task force established by the U.S. Department of the Treasury. The document has been enriched by the constructive comments received during the consultation process. A serious effort was made to incorporate these comments

into the book in order to establish a coherent yet broad-based framework for reforming transport policy and practice.

Kenneth Gwilliam and Zmarak Shalizi prepared the book, which has benefited from in-depth comments from colleagues in the Transport Division of the World Bank's Vice Presidency for Environmentally Sustainable Development. Jerry Lebo provided research assistance, and Barbara Gregory, Emilie Fernandez, Arlene Elcock, and Susanne Holste were responsible for production. Elizabeth Forsyth edited the final version. Alison Peña was the proofreader. The work was carried out under the direction of Louis Y. Pouliquen, director of the Transportation, Water, and Urban Development Department, and his successor, Anthony J. Pellegrini.

Abbreviations

AGETIP	L'Agence pour l'Exécution de Travaux d'Intérêt Public contre le Sous-emploi
BOT	Build-operate-transfer
CFC	Chlorofluorocarbon
EDI	Economic Development Institute (of the World Bank)
ERR	Economic rate of return
GEF	Global Environment Facility
GDP	Gross domestic product
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFC	International Finance Corporation
MIGA	Multilateral Investment Guarantee Agency
NAFTA	North American Free Trade Association
NGO	Nongovernmental organization
OECD	Organisation for Economic Co-operation and Development
POLONOROESTE	Northwest Integrated Rural Development Scheme (Brazil)
PSO	Public service obligation

Summary

Transport is central to development. Without physical access to jobs, health, education, and other amenities, the quality of life suffers; without physical access to resources and markets, growth stagnates, and poverty reduction cannot be sustained. Inappropriately designed transport strategies and programs, however, can result in networks and services that aggravate the condition of the poor, harm the environment, ignore the changing needs of users, and exceed the capacity of public finances.

World Development Report 1994, which focused on infrastructure, stressed the importance of expanding the role of competitive markets and the involvement of the private sector to increase efficiency in the provision and operation of infrastructure and services. The report noted that this was easier to implement in some sectors, such as telecommunications, than in others, such as transport. This book endorses that general message and elaborates on how the specific characteristics of the different transport subsectors affect the potential for expanding the role of competitive markets. It also attempts to set the expanded role of markets explicitly in the broad framework of sustainable development.

Macroeconomic cross-country studies by the World Bank show that investing in transport promotes growth by increasing the social return to private investment without crowding out other productive investment. Microeconomic analysis confirms the high social value of transport. The estimated economic rate of return on transport projects at completion is 22 percent, half as high again as the Bank average. Improvements in rural transport have lowered the costs of agricultural production directly, by increasing access to markets and credit, and indirectly, by facilitating the development of the nonagricultural rural economy. Improvements in urban transport have increased labor market efficiency and access to amenities, making changes in the scale and form of urban agglomerations possible. Improvements in interurban transport have facilitated domestic and international trade and sped the movement of freight, as well as of people.

Learning from Experience

The World Bank Group has been active in transport lending since the late 1940s. Nearly \$50 billion in loans and credits has been committed exclusively for transport sector development through more than 1,000 projects, and \$12 billion more has been committed for transport components of other lending operations in support of agricultural, industrial, and urban development.¹ Lending exclusively for transport projects peaked at 40 percent of the Bank's overall lending between 1956 and 1965. During the late 1980s and early 1990s the share fluctuated between 13 and 16 percent, and some transport issues have been addressed through public enterprise reform loans and adjustment loans rather than transport loans. Rail and port lending has declined from two-thirds of the portfolio in the period of postwar reconstruction to about 15 percent at present, while urban transport lending has increased from a very low level to about 15 percent of the transport portfolio. Highway lending has stabilized at about 60 percent of the transport portfolio; 70 percent of highway lending is now devoted to rehabilitating rather than expanding networks. Transport accounted for nearly 4 percent of projects approved by the International Finance Corporation (IFC) in 1994 and 1995. The Multilateral Investment Guarantee Agency (MIGA) has also recently commenced operations in the sector.

The Bank has successfully financed the construction of physical infrastructure and the acquisition of transport equipment, increased the construction and engineering contracting potential in borrowing countries, and assisted in establishing technical capabilities. However, it has learned from experience that physical completion of projects does not in itself generate the expected benefits if institutions are weak and the policy framework is inadequate. This has frequently been the case where the state is the sole provider of transport infrastructure and is either a monopoly supplier or a strongly interventionist regulator of the provision of transport services.

The dominance of the public sector in the operation of transport services has had several adverse effects. Costs have been too high (for example, road haulage costs are five times as high in the heavily controlled transport sectors of some West African countries as in the liberalized transport sector of Pakistan), and tariffs have been too low, resulting in high public deficits. For example, for some years before rail services were granted as a concession to the private sector in Argentina, the deficit of the state-owned rail enterprise was between 1 and 2 percent of gross domestic product (GDP). Despite the high costs, assets were not maintained, and service did not respond flexibly to rapidly changing demand.

Challenges for the Transport Sector

Continued improvement of transport systems requires completion of some "unfinished business" of extending basic infrastructure networks and providing for

their adequate maintenance. But it also requires attention to the new problems posed by user aspirations for better-quality services, by participation in the opportunities and risks of a competitive global marketplace, and by the adverse consequences of rapid motorization. Appropriate strategies and actions will be required both to improve provision and maintenance of transport *infrastructure* and to improve the provision of transport *services* using that infrastructure.

Addressing Unfinished Business

INCREASING ACCESS AND AFFORDABILITY. Developing countries need to increase the access of the rural poor to markets and amenities. To do this, secondary and tertiary transport networks will have to be expanded and additional public transport services created. Thirty-three percent of China's population and 75 percent of Ethiopia's population still do not have access to all-weather transport. Walking more than 10 kilometers a day each way to farms, schools, and clinics is not unusual in rural areas, particularly in Sub-Saharan Africa, but also in parts of Asia and Latin America. Commuting (whether walking or taking public transport) also absorbs a large part of the time of the urban poor. Commuting by public transport is very costly for the urban poor, taking, for example, 14 percent of the income of the poor in Manila compared with only 7 percent of the income of the nonpoor.

CONFRONTING THE MAINTENANCE CRISIS. Over the two-decade period 1964–84, \$45 billion worth of road infrastructure assets was lost in eighty-five developing countries because of inadequate maintenance. Every dollar of essential maintenance postponed increases the costs of operating a vehicle in the current period by more than \$3. The postponed maintenance also increases the costs incurred by road agencies in the long run.

Meeting New Challenges

INCREASING RESPONSIVENESS TO CUSTOMER NEEDS. Growing personal incomes and rapidly changing markets are generating demand for a greater variety and a higher quality of transport services than are currently available in most developing and transition economies. Higher priority is being attached to *moving people rather than vehicles*, ensuring greater safety in transport, minimizing adverse effects on health, paying more attention to amenities and aesthetic issues, and reducing adverse impacts on the environment and ecology that result from improperly designed and executed transport development strategies.

ADJUSTING TO GLOBAL TRADE PATTERNS. Domestic and international trade liberalization is bringing about the movement of larger volumes of goods (particularly intermediate goods) over longer distances than was the case in the past.

The Republic of Korea, Malaysia, Taiwan (China), and Thailand have based their rapid growth on the export of their manufactured goods through participation in globally integrated production and assembly chains. Even in low-income developing countries (excluding Sub-Saharan Africa), manufactured goods account for more than half of exports. Many countries have difficulty competing for increasingly mobile production and assembly processes because the administrative arrangements and regulations that govern freight and passenger transport are inefficient. Bottlenecks in transport infrastructure are constraining growth in some rapidly growing countries, such as China. Economic reform and political realignment in Eastern Europe and the former Soviet Union, and emerging free trade areas and customs unions in Latin America, also promise to generate a need for investment in transport and for harmonization of regulations to facilitate new patterns of trade and transport.

COPING WITH RAPID MOTORIZATION. Cities are major engines of growth in most developing countries, and urban populations are expanding at a very high rate (more than 6 percent annually). At comparable levels of income, industrial countries had few motorized vehicles. However, stimulated by growing per capita income in urban areas, ownership of motor vehicles is increasing in developing countries at a faster rate than the proportion of central urban space devoted to roads. This proportion is very low in many developing country cities—in the 7 to 11 percent range in Bangkok and Calcutta, for example, compared with 20 to 25 percent in most European cities with fully developed transit systems and more than 30 percent in Manhattan.

As in industrial countries, the increased dependence on automobiles in the developing countries is reducing both the diversity and availability of nonmotorized public transport services for the public, particularly the poor. It has also generated three transport-related problems that are qualitatively different from their counterparts in industrial economies. First, roads in cities such as São Paulo and Seoul are much more congested at lower rates of car ownership than in industrial countries. Second, slow-moving traffic, combined with an ill-maintained stock of vehicles, is making the megacities in developing countries, such as Bangkok, Mexico City, and Tehran, the most polluted in the world. Third, sprawling, land-consuming urban structures are making the journey to work, particularly for some of the very poor, excessively long and costly. With vehicle growth rates of 15 to 20 percent a year in many cities in developing countries, these problems will emerge rapidly in other cities—if they do not already exist—under “business-as-usual” policies.

Sustainability as the Basis of a More Demanding Transport Policy

Together, these challenges highlight the need to reform transport policy in order to support a better quality of life on a sustained basis. *Economic and*

financial sustainability requires that resources be used efficiently and that assets be maintained properly. *Environmental and ecological sustainability* requires that the external effects of transport be taken into account fully when public or private decisions are made that determine future development. *Social sustainability* requires that the benefits of improved transport reach all sections of the community. Economic and financial considerations have a pivotal role to play. Rigorous economic appraisal of investment in infrastructure, appropriate price incentives for its efficient use, and adequate financial and fiscal provisions for its maintenance remain crucial. Road or public transport systems that fall into disrepair because they are economically or financially unsustainable fail to serve the needs of the poor and often damage the environment. But tradeoffs also occur. For example, if environmental and social impacts are not fully addressed in both private and public decisionmaking, expansion of motorized transport can have unacceptable negative environmental and social effects.

Three types of Bank action are most important in support of policy and institutional reform to enhance sustainability. First, actions that involve synergy among the different dimensions of sustainability are pivotal to the whole strategy. The most critical of these are the introduction of economically efficient charges for infrastructure and the development of competitive market structures within the sector. Second, some actions are urgent, either because they are basic to reform (such as actions to establish the institutional basis for a more competitive and commercial transport sector) or because they address problems that have already become critical (such as road safety and the most serious health-threatening aspects of urban air pollution). Third, some actions are relatively novel. These include measures to assist nonmotorized transport; to mobilize the potential of local authorities, communities, and nongovernmental organizations; to improve maintenance through more secure and participatory financing arrangements; and to accelerate improved public sector performance.

Economic and Financial Sustainability

The primary economic and financial objective is to make transport more cost-effective and continuously responsive to changing demands. The strategy for achieving this involves creating competition in those parts of the sector where a commercial market can operate without significant adverse spillover and distributional consequences, and enhancing user participation in those parts where it cannot. Competition must be facilitated by regulatory reform to enable private firms to enter and exit the market freely. Where social or environmental consequences are important, as for infrastructure with significant economies of scale, competition *for* the market through tendered franchises may be more appropriate than free competition *in* the market. The commercialization of remaining public sector firms can also contribute significantly

to economic and financial sustainability. In all these cases, markets will not work properly unless users are charged the full cost to society of their use of transport infrastructure (see the last bulleted point, p. 9).

The objective is to increase the responsiveness of transport supply to user needs by creating competition and by enhancing user participation. The World Bank Group can assist countries in the following ways.

1. Increase the use of competitive market structures in transport services.

■ Encourage *the private operation of road, rail freight, air, and maritime fleets*.

■ Discourage *cargo reservation and flag discrimination* in the absence of a comprehensive assessment of net benefits to the country.

■ Develop *better franchise and concessionary arrangements* to ensure competition for the market.

2. Increase efficiency in the use, provision, financing, and management of transport infrastructure.

■ Introduce *direct charges for infrastructure that closely reflect costs*, including the opportunity cost of nonmarketed effects.

■ Explore actively the potential for *corporatizing infrastructure agencies*.

■ Introduce proxy user charges based on *earmarking* taxation to provide a cost-effective framework for maintaining infrastructure where there is a maintenance crisis and no direct user charges.

3. Establish an enabling framework for competition.

■ Create or strengthen *regulatory institutions and performance standards* for transport to ensure fair competition, to avoid predation and cartelization, and to protect the public interest.

■ *Unbundle and restructure agency responsibilities* to enhance the potential for the sale, lease, or subcontracting of the provision, operation, and maintenance of transport infrastructure.

■ *Increase the capacity for creating private-public partnerships* by defining more clearly and sharing more fairly the liabilities, risks, and returns in build-operate-transfer and concessionary contracts for transport infrastructure.

4. Develop the necessary strategic planning and system management capabilities to complement the market.

■ Create or strengthen the public *strategic planning capabilities* necessary to complement and underpin a more competitive transport network.

■ Establish processes for the effective participation of *users and affected*

communities in making decisions on the design, management, and maintenance of transport infrastructure and publicly sustained services.

Environmental Sustainability

More than half a million people are killed in road accidents each year. In recent years in India only 5 percent of those killed were in vehicles; the rest were pedestrians and cyclists. In Kenya, losses associated with road accidents amount to 1.3 percent of GDP. In some large city centers, road traffic accounts for 90 to 95 percent of health-threatening lead and carbon monoxide in the air and a major share of suspended particulate matter. Reducing the threats to life and health is the highest priority. Cost-effective (rather than state-of-the-art) technology is necessary, but not sufficient, for transport to be environmentally sustainable. Strategic action is also required in the form of better-directed planning of land use, stricter management of demand, and greater incentives to use public transport through efficient pricing for congestion and pollution.

The objective is to ensure that environmental issues are addressed as an integral part of the formulation of transport strategy and project design through actions that have a high ratio of benefit to cost or are cost-effective. The World Bank Group can assist countries in the following ways.

1. Address health-threatening impacts as a first priority.

- Initiate benchmarked *safety programs*, particularly in road transport.
- Adopt *cleaner fuel standards* to eliminate lead and sulfur emissions, combined with fuel supply and pricing policies that encourage the use of cleaner fuels.

2. Integrate environmental and economic elements in project appraisal.

- Encourage the *preparation of implementable strategies* for national or local transport that take into account environmental and economic considerations.
- Encourage *more systematic estimation of the impact that transport programs and projects have on safety and air pollution* (including, where possible, a monetary valuation in economic rate-of-return calculations).
- Assist efforts to use the *most cost-effective rather than the most technologically advanced* solutions to environmental problems.
- Ensure that the *effects on nonmotorized transport* are considered in the design and evaluation of road and rail projects.
- Protect against the *adverse environmental impact of developments induced by roads and other transport networks on forests, wetlands, and*

other natural habitats, as well as on cultural heritage sites, by requiring that the correct framework for protection be in place before the project is implemented.

There is also a need to pay special attention to spatial issues and modal options now even though their benefits may only be realized in the long run. These include the following actions:

3. Develop an environmentally sensitive strategic framework.

- *Better integrate the provision of circulation space and transport capacity* with land-use development, particularly in rapidly growing areas.
- *Develop local standards for the provision of nonmotorized transport.*
- Develop strategies that enable *urban mass rapid transit* projects to be incorporated, in a cost-effective way, in the long-term development of growing conurbations.
- Establish *road-user charges that reflect externalities* (road damage, air and noise pollution, congestion, and safety); where fuel taxation is used as a proxy, Western European levels are a more appropriate benchmark than U.S. levels for developing countries on the threshold of rapid motorization.
- Establish a *general urban transport fund* to which revenues from the fuel surcharge are assigned in support of expenditures on the most sustainable means of improving the performance of the urban transport system.
- Ensure that *urban public transport fare, service, and finance policies* reflect the need to maintain a balanced, sustainable urban transport system, while avoiding an excessive shift to private automobiles.
- Be sensitive to the obligations of member countries under international environmental agreements, such as the International Maritime Organization Convention on Maritime Pollution, in preparing lending operations in the relevant sector.

Social Sustainability

Meeting the transport needs of the poor requires more attention to the roles of the informal sector and of nonmotorized transport and to the maintenance of rural access facilities, particularly with the use of labor-intensive techniques. Specific provisions are sometimes necessary to offset the effects of commercialization on the price of transport and the level of service and to mitigate the effects of occupational and spatial dislocation.

The objective is to increase the social sustainability of transport by making poverty reduction an integral part of national and local transport strategies. The World Bank Group can assist countries in the following ways.

1. Target the transport problems of the poor (particularly the urban poor).

■ *Improve their physical access* to jobs and amenities and reduce “excessive” time spent walking.

■ *Reduce barriers to the informal supply of transport* (subject to reasonable and enforceable levels of safety).

■ *Enable greater use of nonmotorized transport* by improving rights-of-way and interchange infrastructure and eliminating fiscal and financing impediments to vehicle ownership.

■ *Eliminate gender biases* by integrating the transport needs of women into the mainstream of transport policy and planning.

2. Improve the approach and criteria for addressing the transport problems of the rural poor.

■ *Emphasize access* (for example, by ensuring that bridges and culverts are durable and do not collapse or wash out) rather than high standards of performance (for example, by paving surfaces to increase speed) in rural transport networks.

■ *Support cost-effective, labor-intensive methods* for constructing and maintaining subsidiary roads

■ *Ensure community participation* in decisionmaking on local transport investment and maintenance, establish extension services to provide necessary technical advice and training, and support the development of rural funds.

3. Protect the poor against the adverse effects of changes in general transport policies and programs.

■ *Minimize the amount of resettlement and, where unavoidable, mitigate the effects of resettlement* by ensuring that people displaced by transport projects are resettled expeditiously and fairly.

■ *Mitigate the effects of redundancy* in overstaffed transport enterprises and agencies by ensuring that constructive reemployment and severance financing arrangements are in place.

■ *Develop efficient subsidy schemes for “social service” public transport* by defining public service obligations (PSOs) and establishing fiscally sustainable contractual compensation arrangements.

Redefining the Role of Governments and the World Bank Group in the Transport Sector

The change of focus in transport policy toward a market-based approach implies a radical change in the role of government. The private sector can take on more of the responsibility for providing, operating, and financing transport services and even some transport infrastructure through concessionary arrangements. Thus, the role of the government as supplier or quantitative regulator will decline, but its importance as the enabler of competition and the custodian of environmental and social interests will increase. Cost-benefit analysis remains the preferred method for allocating public resources economically (both for investment and for purchase of social services). Setting efficient charges for the use of publicly provided infrastructure, maintaining the competitive environment in the sector, and increasing community and user participation in decisionmaking, particularly in those areas where markets do not function adequately, will become more important.

There are a number of ways in which the World Bank Group can help governments develop a sustainable, well-functioning transport system, which is a crucial determinant of a country's competitiveness. Bank country strategy papers that assume moderate or high growth of GDP for an extended period must take into account that most developing countries are still at a stage where demand for freight transport grows more rapidly than GDP and that demand for passenger transport grows at least as fast as per capita GDP and substantially faster in growing urban areas. Failure to pay attention to these consequences can result in bottlenecks and problems in the performance of the transport system.

Institutional and policy reform should be the primary focus of the World Bank Group's efforts to make transport services more sustainable. In the absence of extensive reforms to deregulate and open up the sector and to strengthen its institutional capacity, projects are not likely to achieve their goals. The Bank can help governments to fulfill their enabling and supervisory role in a freer transport market through more selective and focused technical assistance for building the capacity and skills needed by the public sector.

A continued strong lending program in transport is essential because lending is complementary to policy and institutional reform; investment requirements in transport will continue to grow; and the private sector cannot supply all the transport infrastructure financing that is needed. By and large, existing lending instruments allow the freedom necessary to design and finance operations that support a reform agenda. Greater private sector involvement in financing transport infrastructure can be stimulated by IFC loans, equity participation, and capital market activities and by Bank and MIGA guarantee arrangements. There is also a need to explore further the potential of extended

onlending arrangements to facilitate the involvement of community and non-governmental organizations.

Partnerships are increasingly important and should be fostered by the Bank at the country level between the various actors and stakeholders; at the international level between the development community and the country; between the financial community and the sector; and between all those who are addressing the challenges of improving transport.

Lessons from experience must be learned more systematically. Much can be learned directly from the Bank's portfolio of activities in transport. *Experience needs to be carefully monitored on a number of important topics, including attempts to implement more explicit road-user charges; improve the maintenance performance of road administrations; increase the participation of beneficiaries in formulating and implementing transport policies and programs; develop and structure infrastructure concessions; devise methods to value time savings and environmental and long-term structural effects for improved project appraisal; and develop mechanisms (including tax and subsidy schemes) to sustain transport services for the poor.*

Developing a strategic approach to motorization is an increasingly critical task. The growth in demand for mobility in developing countries has been satisfied primarily by an increased reliance on automobiles and trucks. The centrally planned economies tried to avoid this trend by imposing restrictions on motorization, but these restrictions now hamper their ability to respond with the flexibility needed to compete in market economies. Many developing and transition economies are not yet locked into a system of motorized transport but are already entering a phase of accelerated growth in motorization. As a result, many cities and interurban networks in these countries are experiencing severe congestion, safety problems, and pollution at earlier stages of development than their industrial-country counterparts. This suggests some urgency in identifying and implementing an alternate strategy with higher net benefits. Two different, but potentially related, issues must be addressed: the need to develop a more appropriate pace for motorization (that is, to balance decentralized private decisions on small capital outlays, such as the acquisition of a vehicle, with society's ability to mobilize resources and implement large capital investments to expand road networks) and the need to identify a more balanced multimodal transport network, with fewer implicit or explicit subsidies, that could become the long-term objective of transport policy. The central problem is to identify one or more strategies within a market framework that are capable of generating efficient and sustainable spatial structures and multimodal transport systems while accommodating significant economic and population growth. More research is necessary on this topic, given that hundreds of billions of dollars are likely to be invested in surface transport over the next two to three decades in developing and transition economies. It would also be appropriate to initiate a process of consultation with various

stakeholders, through workshops and conferences on motorization, as a basis for gaining widespread commitment and contributions to an international effort aimed at developing and nurturing more sustainable alternatives to the dependency on automobiles. In particular, the consistency between transport policy (focusing on managing the rate of motorization) and industrial policy (focusing on developing the domestic automobile and bicycle industry) should be addressed at the level of country strategy.

Note

1. All dollars are U.S. dollars unless otherwise noted. A billion is 1,000 million.

CHAPTER ONE

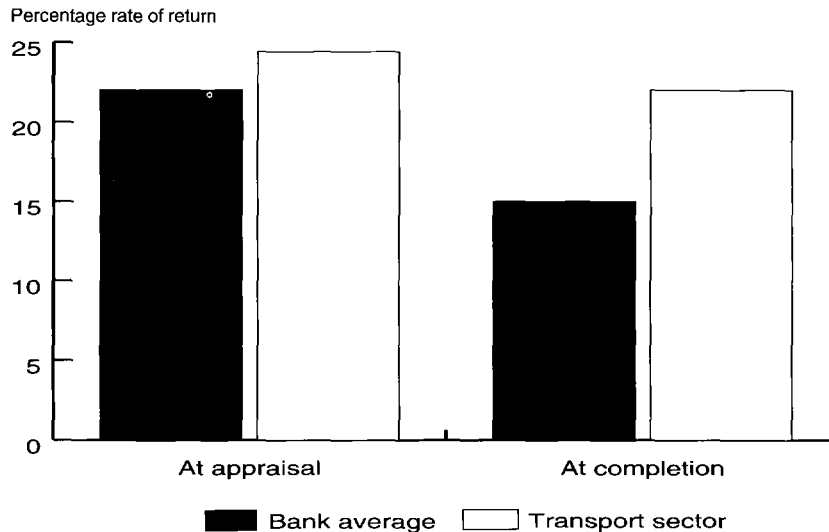
Refocusing Transport Sector Policy

World Bank operations have contributed to the creation of essential transport infrastructure in developing countries, with the aim of improving access to jobs, education, and health facilities and of facilitating domestic and international trade. However, new challenges associated with the changing characteristics of global production and trade, as well as people's growing aspirations for a better quality of life, will require developing and transition countries to adopt transport policies that are more sustainable economically and financially, as well as environmentally and socially.

Transport is crucial to development. Without access to jobs, health, education, and other amenities, the quality of life suffers; without access to resources and markets, growth stagnates, and poverty reduction cannot be sustained. Inappropriately designed transport strategies and programs, however, can result in networks and services that aggravate the condition of the poor, harm the environment, ignore the changing needs of users, and exceed the capacity of public finances.

Studies by the World Bank have shown that transport generates growth by facilitating trade, both nationally and internationally, and by increasing access to health and education facilities, as well as to local and national amenities. At the macroeconomic level, cross-country studies have confirmed that investment in transport raises growth by increasing the social return to private investment without crowding out other productive investment and that inadequate transport infrastructure is an important constraint on aggregate agricultural productivity. At the microeconomic level, improvements in transport directly lower agricultural input prices and hence the costs of production, increase access to markets and hence diversification of output, and indirectly

FIGURE 1.1 ESTIMATED RATES OF RETURN ON WORLD BANK-FINANCED PROJECTS



Source: World Bank 1995a.

facilitate the development of the nonagricultural rural economy. In urban areas, the quality of transport infrastructure and public transport service affects the locations chosen by firms and individuals, the scale and form of urban agglomerations, the efficiency of the labor market, and the costs at which labor is obtained.¹ At the project level, reports by the Operations Evaluation Department of the World Bank (OED) have shown that the performance of the Bank's lending in the transport sector is above average, both at appraisal and at completion (see figure 1.1).²

The importance of transport does not diminish as countries industrialize. International trade in merchandise, and by implication the movement of goods, grew, on average, throughout the world by 5 percent annually between 1980 and 1992, compared with income, which grew by only 3 percent a year. Japan and Korea have based their rapid growth on the export of their manufacturing goods, and economies such as Malaysia, Taiwan (China), and Thailand have benefited from participating in globally integrated production and assembly chains (World Bank 1993b). This could not have occurred without high-quality domestic, regional, and international transport.

Until the 1980s, transport *infrastructure* (rights-of-way, track, terminals, and associated traffic management) in developing countries was provided primarily by the public sector for all modes of transport (road, rail, air, and maritime and inland water) and at all levels (international, national, regional, and local, both urban and rural). In the provision of transport services (conveyance

of passengers and freight), railways were usually a public sector monopoly, while in air and maritime transport, national-flag carriers were also usually in the public sector. In contrast, in trucking, bus, and inland waterway transport, the private sector was predominant, even though state-owned enterprises for transport existed in many countries and nontransport state-owned enterprises often possessed their own fleets. Even in these subsectors, however, governments have usually played a critical role by setting charges for the use of public infrastructure and by regulating the type, quantity, and prices of private sector services (Armstrong-Wright and Thiriez 1987).

The World Bank Group's Experience in Transport Lending

Within this context, the World Bank Group contributed to the development of the transport sector in its borrowing member countries by financing the construction of physical infrastructure and equipment, technical assistance to evaluate and implement required reforms and adjustments in sector policies and management practices, and training programs to facilitate human resource development. It has also engaged in a continuing dialogue with governments to assist policymaking.

Sectoral Composition of the Lending Program

Since it started lending for transport in the late 1940s, the Bank has provided nearly \$50 billion in loans and credits through more than 1,000 projects in direct support of transport sector development. Additional funding, amounting to roughly \$12 billion up to 1994, was provided through the transport components of lending operations for agricultural and industrial development. The share of transport lending in the Bank's overall lending has varied substantially. Through the end of 1955 it averaged 18 percent, increasing to 40 percent between 1956 and 1965 and then declining to 30 percent between 1966 and the early 1970s. Since then it has fluctuated between 13 and 16 percent. The composition of transport lending has also changed substantially (see figure 1.2), with the share of road and urban transport lending increasing at the expense of railway and port lending.

Railway and waterborne transport lending accounted for about two-thirds of the Bank's lending for transport up to 1960, largely in loans to Japan and European countries for equipment to make up for the replacement lag and prolonged shortages following World War II. These loans could be disbursed quickly and needed little supervision. After 1960 the emphasis shifted to building infrastructure in the developing countries, including the newly independent African countries. Beginning in the mid-1970s the emphasis in both subsectors moved to institutional reform, and during the 1980s the Bank began to engage in much broader policy dialogue with borrowers. For example, the Maritime Sector Development Program in Indonesia covered a

of passengers and freight), railways were usually a public sector monopoly, while in air and maritime transport, national-flag carriers were also usually in the public sector. In contrast, in trucking, bus, and inland waterway transport, the private sector was predominant, even though state-owned enterprises for transport existed in many countries and nontransport state-owned enterprises often possessed their own fleets. Even in these subsectors, however, governments have usually played a critical role by setting charges for the use of public infrastructure and by regulating the type, quantity, and prices of private sector services (Armstrong-Wright and Thiriez 1987).

The World Bank Group's Experience in Transport Lending

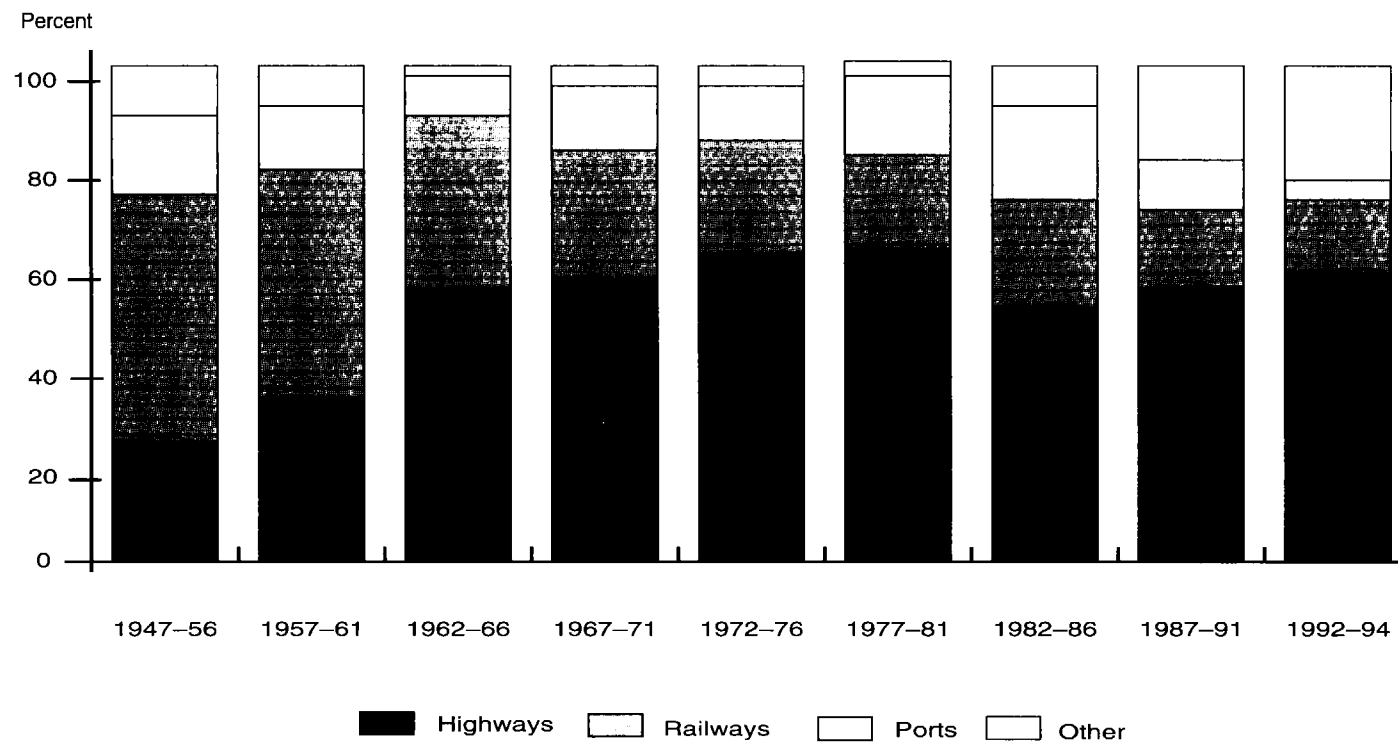
Within this context, the World Bank Group contributed to the development of the transport sector in its borrowing member countries by financing the construction of physical infrastructure and equipment, technical assistance to evaluate and implement required reforms and adjustments in sector policies and management practices, and training programs to facilitate human resource development. It has also engaged in a continuing dialogue with governments to assist policymaking.

Sectoral Composition of the Lending Program

Since it started lending for transport in the late 1940s, the Bank has provided nearly \$50 billion in loans and credits through more than 1,000 projects in direct support of transport sector development. Additional funding, amounting to roughly \$12 billion up to 1994, was provided through the transport components of lending operations for agricultural and industrial development. The share of transport lending in the Bank's overall lending has varied substantially. Through the end of 1955 it averaged 18 percent, increasing to 40 percent between 1956 and 1965 and then declining to 30 percent between 1966 and the early 1970s. Since then it has fluctuated between 13 and 16 percent. The composition of transport lending has also changed substantially (see figure 1.2), with the share of road and urban transport lending increasing at the expense of railway and port lending.

Railway and waterborne transport lending accounted for about two-thirds of the Bank's lending for transport up to 1960, largely in loans to Japan and European countries for equipment to make up for the replacement lag and prolonged shortages following World War II. These loans could be disbursed quickly and needed little supervision. After 1960 the emphasis shifted to building infrastructure in the developing countries, including the newly independent African countries. Beginning in the mid-1970s the emphasis in both subsectors moved to institutional reform, and during the 1980s the Bank began to engage in much broader policy dialogue with borrowers. For example, the Maritime Sector Development Program in Indonesia covered a

FIGURE 1.2 MODAL DISTRIBUTION OF WORLD BANK LENDING FOR TRANSPORT, FUNDS COMMITTED, 1947-94



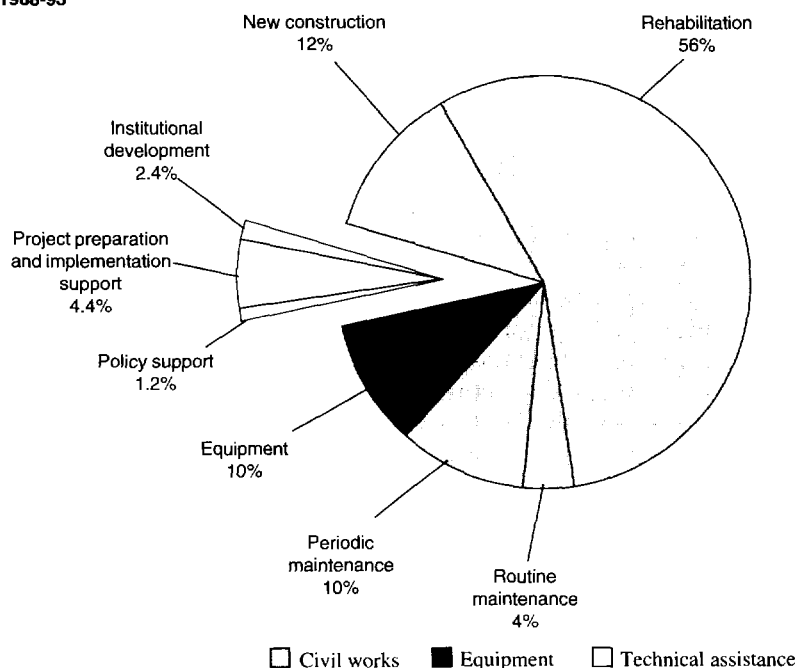
Note: Before about 1975, largely pipeline and aviation projects and engineering loans and credits; thereafter urban transport projects and sector loans and credits.

Source: World Bank data.

broad spectrum of ocean and inland waterway transport, port, and trade logistical issues. The successful concessioning of Argentina's railways is a broad spectrum of ocean and inland waterway transport, port, and trade logistical issues. The successful concessioning of Argentina's railways is a case in which the Bank played an important role in assisting a government that was already committed to institutional reform. However, as experience with Brazilian ports and Pakistani railways shows, Bank lending operations aimed at facilitating institutional reforms have not been that successful in the absence of government commitment.

Highway sector lending increased steadily until the late 1970s, by which time it accounted for two-thirds of the transport portfolio. It now accounts for about 60 percent of transport lending. In earlier years the emphasis was on the creation of a basic road network. During the 1970s and 1980s attention was directed more toward rehabilitation and maintenance, which accounted for 70 percent of highway sector lending between 1988 and 1993 (see figure 1.3). Concerted efforts to establish effective maintenance organizations and budgetary commitment gained momentum only in the late 1970s. Lending in the sector has not been confined to principal roads. In most countries the total length of the network of rural roads, paths, and tracks is

FIGURE 1.3 MAJOR COMPONENTS OF WORLD BANK-SUPPORTED HIGHWAY PROJECTS, 1988-93



Source: Analysis of data from World Bank staff appraisals 1994.

five or more times that of the primary interurban highway network. For example, during the twenty-five years from 1964 to 1989 the Bank provided about \$1.7 billion in loans and credits to construct, rehabilitate, or maintain more than 160,000 of the 880,000 kilometers of classified rural roads in Sub-Saharan Africa.

Urban transport lending began in the mid-1970s. A sector policy paper published by the World Bank in 1975 emphasized the need to rationalize the use of transport facilities, promote efficient public transport companies, and devise patterns of spatial development to reduce transport requirements. Although the paper placed a heavy emphasis on increased charges for road use in congested areas, much of the effort in Bank projects, and much of the attention of the subsequent 1986 policy paper, was devoted to traffic management and the development of public transport (World Bank 1975, 1986c).³ In some Latin American countries radical measures to give buses priority over private cars were successfully implemented.⁴ In East Asia measures to assist private sector minibuses in Kuala Lumpur and jitneys in Manila improved the quality and affordability of public transport.

Aviation sector lending funded the construction and rehabilitation of some international airports in the postwar period and of local airports from the 1970s on, but such lending is now negligible. It is likely that future investment needs in airports and air navigation facilities will be met predominantly by the private sector. More recently, the Bank has been involved with airport privatization and with the privatization or restructuring of airlines on a national or regional basis to eliminate major drains on public finance (in Angola, Bolivia, Cameroon, Jamaica, Poland, and Sri Lanka).

The Changing Focus of Transport Lending

Fiscal crises in many developing countries since the early 1980s, and more recently in the transition economies, have reduced the resource base for transport sector funding. This has highlighted the need to use existing resources more efficiently. Development may still be constrained by inadequate transport infrastructure in some transition economies, in China, and in some other Asian countries with rapidly growing economies, but the main near-term problem in many countries is the inadequacy of management and maintenance of both infrastructure and service. This shortcoming is often exacerbated by unwieldy regulations and managerial practices.

To address this problem, the Bank has used a variety of instruments. *Sector loans*, such as the highway sector loans to Indonesia and Thailand in the early 1990s, have supported multiyear public investment programs based on prior mutual agreement on the objectives, general composition, and priorities in the sector. By contrast, *sector adjustment loans*, such as those made to Burkina Faso in 1992 and Senegal in 1994, have focused on policy reform rather than on the investment program. *Sector adjustment loans* have

addressed a wide range of sector policy and management issues, often covering several transport modes within a single lending operation.

Bank financing of transport vehicle fleets has been decreasing as the Bank has concentrated on assisting the transfer of transport enterprises from the public to the private sector (particularly in road freight haulage and air transport) and on reducing constraints on private initiative (as in the case of the Mexican trucking industry). This approach has been pursued through narrowly targeted policy reforms in the context of investment projects (for example, as in road freight haulage privatization in Yemen) or, more usually, as an integral part of broader structural adjustment loans (as in the privatization of air and urban transport in Peru), or public enterprise reform adjustment loans (for example, Argentine railways). In other cases, such as the privatization of trucking in Hungary, Poland, and Russia, the Bank has had an indirect influence through its participation in the general policy dialogue on reform of the transport sector.

Transport policy and management issues have also been addressed in *public expenditure reviews*, in fiscal studies, and in reforms associated with structural adjustment lending and public enterprise reform projects. These new-style operations have been particularly successful in Argentina, Chile, and Mexico, where governments adopted liberal economic management policies to redress the failure of protectionist regimes. In some countries, the Bank has supported institutional development, such as the creation of a national highway maintenance organization (as in Chile), metropolitan planning organizations (as in several Brazilian cities), and traffic management organizations (as in Tunis).

Increased Cooperation with the Private Sector

Historically, the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA) have been the most active parts of the World Bank Group in the transport sector. However, since 1992, when the IFC's infrastructure department (including a transport division) was created, the IFC has made a range of direct investments on its own account (debt, equity, and quasi-equity) and has organized syndication of debt in the sector. Individual loans have reached \$50 million, with participation generally structured as part of a larger project finance package. By the end of 1995, fifteen projects had been approved, all in Asia or Latin America, in ports, airports, rail, mass transit, airlines, and shipping. The IFC has also been involved in setting up regional infrastructure funds to facilitate the flow of private sector equity into developing countries; a fund for Asia now has a capitalization of \$700 million. Such funds have been able to identify suitable investment opportunities, particularly where there is an appropriate enabling environment to facilitate complementary long-term loan financing. More recently, MIGA has also begun operating in the transport sector.

Learning from Experience

In general, the Bank has been successful in assisting the establishment of basic transport infrastructure and in improving the treatment of environmental and resettlement issues in client countries. In public transport it has also supported the pioneering of new modes (such as minibuses in Kuala Lumpur and Sri Lanka) and the development of cost-effective mass transport facilities (such as the busways in several South American cities). Through its lending program, the Bank has supported a wide variety of technologies ranging from low-technology options (for example, bicycles in Peru, jitneys in the Philippines, and rural roads and tracks in Sub-Saharan Africa) to high-technology options, such as high-speed rail (the Japanese Shinkansen), interurban motorways, and container ports (Nava Sheva in India).

Some investments failed. In some cases this was attributable to bad forecasting, as in the case of the Second Congo Railway Loan of 1976–80, where critical rail traffic did not materialize, costs escalated, and the fundamental premise that the old line would be replaced by the new was not realized. In most cases it was due to insufficient attention to institutions and incentives, as in the case of the Colombian and Argentine railways, which, despite a series of loans, did not significantly improve until they were privatized. The Bank has learned from this kind of experience (see box 1.1). In particular, it has begun to address the institutional weaknesses that caused many of the problems in past lending for infrastructure projects by patient and persistent encouragement through redesigned transport sector loans and project loan conditions.

In many cases the problem is not to reform a single agency but to develop a coordinated approach by several institutions. The need for an integrated policy has become particularly apparent in urban areas, where attempts to manage traffic have often failed due to political unwillingness to implement and enforce policies, lack of staff for design and enforcement, and lack of public transport alternatives. To be effective, a range of interventions needs to be coordinated as part of a comprehensive strategy for integrating transport into land use and development programs. This inevitably takes time and continuing, consistent commitment (see box 1.2).

In other cases, even broader policy coordination is necessary. For example, the transport infrastructure loans to Brazil in support of the Carajas Iron Ore Project and the POLONOROESTE program financed development projects that were successful in engineering terms but were inadequately supported by other actions to prevent ecologically and socially damaging exploitation (box 1.3). The introduction of systematic environmental assessments in 1989 has helped prevent direct harm from Bank-funded projects, but difficulties remain, particularly in respect to the longer term and the less direct consequences of projects that are potentially beneficial but require continued monitoring, management, and control.

BOX 1.1 INSTITUTIONAL REFORM AND RAILWAY PERFORMANCE

Until the early 1980s the World Bank's lending to railways often failed to generate the expected improvement in railway performance in developing countries. Projects frequently fell short of their objectives because the Bank attempted to treat poor performance by setting operational targets rather than by focusing on the underlying institutional causes and the means of alleviating them. The essence of the problem was that the government was able to interfere in the management of the enterprise. This led to poorly defined goals, relatively passive management that was unresponsive to changing conditions in the market, inadequate funding, and lack of autonomy. Evidence mounted during the 1970s and 1980s of the potential benefits from fundamental reform of public enterprises and their operating environment. Experience showed that (a) the functions of railways need to be clarified and divided into market-driven and socially driven components; (b) public service obligations should be defined in a centralized arrangement with explicit negotiated payments from the government; (c) railways should be organized in profit centers along their lines of activity; (d) railways need to be given effective incentives and clear authority; (e) changes in regulation and other government intervention should reflect

the new responsibilities and authorities of restructured railways; and (f) obstacles to change, such as redundant labor, excessive debt, or uneconomic trackage, need to be removed. These lessons have been reflected in the Bank's railway lending since the 1980s in the following ways:

- Performance agreements have been adopted in many countries to clarify the relationship between the railway and the government.
- The private sector's role has increased significantly in Argentina and Peru (franchising of individual freight and passenger lines).
- Private sector participation has increased in Mozambique (warehousing and container freight stations), Poland (manufacturing and repair subsidiaries), and elsewhere.
- Competition has been promoted and public interference has been reduced through regulatory reform in Colombia and Morocco.
- Explicit attention has been given to reducing labor redundancy, most notably in Argentina and Poland.
- In countries like China and India where railways still operate in a strong planning context, the focus has shifted toward facilitating institutional change and a market orientation.

Source: Galenson and Thompson 1994.

Challenges for Transport Policy

Within existing institutional and policy frameworks, a core network of transport infrastructure and associated conveyance services has been put into place. However, political and economic liberalization has created more freely functioning

BOX 1.2 INTEGRATED POLICY DEVELOPMENT: URBAN TRANSPORT IN TUNIS

In 1972 Tunis suffered from acute traffic congestion, poor-quality mass transport services, and a deteriorating environment for pedestrians. Since 1973, the World Bank has helped address these problems through a series of lending operations, including two urban transport projects, a municipal sector project, and a public enterprise reform loan. Together these operations have supported a strategic combination of traffic management measures and low-cost investments, large-scale road and mass transport investments, regulatory reforms, and institutional growth. The program is not yet completed.

In the area of traffic management the Bank assisted in establishing the Tunis District's regional planning agency and in setting up a traffic management unit in the municipality of Tunis. This unit (which grew to about fifteen professional staff, all Tunisians, with a stable managerial and technical nucleus) implemented a centrally controlled system of traffic signals, minor works for improved intersections, pedestrian-only areas, and reserved bus lanes. All but the bus lane subproject were successful and have been sustained. A second phase of work, including a cell-based traffic-restraint system for the downtown area, expansion of the interconnected network of traffic signals, further improvements of intersections and pedestrian areas, and metered parking, was partly financed by a second urban transport project, which also funded technology transfer in the area of strategic planning of urban

transport by creating a technical group in the Tunis District.

In road investment the government agreed to limit the expansion of traffic capacity for the duration of the first urban project to give traffic management methods a chance to reduce congestion. Only after the establishment of a traffic management regime was a program of strategic road investments implemented to provide expressway-level routes for long and interurban trips, in parallel with a second-phase traffic management program focusing on traffic restraints.

In mass transport the Bank assisted the rehabilitation of the publicly owned company, Société Nationale des Transports, that served Greater Tunis. Investments were made in the bus fleet in Tunis and in the 20-kilometer urban railway line connecting downtown Tunis with suburban townships along the Bay of Tunis. A subsequent public enterprise reform loan supported the establishment of a contractual relationship between government and mass transit operators as a means of improving efficiency in management and service delivery.

Twenty years after the commencement of this program, traffic flow in Tunis is smooth, pedestrians have reclaimed many subareas of the downtown, and the supply of mass transport services has been vastly improved and diversified. This has been achieved through a comprehensive approach, fostered by partnership with interested and activist local and national governments, developed over a protracted period, and leveraged through a substantial investment program.

**BOX 1.3 INDIRECT EFFECTS
OF TRANSPORT INVESTMENTS: LESSONS
OF POLONOROESTE**

In 1981 the Brazilian government launched the Northwest Region Integrated Development Program, or POLONOROESTE, to expand infrastructure and raise agricultural productivity, rural incomes, and social welfare in the agricultural frontier areas of Rondônia and northwestern Mato Grosso. The World Bank made loans to support the federal highway between Cuiabá and Pôrto Velho, to extend the feeder road network, to improve rural, social, and health services, and to protect the environment and indigenous peoples. The start of the program coincided with an acute economic crisis, which encouraged urban emigration and fueled the process of migration stimulated by the road developments.

Road investments under POLONOROESTE were implemented successfully, providing settlers with improved access to markets and services. Moreover, their design contained pioneering environmental and social protection components. But agricultural support services, community facilities, and environmental and Amerindian protection measures lagged behind; there were many more migrants than

projected; counterpart funds were insufficient due to the economic crisis; investment credit for perennial crops was inadequate; and management was overcentralized, with inadequate integration of participating agencies. When the Bank recognized these problems, disbursements were suspended in March 1985 until the federal authorities took steps to strengthen the institutional structure and redirect program funds to protect vulnerable Amerindian areas.

Much of the environmental degradation that has been subsequently associated with POLONOROESTE reflects a failure to predict the scale of migration and to control the expansion of urban and rural settlement so that migrants did not exploit the very areas the program was designed to protect. The primary lesson from this experience is that both the Bank and its member countries need to anticipate the possibilities of environmentally undesirable consequences and to have a strong commitment to (and improve the phasing of) associated measures of amelioration and control. An appropriate framework for protection must be in place before a project is implemented.

Source: World Bank 1992b.

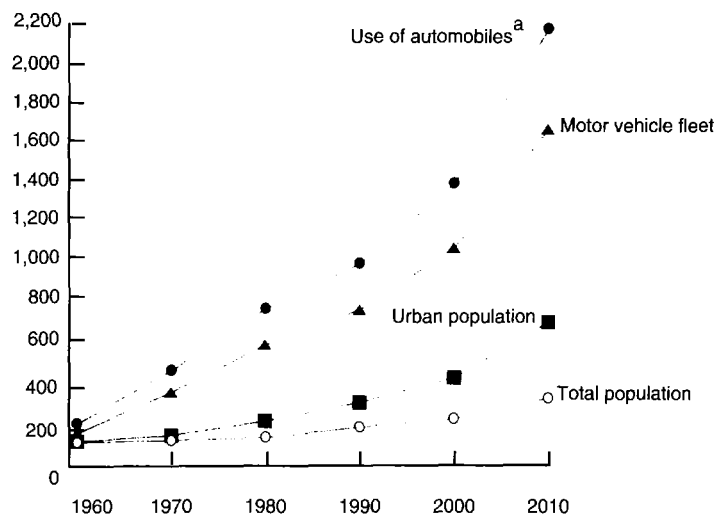
markets for labor, capital, and goods and services, and spatial and industrial structures are changing as a consequence. In particular, labor continues to shift from agricultural employment in rural areas to industrial and service sector employment in urban areas. It is estimated that by 2000, 38 percent of the population of Africa and Asia, 67 percent of that of Eastern Europe, and 77 percent of that of Latin America will live in urban areas; a large proportion of these people will live in megacities.⁵

On present trends, demand for both freight and passenger transport will

continue to grow faster than population and GDP in most developing countries. Although developments in telecommunications may bring about some substitution of movement of information for movement of people (for example, increased telecommuting), in other ways they may increase the movement of goods by making longer-distance international outsourcing of manufacturing processes easier (for example, through improved ability to track, trace, and control freight movements). The bulk of the expected increase in demand will be for road transport. The worldwide fleet of road motor vehicles is expected to grow 34 percent between 1989 and 2000, from 557 million to 745 million. This rapid growth will occur particularly in countries that are on the threshold of industrialization. For example, a tripling of the vehicle fleet is expected in China in the decade 1990–2000 (see Daimler Benz 1990). The number of car-miles traveled tends to grow even faster than the number of cars owned (see figure 1.4). Demand for freight transport in industrial countries typically grows less rapidly with GDP than does demand for personal transport. In the developing countries, however, the growth rate expected for the movement of road freight (and hence for trucks) is close to that expected for the movement of people (automobiles). The highest growth rates for road freight

FIGURE 1.4 ESTIMATED GROWTH IN OWNERSHIP AND USE OF MOTOR VEHICLES SINCE 1950

Index (1950 = 100)



a. Extrapolated from OECD data.

Source: Faiz 1993.

are expected in the former socialist countries of Central and Eastern Europe, where trucking activity is expected to triple within twenty years.

The world growth rate of air travel now exceeds that of car travel (Schumann 1992). In China the growth rate for the past few years has been 20 percent a year. In the maritime sector, aggregate movement of tonnage for all cargo classifications is expected to grow at average annual rates of around 3 percent to reach about 5 billion tons at the beginning of the next century. The transpacific and transatlantic routes will remain important, but movement within Asia will grow most rapidly, and significant increases in movement between Asia and Europe can be expected. Inland waterway transport, particularly of freight, has a long tradition in countries with extensive river systems (for example, Brazil, China, Russia, and Vietnam). In these countries, and in several others in South America and West Africa, further development of inland waterway transport is likely. Rail transport will continue to play a very important role in China, India, and some smaller countries with substantial bulk freight movements. The absolute decline in rail transport that has occurred in Central and Eastern European countries in the past five years has bottomed out in some countries, and traffic should recover with economic growth. Nevertheless, given present trends, the share of rail transport in transition and developing countries may decline. Within nonmotorized transport, animal-drawn transport is generally decreasing. The ownership and use of personal bicycles are currently high and increasing in China and some other Asian countries, and low and stable in Latin America, but have been declining in Africa over the past decade (Doulet 1994). In poorer countries the role of cycle rickshas has also been increasing.

These "business-as-usual" projections imply a continuing high demand for investment in transport infrastructure. In countries with high per capita GDP growth rates, much investment will be needed to eliminate emerging bottlenecks in interurban transport. For example, in Asia the share of infrastructure investment in GDP is expected to rise from 4 percent at present to more than 7 percent by 2000, with transport and energy expected to demand the most resources. Even in countries with low per capita GDP growth rates, transport infrastructure will be increasingly congested in major cities, where an average population growth rate of 6 percent a year is often associated with high rates of local income growth.

Unfinished Business

Continued improvement of transport systems requires completion of some "unfinished business" of extending basic infrastructure networks and providing for their adequate maintenance.

INCREASING ACCESS AND AFFORDABILITY. Increasing access for the rural poor requires the expansion of secondary and tertiary transport networks and

the provision of more public transport services. Thirty-three percent of China's population and 75 percent of Ethiopia's population still do not have access to all-weather transport. Walking more than 10 kilometers a day each way to farms, schools, and clinics is not unusual in rural areas, particularly in Sub-Saharan Africa. Commuting (whether walking or taking public transport) also accounts for a large part of the time of the urban poor. Despite the prevalence of foot travel and cheap informal means of transport, the financial cost of commuting for the urban poor can be high (14 percent of the income of the poor in Manila compared with only 7 percent of the income of the nonpoor).

CONFRONTING THE MAINTENANCE CRISIS. Transport infrastructure and services deteriorated during the 1980s in most African and Latin American countries. In the past two decades \$45 billion worth of road infrastructure assets has been lost in eighty-five developing countries owing to inadequate maintenance. Deferring maintenance expenditures is self-defeating in two ways. In the short run, it increases the costs of operating vehicles. For example, on an annualized basis, every extra dollar not spent by the road agency to maintain in fair or poor condition a road carrying 500 vehicles a day will increase road-users' costs of operating vehicles by between \$3.4 and \$6.1. In the longer term, rehabilitating paved roads every ten to twenty years is more than three times as expensive for the government, in cash terms, as maintaining them on a regular basis, and it is 35 percent more expensive in terms of net present value discounted at 12 percent a year (Paterson and Archondo-Callão 1991).

Meeting New Challenges

Effective performance of the economic and social role of transport also requires attention to the new problems posed by participation in the opportunities and risks of a competitive global marketplace, by user aspirations for better-quality services, and by the adverse consequences of rapid motorization.

ADJUSTING TO CHANGING GLOBAL TRADE PATTERNS. Changing spatial patterns of demand associated with political and economic reform (as in the creation of new sovereign states in Central Asia and Europe) and with emerging regional free trade agreements and customs unions (such as the North American Free Trade Agreement—NAFTA; the Southern Cone Common Market; and the Andean Pact) are reorienting trade flows. Parallel technological improvements in production, information, and international transport have allowed developing countries to be increasingly integrated into a global industrial structure, producing intermediate goods, such as electronic components, or final products, such as fashion goods, to demand and strictly to time within tightly controlled and globally integrated logistical distribution channels (Ewers and Fonger 1993).

Industrial production and assembly processes have become increasingly mobile, as exemplified by the movement of electronic component assembly and clothing manufacturing from country to country (Savy 1992). Already, manufactured goods account for more than 50 percent of the exports of the low-income developing countries (with the exception of Sub-Saharan Africa), more than 60 percent of those of middle-income countries, and more than 90 percent of those of Asia's newly industrialized economies.

INCREASING RESPONSIVENESS TO CUSTOMER NEEDS. The globalization of manufacturing business has arisen partly from the development of a transport-intensive and inventory-sparse logistical structure. More and more, success in international competition requires fast and reliable international movements of freight in smaller consignments using a combination of modes (Peters 1992). Maritime transport, port, and hinterland transport facilities must be better integrated. Harmonized documentation arrangements and good information technology become crucial, as shown in some Sub-Saharan Africa traffic corridor studies (World Bank 1994a). In countries like India, outmoded administrative arrangements and regulations still govern the conduct of trade and transport, imposing delays that damage the countries' potential place in world trade. Requirements for passenger transport also change. Increasing urbanization generates new needs, often in informal settlements in peripheral locations not served by traditional transport operators. Failure to satisfy these needs harms the poor but also harms industrial competitiveness through its adverse effect on the availability of labor. At the other end of the spectrum, higher incomes may generate demand, and willingness to pay, for higher-quality public transport service than has traditionally been offered. Expectations also increase with respect to the safety, convenience, and environmental impact of public transport.

COPING WITH RAPID MOTORIZATION. Cities are major growth centers in most developing countries. However, the process of rapid urbanization has frequently been associated with increasing ownership of motor vehicles, a low proportion of urban space devoted to roads (11 percent in Bangkok, for example, compared with 20 to 25 percent in most European cities with well-functioning transit systems), very mixed traffic composition, and an aging and ill-maintained stock of vehicles (Stickland 1993). These characteristics generate three transport-related problems. First, roads tend to be very congested despite moderate per capita ownership of cars (Buenos Aires, Mexico City, and Seoul are saturated even though their levels of car ownership are only one-third of those of Western Europe). Second, automobile traffic contributes to urban air pollution (as, for example, in Bangkok, Mexico City, and Tehran). Third, the ensuing sprawl means that the poor have to travel a long way, and pay a high price in relation to their income and time budgets, to get to work.

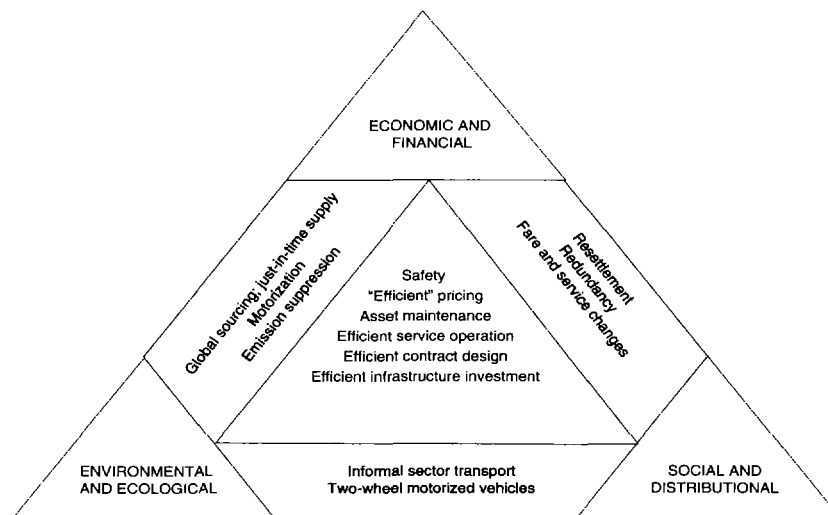
Even where these conditions do not already exist—for example, in many rapidly growing primary and secondary cities in both developing and transition economies—there is a danger that they may emerge very soon.

Sustainability as the Basis of Transport Policy

To be effective, transport policy must satisfy three main requirements (figure 1.5; see also Munasinghe 1993). First, it must ensure that a continuing capability exists to support an improved material standard of living. This corresponds to the concept of economic and financial sustainability. Second, it must generate the greatest possible improvement in the general quality of life, not merely an increase in traded goods. This relates to the concept of environmental and ecological sustainability. Third, the benefits that transport produces must be shared equitably by all sections of the community. This we term social sustainability.

Economic, environmental, and social sustainability are often mutually reinforcing (Munasinghe 1993). Road or public transport systems that fall into disrepair because they are economically unsustainable fail to serve the needs of the poor and often have environmentally damaging consequences. Hence, there are some policy instruments that serve all the dimensions of sustainability in a synergistic way, generating win-win solutions. These instruments include

FIGURE 1.5 THREE DIMENSIONS OF SUSTAINABLE DEVELOPMENT: SYNERGIES AND TRADEOFFS



measures to improve asset maintenance, technical efficiency of supply, safety, contract design, and public administration, as well as charges for external effects. However, that convenient synergy does not always hold. Increased mobility, particularly private motorized mobility, typically increases measured GDP but damages the environment. Although global sourcing of manufacturing industry and “just-in-time” logistics reduce the costs of products, expenditures on transport tend to increase as many more goods are transported over longer distances. These shifts to movement by faster modes (air) or in smaller batches with greater flexibility in frequency of schedule and variety of routes (road) also have potentially adverse environmental implications (particularly noise and air pollution). Improvements of transport infrastructure may involve involuntary resettlement. More efficient provision of transport services in a competitive framework may involve loss of jobs, imposing social costs and restructuring of prices and services that may hurt some users.⁶ Public transport provided cheaply by the informal sector and motorized two-wheelers may meet the transport needs of the poor but be environmentally damaging. All these phenomena involve tradeoffs that governments must face. A policy for sustainable transport is one that both identifies and implements the win-win policy instruments and explicitly confronts the tradeoffs so that the balance is chosen rather than accidentally arrived at. It is a policy of informed, conscious choices.

Economic Sustainability: Creating Incentives for Efficient Response to Needs

A sound economic base is fundamental to sustainability. Transport investments should thus continue to be subject to rigorous cost-benefit analysis, albeit expanded to encompass environmental externalities. The need for economic justification applies not only to infrastructure—which typically accounts for only between one-quarter and one-half of the value of total capital stock employed in transport and contributes only about 5 percent to the total cost of provision of transport services—but also to decisions on the purchase and use of vehicle fleets, as well as the organization of the logistic chain, whether in the public or the private sector. Ensuring the long-term sustainability of facilities requires that capital assets be maintained adequately. In infrastructure, this is hampered by inadequate budgeting and follow-up for maintenance, accentuated when governments take the “soft” option of deferring maintenance during a debt crisis. In the supply of transport services, regulated prices are often set at levels that are too low to provide for the adequate maintenance of equipment. The costs of maintaining excessively ambitious roads and other transport networks and the subsidized operations of poorly managed public enterprises in transport also frequently impose unsustainable fiscal burdens in developing and transition economies. Conversely, where

transport infrastructure is seriously deficient, economic and social development will be constrained. This applies both to poor countries with very sparse networks and to some wealthier and more rapidly growing countries where inadequacies in transport capacity create severe bottlenecks in trade flows.

This is not all that is implied by economic sustainability. Changes in the global economy have altered the nature of the demands that economic development makes on transport. To take advantage of the benefits of global trade in manufacturing goods, developing countries must be capable of providing freight transport that is fast, reliable, and, above all, flexible in response to user needs (Gouvernal 1988).

Environmental Sustainability: Promoting More Livable Settlements and Reducing Adverse External Effects

Demands for more flexible transport have increased dependence on road transport. This dependence tends to raise aggregate energy consumption, generate air pollution, and have other adverse effects on the environment that, although not always cumulative and irreversible, are nevertheless not sustainable in the sense that they do not represent chosen outcomes. In practice, these adverse environmental (and social) impacts are very difficult to reverse once personal lifestyles and the location of activities have been arranged to accommodate a high dependence on road transport. The challenge is to devise a transport policy which ensures that the actual outcomes are chosen, rather than being the unintended and unforeseen consequences of the policies adopted.

Viewing transport within the general perspective of sustainable development yields some immediate insights into this process. The weight placed on the various components of the general quality of life varies between cultures; hence, borrowing countries must ultimately define their own path of development. More motorized mobility is neither necessarily good nor inevitably bad. The relative importance of the components of the quality of life also varies between stages of development. For example, low-income countries may best be assisted by the provision of infrastructure, while medium- and high-income countries may benefit more from policy reform or measures that improve the environment. Whatever the preferred balance, increasing economic sustainability can advance environmentally sustainable development *but does not automatically do so*. Failure to incorporate externalities and environmental considerations into the assessment of projects and policies is what creates the sustainability gap. The policy challenge is to assist countries to recognize the tradeoffs that they face and to devise instruments that will prevent the sustainability gap from developing.

Social Sustainability: Reducing Poverty

In rural areas the poor are mainly dependent for their livelihood on their ability to produce and market agricultural products. Increased access to traded inputs (for example, fertilizers and equipment) and the possibility of transporting agricultural products to distant markets create the conditions for cash cropping to replace subsistence farming. This transformation will also facilitate the development of nonagricultural activities in rural areas.

Inadequate provision for vehicles can be very costly. The common practice of head-loading heavy freight can damage health. Accidents involving motorized vehicles and pedestrians or cyclists are frequent, due to a lack of shoulders on roadways and poor maintenance of rural roads.⁷

In urban areas the principal resource of the poor is their labor, and adequate and affordable transport to work is therefore a critical need. In practice, individuals have to make excessively long journeys to work in major cities on most continents (for example, in Bangkok, Lagos, and São Paulo). Where incomes are very low in comparison with transport costs, a high proportion of long walks to work is found, as in Nairobi (Oudho 1992).

In both urban and rural areas, anything that limits the provision of basic public transport, or makes it more expensive, is particularly damaging to the poor. The ultimate damage that can be done to the poor is the elimination of either the home (resettlement) or the job (redundancy), and these can be by-products of rationalizing the provision and operation of transport networks and services. Particular problems arise in meeting the transport needs of women. Many of the trips made by women are in categories conventionally and often incorrectly regarded as inessential (that is, trips not associated with formal work). As a result, these needs have received inadequate attention, both in the planning and in the financing of public transport.

Central to these problems is the failure to provide or maintain those activities and services that are most critical in ensuring that the poor have access to markets, employment, and social facilities. Because planning skills and paradigms that are relevant to industrial countries have been deployed in developing countries, priority has been given to the provision of high mobility rather than basic accessibility. This has favored persons who are already mobile, particularly vehicular road-users.

The Need for Policy and Institutional Reform

The challenge confronted in this report is to define the strategies that countries need to adopt to increase sustainability. The problems are very diverse. Deficient infrastructure and lack of basic accessibility tend to be more dominant problems in poorer countries, while poor quality of service tends to be in the forefront in the richer developing countries. Nevertheless, there are some

general lessons of wide applicability. Chapters 2 to 4 consider, in turn, the policy and institutional changes that are necessary for enhancing economic, environmental, and social sustainability. The new focus does not vitiate the continuing importance of efficient transport to trade, mobility, and, hence, economic growth or its contribution to the achievement of environmental and social objectives. However, it does highlight the frequent failure of the traditional emphasis on public sector operation and regulation to make that contribution in a continuing, sustainable way. This has been partly a human resource problem—because governments do not possess adequate skills for carrying out the demand-responsive operating tasks required of them—and partly an institutional problem, insofar as governments continue to rely on mechanisms and incentives that make unrealistic demands on human and fiscal resources. Chapter 5 summarizes the new demands that the emphasis on sustainability places on governments. Chapter 6 concludes with the implications of the new agenda for the World Bank Group's operations.

Notes

1. For crowding out, see Easterly and Rebelo (1993), who show that investment in transport and communication infrastructure does not crowd out other investments because it is highly correlated with growth but not with private investment. On agricultural productivity, see Antle (1983); on agricultural input prices and production costs, see Binswanger and others (1987); on market access and agricultural diversification, see Riverson and Carapetis (1991); on urban transport issues, see Hamer (1986); on labor costs in urban areas, see Lee and Anas (1989).

2. An analysis of the economic rates of return (ERRs) at appraisal and completion of 1,015 projects between 1974 and 1987 showed that transport and urban projects had the smallest disparity between the ERRs at appraisal and completion (4 percent for transport and 2 percent for urban projects) and that the average reestimated ERRs for a transport project appraised at 10 percent would also be 10 percent. (See Pohl and Mihaljek 1992.)

3. World Bank (1975, p. 60) states that “demonstrable willingness to advance in this direction [pricing] must be regarded as a *sine qua non* for Bank support.”

4. World Bank (1986a) states that “the [Brazil Urban Transport] Project was successful in implementing some of the most imaginative and radical bus priority measures carried out anywhere in the world.”

5. HABITAT (1987). Of twenty-three cities expected to have populations larger than 10 million by the year 2000, seventeen will be in developing countries, which are expected to have a further eighteen cities with populations greater than 5 million.

6. Economic efficiency is not synonymous with technical efficiency. A technically superior infrastructure is only economically superior if the extra benefits accruing from its technical superiority outweigh the extra costs of its construction.

7. A study of urban road accidents in Côte d'Ivoire found that 60 percent of pedestrian accidents and 40 percent of all accidents were related to a lack of pedestrian facilities. An additional 20 percent of accidents were related to deteriorated road surfaces. (See Saad 1989.)

CHAPTER TWO

Economic and Financial Sustainability

To be economically and financially sustainable, transport must be cost-effective and continuously responsive to changing demands. Competition, facilitated by regulatory reform to enable private firms to enter and exit the market more freely, forces transport suppliers to respond to users' needs at lower costs. Charges for the use of infrastructure and services that reflect the full cost of that use to society are necessary for market signals to be meaningful. The commercialization of remaining public sector firms is also necessary for economic and financial sustainability.

The traditional approach to transport has been based on detailed government intervention in the sector, ostensibly to protect the public interest. In the case of *infrastructure* direct state provision has been the norm. In the case of the provision of transport *services* governments have controlled entry, product characteristics, price levels, and maximum profit rates, through either regulatory commissions or direct control of state-owned enterprises. Regulation has usually taken the form of protection of a monopoly supplier, often in the public sector. Although state enterprises are not always or necessarily technically inefficient (in various ways, the performance of Chinese Railways matches the best in the world), as long as they have recourse to deficit financing to maintain supply, they have little incentive to be cost-effective or to respond flexibly to changes in user demand. Even regulated private enterprises suffer from government interference in matters of operational detail, which leads to the enterprise having poorly defined goals and relatively passive managers who are not responsive to changing market conditions (CEPAL 1992a). This has had three important consequences.

First, assets have not been maintained. In public transport well-intentioned

attempts to protect the poor by keeping fares at uneconomically low levels have led to the physical deterioration of the vehicle fleet and to a reduction in the services provided by many urban bus companies in such cities as Dakar, Panama City, and San Salvador and by many state-owned railway companies (Siele 1992). Public roads have also deteriorated to the point of collapse in many countries, particularly in Africa and Latin America. A recent Bank study concluded that 45 percent of the entire network in Latin America and the Caribbean requires either reconstruction or rehabilitation, at a cost of \$2.5 billion a year over the next decade (Gyamfi 1992).

Second, service has failed to respond to needs. Securely protected monopolies have failed to satisfy demands for expanded service or improved quality. For example, they often fail to serve growing low-income peripheral areas of the megacities, while at the same time making it difficult for informal transport modes to develop and serve the poor. Similarly, protected trucking and rail sectors have been slow to develop integrated high-quality logistics systems.

Third, costs have been too high. In Argentina the privatization of the railways demonstrated that labor costs were more than double those needed to maintain a financially viable system (Kogan and Thompson 1994). In the United Kingdom average operating costs per vehicle-kilometer in the bus industry were reduced by 30 to 40 percent following deregulation and privatization (Heseltine and Silcock 1990). There is also considerable evidence that road maintenance workforces directly employed by government departments (known as force accounts) are less efficient than competitive private sector contractors. In Brazil routine road maintenance costs by contract were 25 percent lower than by force account, and in Colombia, they were 50 percent lower (Gyamfi and Ruan 1992.). International transport is also affected; in Venezuela, the practice of reserving cargo for national carriers has increased shipping costs approximately 30 percent (see Peters 1993; see also box 2.1).¹

The critical weakness of the traditional approach is the absence of any structure of incentives to align the private interests of the supplier with the public interest. The absence of competition has enabled management, favored customers, and organized labor to appropriate part of the potential monopoly profit. The potential loss of patronage, earnings, and, ultimately, employment resulting from a failure to respond to consumer demand in competitive markets is the most powerful means of forcing suppliers to respond to consumer requirements. Thus, the basis for increasing economic sustainability in transport is to create a competitive, market-based transport sector.

Competitive pressures can be introduced in a variety of ways. Where there is no restriction on entry, competition in the market occurs. This type of competition can be between individual operators within a mode of transport, between groups of operators within a mode, or between modes. Even where entry is restricted, it is possible to organize competition *for* the market—for

**BOX 2.1 THE COSTS OF INTERVENTION:
MARITIME TRANSPORT FLAG PROTECTION**

In the majority of developing countries the policy of preserving transport rights for national-flag carriers is misguided. Cargo reservation shields national-flag carriers from competitive pressures in the international market for ocean transport, with the result that the cost of their services is higher than that of the international carriers. The loss to domestic importers and exporters is the difference between what they pay for the carriage of cargo and what they would have to pay in a free market. The gains to balance of payments from using domestic shipping are much less than their freight revenues because the maintenance and operation of a national fleet are usually very foreign exchange-intensive. Without domestic oil resources, steelmaking, and an efficient shipbuilding industry, the only savings that

materialize are the cost of crewing and managing the vessel, assuming that these functions would be fulfilled by nationals. A study of Venezuela concluded that freight rates were about 30 percent higher than would have been the case in a free market. On annual freight expenditures of \$800 million, the cost to the economy was \$287 million. Since 70 percent of the freight payments were to foreign carriers, the extra foreign exchange cost was \$187 million. The balance of payments gain from reserved cargo, once allowance was made for all inputs purchased abroad, was only \$20 million. Losses were therefore 9.4 times as high as gains. Loss-gain ratios for other developing countries were 7.4 for Brazil, 4.3 for India, 6.1 for the Philippines, and 9.2 for Turkey.

Source: Messerlin and Sauvart 1990.

the right to serve individual routes, for the sole right to provide a whole network, or for the right to undertake particular functions as a subcontractor to a monopolist operator.

Competition in the Market: Private Ownership and Operation

Competition in a market free from barriers to entry is appropriate for the provision of many kinds of transport services. Where the size of the market is large in comparison with the minimum efficient scale of operation of a mode of transport, several suppliers can operate concurrently at an efficient scale (for example, in trucking and rural bus operations). Where the optimal scale is larger, competition in the market can still be effective if there are good modal substitutes (which is often the case for railways, in contrast to trucks and buses) or international competitors (which is usually the case for air transport and shipping services and often also for airports and seaports).² In such cases the withdrawal of protective practices, such as reserving cargo for national carriers or sharing the market administratively, while painful in the short run,

is often the best basis on which to obtain the advantages of competition (as shown by the experience of shipping deregulation in Chile). More generally, free entry may be preferable to the alternative of ineffective or corrupt regulation if public administrative skills are scarce, as is the case in many developing countries (Mwase 1992). In contrast, some transport infrastructure cannot be efficiently duplicated, and free entry cannot, therefore, be relied on to prevent a private monopolist from charging unduly high prices.

There are few examples of state-owned enterprises having successfully shed their privileged financial status vis-à-vis the state budget. The absence of a genuine arm's-length relationship tends to undermine the development of a real competitive market. For example, in Odessa a subsidized bus company run by the public authority responded to the approval of a service to be provided by a private operator by beginning an unprofitable competitive service at one-third the fare of the commercial operator. The key to effective competition is the ability to fail, without which discipline is weak. Private ownership tightens the budget constraint and strengthens this threat.

In an unregulated market, profit may be sought through the creation of an operators' cartel, as occurred in the bus industry in Santiago, or by the combination of operators with suppliers of vehicles or terminals to exclude competitors from access to crucial supplies or facilities. Controlling anticompetitive commercial behavior requires a regulatory institution to prevent the acquisition and exploitation of excessive market power (Henry and Pacheco 1994). In practice, the regulation of cartelization is not a simple task because some forms of combination, such as operators' associations in public transport (for example, in Buenos Aires buses) or strategic alliances in logistics (most common in Japan and Western Europe), may actually contribute to the efficient workings of the market (Armstrong-Wright and Thiriez 1987). Even without cartelization, wherever there is a financially strong incumbent in a market, there is a danger that anticompetitive (predatory) behavior will occur. It is, however, almost impossible to distinguish between predatory and strongly competitive behavior. Pricing close to short-run marginal costs may well be efficient behavior when a firm has excess capacity, but it might equally form part of a strategy by a dominant firm to drive others from the market. For example, following deregulation of the trucking sector in Ethiopia, the state-owned enterprise was able to maintain parts of its market by continuing to operate at a deficit and failing to cover its depreciation costs. To minimize such dangers, it is advisable to accompany privatization and deregulation with restructuring the industry into a number of smaller firms. Where optimal scale is very small (as in taxi and trucking sectors), ownership should be fragmented, if necessary, by transferring the ownership of assets to former employees. Competition in transport markets should then be subject only to general oversight by the competent national authority responsible for ensuring fair competition.

Competition for the Market: Private Operation within a Framework of Public Control

There are three distinct reasons why it can be desirable to retain some public regulation of the right to supply transport. First, where duplication of supply would be either wasteful or impractical, as with indivisible infrastructures (major highways, bridges, seaport or airport superstructures, and railway infrastructure), the need to regulate stems from the danger of monopoly exploitation. Second, regulation may be desirable in some cases where an unregulated market process may result in duplication of schedules and potential excess capacity (for example, in local bus markets); increased pressure to engage in dangerous practices, such as overloading freight vehicles or racing buses (often increasing accident rates, as with the “red buses” in Delhi and the “black taxis” in South Africa); and perceived losses in the stability and reliability of service, with consequent losses in patronage and reductions in vehicle occupancy, as occurred in the bus markets in some British conurbations after deregulation. Third, although cost reductions resulting from unfettered competition may allow services to continue that were previously unprofitable, and may even lead to more frequent services being provided on previously unremunerative routes by using smaller vehicles that are more suited to low demand (as happened in the case of Indonesian domestic shipping), social objectives may sometimes require direct financing of some services that might otherwise be lost through competition in the market. For example, the elimination of cross-subsidies may reduce supply or increase the prices of services affecting the very poor, as in the case of rural bus services in Sri Lanka. In such situations, making markets contestable, through competition for the right to provide services at the lowest subsidy, will still allow unremunerative services to be provided at the least real cost (Gwilliam, Joy, and Scurfield 1994). All these defects of the market process may require qualitative controls (for example, standards for safe operation), but not necessarily monopoly franchises and certainly not direct state involvement in service provision (Darbera 1993).

Competition in Service Provision

Route franchising is a means of maintaining some public control over the level of services and prices in the public passenger transport market, while using competitive forces to secure supply at the lowest cost. This can apply to unremunerative bus services alone (as in most of the United Kingdom) or for all services (as in London and in Costa Rica), with the supplier either carrying only the cost risk (as in some cases in the United Kingdom) or carrying both the cost and the revenue risk (as in New Zealand). Where fragmented competition is not possible because of the indivisible scale of operation, market disciplines can still be employed by concessioning facili-

ties or systems. This has been applied to urban and interurban railways in Argentina and to the management of urban bus systems, particularly in francophone Africa.

Competition between groups within a licensed franchise system can be promoted by ensuring that the routes for which monopoly franchises are granted overlap sufficiently to encourage competition for patronage on common sections of the route. This approach is practiced to secure competition among different bus operators' associations in Buenos Aires (and other Latin American cities) and operators of different kinds of public transport vehicles in some African countries. It is also common in taxi markets in many countries where single-vehicle ownership is the rule but where operators combine in competing marketing groups or in the use of competing radio-dispatching circuits. This form of competition makes it possible to organize supply to some degree and limits anticompetitive or chaotic operating practices, so long as there is a competent franchising authority to prevent the emergence of a single strong cartel.

Competition between modes can be effective where demand is dense and varied, as exemplified by the role of privately operated minibuses in Dakar and Hong Kong. The introduction of some new categories of services at higher prices may be a means of reconciling the maintenance of a basic low fare with the provision of adequate total capacity and a sufficiently varied range of price and quality combinations to meet demand. Within regulated systems, this can arise either by design (as in the two-tier bus systems in Seoul and Shanghai) or by default (as in the case of illegal but uncontrolled shared taxis in many African and Latin American cities). A system allowing the informal sector to provide a range of services legally is less susceptible to exploitation by criminal elements. As table 2.1 shows, all services can be operated by the private sector in some form.

Competition in Infrastructure Provision

The competitive award of long-term concessions, licenses, or facility leases is the primary means for introducing market forces into the provision and management of infrastructure with the objective of stimulating efficiency by transferring risk to the private sector. It has been applied to toll roads in China, Hungary, Mexico, and Thailand, to railways in Latin America and Sub-Saharan Africa, and to ports and airports in many countries. Designing concession arrangements is not easy. Governments must develop effective prequalification criteria to select reputable firms. They must discourage over-optimistic bids based on unrealistic traffic forecasts and price setting (as appears to have happened with several Mexican toll roads) or understated construction costs (by allowing lenders to lose money when they make mistakes rather than renegotiating at any price). But there is evidence of substantial achievement. In the port sector the long-term leasing of berths, either with

or without cargo-handling equipment, has brought about increased efficiency in the use of labor and equipment in countries such as China, Indonesia, and Malaysia. In Argentina the concessioned freight railways doubled labor productivity, increased traffic, and reduced tariffs but failed to undertake promised investment expenditures; subsequent passenger concessions show signs of achieving similar improvements in productivity and patronage despite contracts that are drawn more tightly in order to link payments to performance on the investment front.

Where entrepreneurial skills are limited, the periodically renewable management contract, as used in many ports and airports in Africa, may be better in the short term, although its long-term desirability depends on how quickly capability is developed in the particular country. The key message is that the pace of regulatory reform must be tempered by considerations of indigenous administrative and commercial capability.

The Demands of a Competitive Framework on Public Administration

The provision of competitive services through route franchising requires the government to exercise substantial skill in designing networks and specifying tenders (see box 2.2). Franchises should stipulate clearly the service to be provided, including details of monitoring and enforcement procedures, the terms of remuneration for the service supplied, and the penalties for failure to perform (specified in a form that is capable of being legally enforced). Safe and environmentally acceptable operation must also be monitored and enforced, although the more constrained the conditions, the less competition there is likely to be. This may require some quantitative as well as qualitative control, as exemplified by the experience in Santiago. Where local services are concerned, skills are required at the local level that have not yet been developed even at the national level in many countries. It may, therefore, sometimes be sensible to combine the existing planning skills of the state-owned enterprise with the cost-efficiency of private sector supply by allowing the state-owned enterprise to subcontract (as in Delhi urban buses) or by retaining only the planning functions of the state-owned enterprise in a new regulatory role (as in the case of the Companhia Municipal de Transporte Coletivo in São Paulo).

The effectiveness of infrastructure concessions also depends on how efficient governments are in designing and implementing contracts. Auctioning concessions to the highest bidder will give the greatest incentives to cost-efficient production and market-oriented operations but will result in a monopoly profit that maximizes the price charged to the consumer. The alternative of awarding the concession to the supplier offering the lowest price, or the best combination of price and quality, requires a great deal more sophistication on the part of the government in appraising bids and monitoring perfor-

TABLE 2.1 EXPANDING THE SCOPE FOR PRIVATE SECTOR FINANCE AND MANAGEMENT IN TRANSPORT

<i>Sector</i>	<i>Infrastructure</i>	<i>Services</i>
Urban roads	Although usually free, limited-access expressways, bridges, and tunnels can be tolled; some concessions are under consideration.	All services should be operated by the private sector, with free entry (subject to safety and environmental standards), competitive franchising in the bus market, according to local circumstance; barriers to entry of the informal sector should be reduced.
Interurban roads	Construction and maintenance are usually publicly owned, but should normally be contracted out to the private sector; concessionary development of high-volume toll roads and commercialization of public road agencies are possible for major roads.	Trucking and intercity buses should be entirely private, with free competition in the market.
Rural roads	Scope for commercialization is limited by low traffic volumes, high transaction costs, and the prevalence of social objectives; construction and maintenance should be decentralized, with appropriate financial allocations.	Buses, nonmotorized transport, and trucking should all be exclusively private with free entry to the market.
Urban rail	Almost all are publicly owned; concessions are under consideration in some large cities, but the success of concessionary systems has yet to be proved.	Concessioning is possible; social objectives should be embodied in performance contract arrangements.
Interurban rail	Although usually publicly owned, privatization or concessioning is recommended for freight railways; publicly owned companies should be commercialized.	Privatization or concessioning should be encouraged.
Waterborne (maritime and inland)	Major ports can be privatized or concessioned; public sector landlord functions may remain for strategic planning purposes.	Publicly owned fleets should be privatized; cargo reservation should be abandoned.
Air	Airports are usually publicly owned but can be concessioned, either for specific functions or through private management contracts.	Nationally owned flag carriers should be privatized.

**BOX 2.2 DESIGNING AN EFFECTIVE
COMPETITIVE SYSTEM: BUSES IN
SANTIAGO, CHILE**

At the end of 1977, public road passenger transport in Santiago was provided by a public sector operator with 710 large buses (capacity: ninety seats) and a number of strictly regulated private associations operating about 3,167 regular buses (capacity: seventy-eight passengers) and 1,558 taxibuses (capacity: forty passengers). Fares, routes, frequencies, and bus imports were strictly controlled.

In November 1979 entry to the sector was effectively deregulated, although a formal power of regulation remained. Fares were progressively deregulated and became completely unregulated in June 1983. Entry to the taxi business and taxi fares were also liberalized over the same period.

The effects of deregulation were dramatic. The public sector operator was driven out of the market. Total capacity more than doubled over the next decade, with beneficial effects on the frequency of schedules and availability of seats. Other effects were not so benign. By 1985 the regu-

lar bus fares had increased in real terms to nearly three times their 1977 level (partly due to collusion between operators), and the differential between bus fares and taxibus fares had disappeared. The average age of buses increased from 7.0 to nearly 11.6 years and that of taxibuses from 5.0 to 9.5 years between 1980 and 1986. Congestion in the central city and bus-generated air pollution increased substantially.

Those problems have since been addressed. In 1987 each weekday, on a rotating basis, 20 percent of the vehicle fleet was prohibited from operating. In March 1989 buses built in or before 1966 were banned in the city. Most recently, in order to maintain competition while restricting the congestion and environmental effects of buses in the central city, licenses were put to competitive tender, with the quality and cleanliness of the vehicle, as well as the price to be charged, being among the decisive criteria. In this way, competitive pressure has been retained, while new environmental and quality incentives have been introduced.

Source: Thomson 1992.

mance. If intermodal or international competition is insufficient to prevent the exploitation of a monopoly franchise, controls have to be built into the concession arrangement (for example, by specifying maximum motorway tolls, as in Malaysia, or fares, as in the Buenos Aires metro).

Increasing the Private Financing of Infrastructure

In the nineteenth and early twentieth century much transport infrastructure was privately financed. After World War I, public finance of infrastructure dominated, and prior to 1982 there was virtually no further private financing of transport infrastructure in developing or transition economies. Since then, and most notably since 1988, private financing of transport infrastructure has

increased dramatically. This applies particularly to the financing of assets for which (a) access can be limited (as in airports and seaports, tunnels, bridges, and major highways, in contrast to urban and rural local roads); (b) the projected volume of traffic is high (container ports, freight rail, primary roads); (c) the generation of cash is expected to be reliable (market or regulated tariffs with reasonable pass-through arrangements, limited exposure to noncommercial risk, and the availability of buyout provisions); and (d) foreign exchange earnings are possible (ports, airports).

As table 2.2 shows, private financing of transport infrastructure has hitherto been most significant in the Latin America and Caribbean region and in East Asia but has been virtually nonexistent in Europe and Central Asia, the Middle East, and Sub-Saharan Africa. Even in those regions where private investment in transport has been considerable, the flows have been significant in only a few countries. Argentina and Mexico, which have made most headway in creating an overall enabling framework, have the largest privatization programs and account for more than 50 percent of the total. China, Malaysia, and Thailand, where major toll roads have been developed under enclave arrangements, together account for a further 30 percent. The pattern of private sector financing of transport closely mirrors the pattern of overall private sector flows to developing countries.

Private financing of construction is usually associated with continuing public sector responsibility for strategic network and locational planning. In

TABLE 2.2 PRIVATELY FINANCED TRANSPORT INFRASTRUCTURE, 1982-94
(millions of U.S. dollars)

<i>Sector</i>	<i>Africa</i>	<i>Asia</i>	<i>Middle East and North Africa</i>	<i>Europe and Central Asia</i>	<i>Latin America and the Caribbean</i>	<i>Total</i>
Toll motorways	286 (1)	6,337 (14)	..	50 (1)	12,177 (24)	18,850 (40)
Railroads	..	1,142 (4)	1,379 (5) ^a	2,521 (9)
Airports	..	577 (1)	80 (1)	657 (2)
Ports ^b	53 (4)	2,505 (46)	..	165 (6)	1,130 (51)	3,853 (107)
Total	339 (5)	10,561 (65)	...	215 (7)	14,766 (81)	25,881 (158)

.. Negligible.

Note: Numbers in parentheses indicate number of projects.

a. Cost information is incomplete.

b. Actual financial investment by the private sector, not total project costs.

Source: *Public Works Financing* 1993, 1994; World Bank data.

the case of toll roads and urban mass transit infrastructure, private firms are normally given a concession to manage and operate the facility for a period of years, with ownership of the asset returning at some point to the public sector. Build-operate-transfer (BOT) is one possibility, with the transfer occurring at the end of the operational concession period. In ports and airports the public sector is often primarily a landlord, providing only the basic access services (such as channel dredging and air traffic control), while the private sector provides and owns most other facilities. As of early 1994, no less than fifty-four countries were considering some type of privatization of the national airport system. The objectives of private involvement are to increase efficiency in service provision, to avoid political interference in operations, and to circumvent public sector budget constraints.

Supply can be made more efficient by involving the private sector in the design and construction of infrastructure even when it is owned and managed by the public sector. Private sector skills can then be used in putting the initial project together, assembling the necessary partners to complete the scheme, and managing procurement and operations. Concessioning is, therefore, particularly appropriate when these skills are scarce in the public sector, which is even more likely to be the case for urban rail schemes than for roads.

Private sector firms can maintain and manage operations more efficiently if political interference in their affairs is minimized. Concession schemes can facilitate this, particularly for enclave projects in situations where a broader reform of public procedures is difficult. The private sector usually has more flexible procurement rules than the public sector, and this can speed up implementation. It is critical to ensure, however, that cost savings from speedier implementation are not made at the expense of adherence to planning and environmental assessment procedures. Private provision can be less environmentally damaging than public sector provision if the contractual arrangements firmly establish the necessary standards and if penalties for infringement can be enforced.

Concessions can ease a government's fiscal problems by moving infrastructure projects off-budget during the years of construction. This advantage is reduced to the extent that the government makes payments that allow dividends to be paid to investors before the facility is commissioned or gives revenue guarantees in excess of the revenue-earning potential of the facility. Moreover, in principle, a public road administration, if given the status, obligations, and freedom of a commercial corporation, could borrow more cheaply than a single-project concessionaire because it can spread risk over a number of schemes or repay over longer periods (Blackshaw, Flora, and Scurfield 1992). Hence the corporatization of the road network, which would also move road investment off-budget, may in some cases be a better way of mobilizing private sector skills and incentives than a program of single-project concessions.

To date, private funding of transport infrastructure has been limited, and the problems of attracting private capital should not be minimized. In Central Europe it has been difficult to attract foreign finance for the most attractive road projects (such as the Hungarian M1/M15 motorway) except by providing generous state contributions. In some cases governments have become disenchanted after realizing how much public expenditure or potential public sector toll revenue would be necessary to attract relatively small amounts of new private sector investment. Furthermore, because of traffic diversion in dense networks, the economic benefit may be considerably lower for a tolled than for an untolled facility.³ If the toll route is private, the social costs of the misallocation of traffic between the tolled private route and the untolled public network can far exceed the profit earned by the concessionaires (Newbery 1994). Experience with toll roads in Latin America has also shown that inappropriately designed concessions may limit the social benefits obtained from concession schemes. In Mexico, on the basis of government guarantees of cost and traffic flows, the private sector invested \$14 billion in a 6,000-kilometer toll road program; despite high tolls, only three of fifty-three concessions had proved profitable by late 1995, and the government is now having to meet the costs of its contingent obligations. Despite these important caveats, reliance on toll-financed private sector projects may be justified if constraints on public sector finance and borrowing capability preclude the possibility of the road being provided on an untolled basis.

Private sector financing of transport infrastructure must thus be seen as a partnership between the public and private sectors. The potential for raising private finance on both domestic and international capital markets can be enhanced by making policy reforms that create clear rules allowing investors to form reasonably firm expectations about cash flows generated in an infrastructure business. Developing a successful program—as has been done in Malaysia—depends on a number of important prerequisites: an active government role in planning the network; strong commitment to private funding; steady economic growth; the acceptance of some risk-sharing between private and public sectors (although governments should not guarantee normal commercial risks); strong local capital markets; and an entrepreneurial private sector (Allport 1994). The selection of a preferred form of public-private partnership, and of the specific form of private sector participation, should be based on an analysis of the total social costs and benefits of the alternatives available (Newbery 1994).

Making Public Sector Management More Market Sensitive

The private sector can become involved in most modes of transport operation as long as there is a sound legal framework protecting private property and contracts. Large efficiency gains are achievable in much transport infrastructure as a consequence of the absence of efficiency incentives in traditional

supply arrangements, but a number of factors make transport infrastructure less amenable to private financing than other infrastructures. First, for some types of infrastructure, like local roads in urban or rural areas, the physical difficulties of excluding users who do not pay, or the high transaction costs of implementing direct user charges, make a competitive market difficult to achieve. Similar problems arise in scheduling the use of shared rail infrastructures. Second, privatization may not be politically acceptable where there is a perception of large, uncompensated income transfers. Third, where there are substantial externalities (such as road congestion and air pollution effects) that cannot easily be addressed by market-based instruments, there is a greater likelihood of government intervention. This will reduce the appeal of the sector to private investors. Fourth, where traffic flows are low, profitability from user charges is also likely to be low. Finally, some transport infrastructure is so intertwined with spatial planning that governments are not willing to leave it entirely to the private sector. The significance of these various effects differs among modes. The greatest potential for efficiency gains from privatization lies where monopoly protection has traditionally been strongest, as in the rail sector. The greater the number of dimensions in which prospects are good, the lower the risk to the investor, and the greater the probability of private nonrecourse finance. The ranking of potential in any particular dimension is arguable. Nonetheless, the pattern in table 2.3 suggests that much of transport infrastructure is not as attractive to private investors and operators as power or telecommunications infrastructure. For this reason, the public sector will continue to bear a primary responsibility for the provision of transport infrastructure.

Where the transport sector has long been dominated by a monolithic organization (for example, the railway organizations in China, India, and Russia), it may be difficult to make rapid changes without risking severe social disruption, particularly where organizations are divesting themselves of traditional social responsibilities that hamper their commercial potential and responsiveness to consumers. The first steps toward lowering costs may have to be limited to the unbundling of functions (between transport and nontransport activities, between transport infrastructure and operations, and between different lines of business, functions, or regions) to allow for competition in the supply of inputs. Those components for which scale economies are lowest can then be subcontracted on a competitive basis. This already occurs to a large extent in maintenance (particularly in the contracting out of road maintenance to the private sector), in vehicle operations (for example, the separation of rail service provision from infrastructure or of the competitive operations of bus operations from service planning), and in ancillary service provision (catering and baggage handling in air transport). Although the benefits may be substantial, the incentives to subcontract may be small unless there is either an external competitive threat or a legal requirement to subcontract.⁴

TABLE 2.3 POTENTIAL FOR PRIVATE FINANCING OF TRANSPORT INFRASTRUCTURE IN DEVELOPING COUNTRIES

<i>Potential for</i>	<i>Local facilities</i>			<i>National facilities</i>			<i>Power</i>		
	<i>Local roads</i>	<i>Urban rail</i>	<i>Local ports</i>	<i>Trunk roads</i>	<i>Main ports</i>	<i>Freight rail</i>	<i>Generation</i>	<i>Distribution</i>	<i>Telecommunications</i>
Competitive market	Low	High	Low	Medium	Medium	High	High	Low	Medium
Large efficiency gains	Medium	High	High	Medium	Medium	High	High	Low	High
Minimal transfers	Low	Low	Low	Low	Low	Medium	High	Medium	Medium
Few externalities	Low	Low	Low	Medium	Medium	High	Low	Medium	High
Profits from user charges	Low	Low	Low	Medium	High	High	High	Medium	Medium
No spatial planning effect	Low	Low	Low	Low	Low	High	Low	Low	High
Overall success	Low	Low	Medium	Medium	Medium	High	High	Low	Medium

Source: Developed from Meyer and Gómez-Ibáñez 1993; judgments on ratings made by World Bank staff.

It is notable that those state-owned transport enterprises that are the most successful in providing economical and efficient services are also those that have the greatest degree of commercial autonomy, whether they are operating in domestic markets (for example, buses in Tamil Nadu and Zimbabwe) or in highly competitive international markets (for example, Ethiopian Airlines and the Port of Singapore). Hence, even where the pursuit of environmental or social objectives implies the need for public transport subsidies (see chapters 4 and 5), the setting of political objectives should be separated from the management of the enterprise. This can be achieved by combining commercial objectives with management autonomy within performance agreements. These should explicitly state the public service obligations (PSOs) and performance criteria that the enterprise must meet and the price that the government will pay to the enterprise for the performance of those obligations. Performance agreements are common in the railway sector in such countries as Bolivia, Ghana, Mexico, and Tunisia but are equally applicable to other transport activities (Shirley and Nellis 1991).

Experience with performance agreements in developing countries has highlighted some serious problems in implementation. First, it is difficult to specify efficient performance in a way that suppliers cannot manipulate to their own advantage (unit cost measures may be manipulated easily by changing the product mix). Second, it is difficult to formulate efficient penalties for failure to perform (withholding finance may penalize customers more than the supplier if there is no alternative supplier). Third, it is difficult to identify realistic targets when tastes and technologies are changing rapidly. Performance agreements require discipline on the part of the government as well as on the part of enterprises. In Senegal the government failed to carry out its commitments under a performance agreement with its railway enterprise. In Mexico a series of *convenios* (agreements) has failed to improve railway performance noticeably because a valid and explicit role for the railways has not been defined adequately so that clear financial targets and responsibilities can be set. Disappointment with these devices is a major reason for the growing interest in finding more credible mechanisms to provide firms with appropriate degrees of autonomy in the process of private sector concessioning.

Where possible, greater market discipline in infrastructure provision is best achieved by full corporatization, giving the supply agencies a commercial remit and the freedom to set tariffs and determine expenditures. This will work well where there is a method of pricing directly for use and there are no externalities. These conditions appear to hold for interurban freight railways (though not for urban passenger railways, where externality effects may be large), for selected links or sparse networks of interurban roads, and, to a lesser extent, for airports and seaports (because of water, air, and noise pollution) or for urban and rural secondary roads (where there are both externalities and a limited ability to price).

Where transport infrastructure is corporatized, revenues are derived primarily from direct user charges. Without corporatization, transport infrastructure—as in the case of road agencies—depends for funding on budget allocations unrelated to the revenues derived from road-users. Recognizing the high costs associated with the propensity of governments to defer funding for road maintenance in times of fiscal pressure, countries as disparate as Hungary, Iceland, New Zealand, and Switzerland are adopting a more commercial approach to road management. The Economic Commission for Latin America and the Caribbean is urging Latin American countries to corporatize their road systems, and the Bank is helping to develop practical schemes to commercialize road management as part of the effort to improve road maintenance in the Sub-Saharan Africa Transport Program (CEPAL 1992b; Heggie 1995).

There are several requirements for successful commercialization of road infrastructure. First, the accounts and performance of the road agency must be made transparent, with the amount of money spent on roads, the efficiency with which it is expended, and the effects of that expenditure on performance clearly visible. Second, there must be a clear indication of what constitutes a charge for roads, with charges being specified separately from general taxation on use. Charges for road use must be directly transferred to the road authority. Third, the level of charges and expenditures must be linked. Finally, the level of charges and the maintenance and operational expenditures should be determined by representatives both of users and of the groups whose environment is affected by the roads.

The establishment of a user-managed commercialized road authority does not automatically resolve the problem of how to treat externalities (which may require that part of the charge be paid to some institution acting on behalf of affected third parties such as health or environmental agencies) or strategic interests (which may require that some lightly used roads be maintained for social reasons). These considerations may be deferred in the short run if it is agreed that failure to finance the maintenance of an economically essential primary road network is of crisis proportions. For a commercialized road agency to be a continuing element in a transport administration, however, the satisfactory incorporation of environmental and social issues is essential.

Setting Efficient Prices

Within a competitive market, enterprises have an incentive to set profit-maximizing prices. So long as all competing and complementary markets are competitive, and all adverse effects on third parties are charged for, these prices will also be economically efficient. Given the high level of fixed costs in many transport modes, efficient pricing may involve extensive differentiation of prices to make the most effective use of capacity. The Bank has long advocated higher prices for congested facilities (Hau 1992). Peak pricing is already feasible and is reasonably widely applied in metros, urban and interur-

ban railways, buses, airports, and, in some cases, air transport services. The important requirement is that the freedom of enterprises to determine the level and structure of prices should only be constrained if there is a real danger of monopoly exploitation. Distributional interests should be handled through PSO components in contracts between enterprises and government.

Within a competitive transport market, it is also critical that charges for the use of infrastructure be set correctly. Privatization or commercialization of public transport without appropriate charges for the use of public infrastructure may accentuate distortions both within the sector and among sectors. This danger presently threatens the public transport systems in the larger cities in transition economies, such as Hungary and Poland. Charges for the use of road infrastructure are the critical element. The onus for achieving the right level and structure of charges falls on the government. Because the factors that determine those charges include both environmental and distributional concerns (see chapters 3 and 4), we return in chapter 5 to infrastructure pricing as one of the most important functions of governments in a market-based transport sector.

Notes

1. The validity of this conclusion depends in good part on the existence of competition in the international shipping business. For example, Asian countries depended heavily on the monopolistic Far East Freight Conference during the 1950s and 1960s, before they developed their own carriers.

2. In the case of landlocked countries the effective competition may be between alternative corridors to the sea via ports in different countries.

3. Construction of a section of the M3 motorway in Hungary would have an estimated ERR of 29 percent if built as a free road, but only 13 percent if built as a toll road with toll levels sufficiently high to attract BOT financing. ERRs are reduced in two ways by the imposition of tolls on new high-capacity routes. First, some potential savings in travel time are lost to traffic that is discouraged by the toll from using the superior route. Second, levels of congestion are higher on the untolled routes than would otherwise be the case.

4. Where operators interact extensively with one another, it may be difficult to find an effective way of handling infrastructure allocation issues. For example, the high transaction costs of operating a commercial allocation of paths on networks with limited possibilities for passing may best explain why the infrastructure and operation of railways were historically more vertically integrated than those of other transport modes.

CHAPTER THREE

Environmental Sustainability

Transport has significant effects on the environment that should be addressed explicitly in the design of projects and programs. Reducing life- and health-threatening effects should be the highest priority. Making better use of readily available and cost-effective technology is necessary, but not in itself sufficient. More strategic action is also required in the form of better-directed planning of land use and stricter management of demand, including the use of pollution and congestion charges to correct the relative prices of private and public transport.

Inappropriately designed transport systems can damage the environment in which people live and work. Worldwide, more than half a million people die each year in road accidents. The air quality in the major cities of developing countries is already as bad as or worse than that in cities of industrial countries, despite lower levels of vehicle ownership (see table 3.1). Road traffic is not the only source, nor even frequently the main source, of air pollution, but it is a primary source of some categories of pollutants. In large city centers road traffic may account for as much as 90 to 95 percent of lead and carbon monoxide, 60 to 70 percent of nitrogen oxides and hydrocarbons, and a major share of particulate matter. These emissions damage health, especially of pedestrians and persons living or working in the open on traffic thoroughfares. In Mexico City high particulate levels contribute to an estimated 12,500 deaths a year (Serageldin 1993). Lead concentrations in some areas of Cairo are five to six times as high as the global norms set by the World Health Organization, and as a result, the lead content in the blood of children in Cairo is three to five times as high as that of children in rural Egypt (Stickland 1993). Ground-level ozone accumulation causes major respiratory

TABLE 3.1 AMBIENT AIR QUALITY INDICATORS FOR SELECTED CITIES, 1987–90
(average mean concentration)

<i>City</i>	<i>Lead^a</i>	<i>Carbon monoxide^b</i>	<i>Nitrogen dioxide^c</i>	<i>Ozone</i>
Bangkok	○	○	○	○
Beijing	○		○	○
Bombay	○	○	○	
Cairo	●	○		
Jakarta	○	○	○	○
London	○	○	○	○
Los Angeles	○	○	○	●
Mexico City	○	●	○	●
Moscow	○	○	○	
New York	○	○	○	○
São Paulo	○	○	○	●
Seoul	○	○	○	○
Tokyo		○	○	●

Key:

- WHO guidelines exceeded by more than a factor of two
 - WHO guidelines exceeded by a factor of up to two
 - WHO guidelines normally met
- A blank indicates not available.

a. 90–100 percent from transport sources

b. 80–100 percent from transport sources.

c. 60–70 percent from transport sources.

Source: WHO and UNEP 1992.

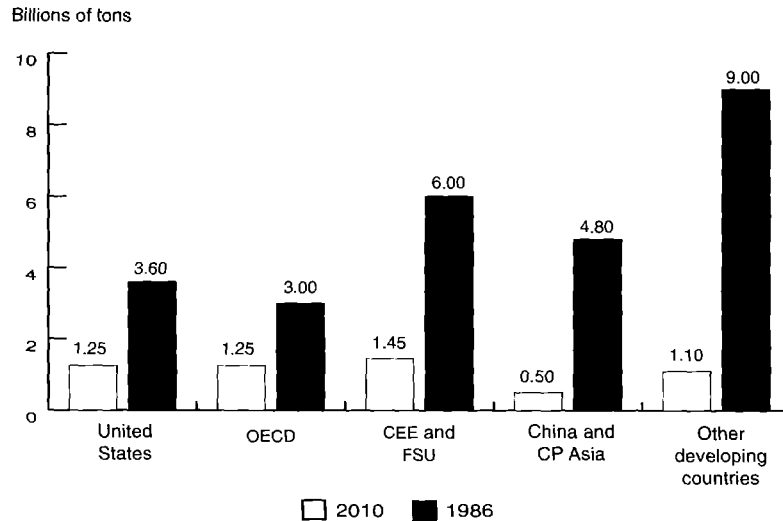
problems in many cities. Transport also causes noise, and insensitively designed transport infrastructure is visually intrusive and, by physically dividing neighborhoods, can have adverse effects on local amenities (Frybourg and Bureau 1985; Lambert 1986). While local conditions have improved recently in many industrial countries, those in many developing-country cities have continued to decline.

At the regional level, a lack of attention to the impact of transport can damage habitats and biodiversity. For example, shipping can contribute to pollution in ecologically sensitive coastal waters, and automotive air pollution can contribute to acid rain and problems associated with forest degradation. One of the most contentious issues is the impact of roads—and the subsequent induced development—on forests and other ecological habitats and cultural sites. Whether or not to open a new area for settlement (as in the

transmigration program in Indonesia), to provide access to natural resources (as in the POLONOROESTE program in Brazil), or to connect two areas of economic activity by crossing a forest or biologically sensitive area (as in the Zurqui Pass in Costa Rica) is primarily an issue of development policy, not transport policy. It is critical, however, that roads or other transport links not be built unless there is some framework for anticipating and mitigating likely adverse impacts. Current environmental assessments for Bank-supported road projects do require the inclusion of a regional plan for the area affected. But even that may not suffice. In the Brazil–Northwest Region Development Program, it was possible at first to provide access to new areas opened for agricultural activity (first rubber, then coffee and cocoa) without generating significant environmental damage as long as farm incomes were adequate. But with the subsequent collapse of global coffee prices, income in the region could only be maintained by cutting down trees and transporting the lumber by road until the area was deforested (World Bank 1994b). In short, induced development (as a result of the immigration of new settlers) is inherently fraught with uncertainty regarding environmental impacts over a longer time horizon. Therefore the decision whether or not to build roads must take these risks into account. Before action is taken to open access to new areas, satisfactory provisions must be in place to avoid or mitigate adverse ecological and cultural consequences, even if they appear to have a low probability of occurrence. In addition, at the more micro level it is necessary that road design and construction be sensitive, avoid destruction of habitats or cultural sites, and not contribute to soil erosion. As many of the poorer countries are the most vulnerable to these longer term or cumulative impacts, it is important that they be alerted to the dangers faced.

Transport also damages the global environment. Pollution from motor vehicles produces about one-fifth of the incremental carbon dioxide in the atmosphere arising from human activity (which potentially contributes to global warming), one-third of the chlorofluorocarbons, or CFCs (which contribute to depletion of the ozone layer), and half of the nitrogen oxides (which contribute to continental scale acidification and ecological damage). The contribution of transport to ozone depletion is now being reduced by the elimination of fully halogenated CFCs, which are especially damaging.¹ The situation with global warming gases is less favorable. Although global warming is primarily a result of the levels of industrialization and motorization in the industrial countries, on which the main onus for mitigation presently lies (Rommerskirchen and others 1991), developing countries have no grounds for complacency. If current trends continue unabated, by 2010 these countries could be the largest source of emissions of carbon dioxide and methane (see figure 3.1; OECD 1992). At present, their main incentive to reduce their output of global warming gases is the heavy burden that growing oil imports place on their balance of payments.

FIGURE 3.1 TRANSPORT AND THE GLOBAL ENVIRONMENT: CARBON DIOXIDE EMISSIONS, 1986 AND PROJECTED FOR 2010



Note: CEE, Central and Eastern Europe; FSU, Former Soviet Union; CP Asia, centrally planned Asia.
Source: Faiz 1993.

The environmental effects of transport differ significantly by mode (PLANCO-Consult 1990). Road motor vehicles are the dominant source of the emissions that have local and continental effects (such as the formation of acid rain), and they account for more than three-quarters of the transport sector's contribution to global air pollution. Aviation causes local air and noise pollution at ground level, and gaseous emissions in the troposphere deplete the ozone layer and contribute to global warming. Aviation is likely to become a more important source of pollution because, despite improvements in engine technology, its consumption of fuel has grown more than 3 percent a year and is expected to double every twenty years (Arrhenius and Waltz 1990). In maritime transport the operational discharging of oil was reduced 60 percent during the past decade, and shipping now accounts for only about one-quarter of the oil entering the marine environment, although major damage still results from tanker accidents (Peet 1994). Rail transport is relatively benign environmentally, although direct and indirect coal burning (to generate electricity) and rail-generated noise can have heavy localized impacts. Inland waterway transport is fuel-efficient and rarely has local environmental impact. Nonmotorized transport is almost entirely environmentally benign.

Combining Reduction of Transport Costs with Environmental Awareness

Most transport improvements are designed to reduce transport costs or improve the quality of service for transport users. These improvements in efficiency can often have a beneficial impact on the environment—for example, by reducing fuel consumption and air pollution (European Conference of Ministers of Transport 1989)—but this is not always the case. Consequently, since late 1989 a full environmental assessment has been mandatory for all Bank-assisted projects that may have a significant adverse impact on the environment, and a partial assessment is required for those expected to have a minor impact.² The proportion of transport projects subject to full assessment has risen from 10 percent of projects approved in fiscal 1991 to 20 percent in fiscal 1993.³ These have included all modes and most regions, with the rapidly developing Chinese transport sector attracting the most comprehensive attention.⁴ Almost all transport projects are subject to at least a partial assessment. The increasingly stringent application of these procedures has encouraged the design of projects that are sensitive to environmental concerns and that mitigate any directly adverse environmental impact. In this sense, most Bank-assisted projects now avoid doing direct harm to the environment.

Furthermore, more and more transport projects, or project components, are focusing positively on improving the environment, rather than simply avoiding direct environmental harm. The Second Multi-State Roads Project in Nigeria, the State Highway Management Projects in Brazil, and the Highway Management Project in Venezuela all support the building of national and local technical capacity to assess the environmental impact of road projects. The Tehran Transport Emissions Reduction Project in Iran, funded by the Global Environment Facility (GEF), is a comprehensive package with components that cover emissions inventory and air quality monitoring, vehicle fleet and fuels improvement, and traffic management. The GEF portfolio also includes investment in pilot projects covering the management of freshwater bodies and river basins, marine pollution, and marine ecosystems. The Bank recently financed waste-oil reception facilities for ports in China and an Oil Pollution Management Project for ports in the Maghreb countries.

These projects address the immediate and direct effects of transport. It is much more difficult to control longer-term and less direct effects, particularly when a transport project is only a subsidiary part of a broader plan for the economic development of ecologically or culturally sensitive regions (World Bank 1992b). In such cases the fundamental questions are those of regional development policy rather than transport policy. But transport infrastructure may still be the instrument through which undesirable developments occur (see box 1.3). Transport developments threatening encroachment on natural habitat or cultural heritage should not be supported unless the Bank is satisfied

that an appropriate framework of protection is in place before implementation (Peuker 1992).

Conversely, inaction can also be damaging. For example, in rapidly growing cities and in conurbations like Bangkok, where networks are poorly developed, the long-term economic and environmental costs of inadequate transport capacity can be very high. It is at this strategic level that the Bank has had the most difficulty in helping countries to implement policy effectively. Thus, a comprehensive and well-articulated country strategy combining the efficiency, equity, and environmental objectives of transport development is critical.

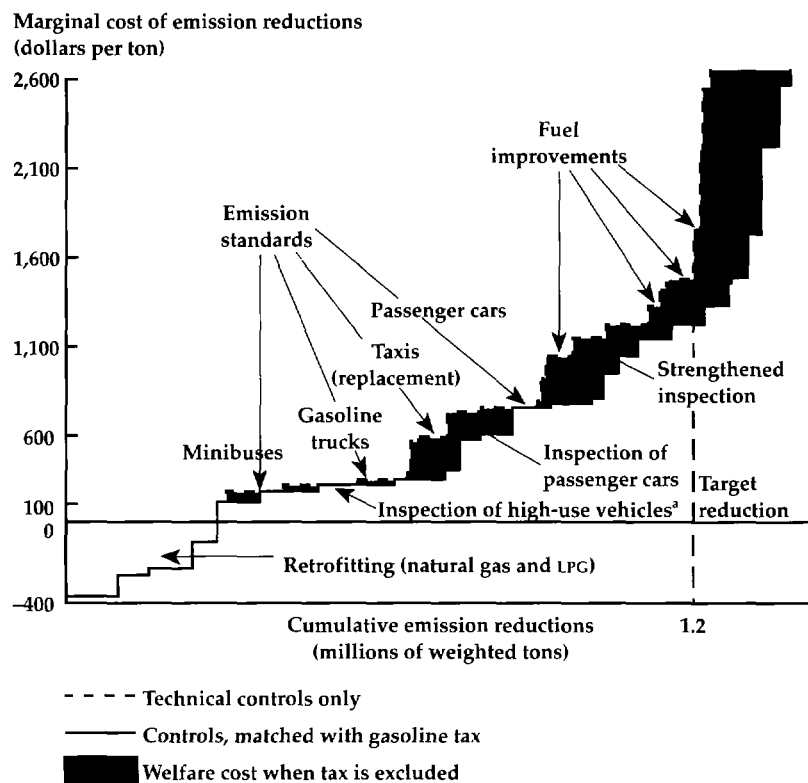
A country strategy should, in principle, be based on a full cost-benefit analysis incorporating both transport and environmental objectives. It should include short-term management and pricing instruments and long-term strategic planning instruments as the context for identifying investment actions. Research will be required to identify critical environmental effects and to determine the efficacy of different interventions. In the interim, an appropriate framework would start with a rudimentary setting of priorities based on the best available epidemiological analysis of the effects of transport on people. That would be followed by selection of the most cost-effective options for meeting priorities in the form of targeted goals (see figure 3.2), prior to fuller valuation (possibly in monetary terms) of an individual project's environmental impact, as recently undertaken for the São Paulo urban transport project.

The priorities in country and sector strategies that emerge from such an analysis will differ from country to country. But there is already enough evidence to identify some general priorities. Strategic and structural actions, including the creation of economic incentives for environmentally sensitive behavior, are a high priority. Although their effects may be slow to come to fruition and may be politically and administratively difficult to implement, they are the critical and pervasive basis for the development of environmentally sustainable transport. Within such a strategic framework, some priority problems can be identified where the benefits of making improvements are judged to be very high, particularly because they seriously threaten life and health. The most appropriate technology should be selected on the basis of relative cost-effectiveness, in the context of the main problems in the country, taking into account what the country can afford and effectively implement. This often means that the actions with the highest priority are not those attempting to impose state-of-the-art standards or technologies but those making more immediate improvements in the way in which existing or easily implemented equipment is used and capacities are deployed.

Priority Components of a Transport Strategy

Addressing the adverse environmental consequences of urban transport is increasingly urgent in the rapidly growing major cities in developing countries.

FIGURE 3.2: PROGRAM TO REDUCE AIR-POLLUTING EMISSIONS FROM TRANSPORT IN MEXICO CITY, WITH AND WITHOUT A GASOLINE TAX



Note: Calculations are based on -0.8 elasticity of demand for gasoline.

a. Including taxis, light-duty trucks, and minibuses.

Source: Eskeland 1994b.

The key to medium-term environmental sustainability is the integration of environmental concerns within economic incentive structures. Prices that internalize environmental effects and market mechanisms (such as trading permits) should be used more than they are at present.

Introducing Congestion and Pollution Charges

Restricting the size of the fleet has been the traditional approach to demand management in developing countries. High import tariffs (in the range of 300–400 percent) performed this function, as many countries did not produce their own cars and trucks. Trade liberalization will not undermine this approach if

the import tariff is replaced by a comparable domestic excise or luxury tax. Limiting the size of the fleet will not be easy as incomes grow and will not be as effective if vehicle usage grows faster than vehicle ownership.

Market instruments of demand management allow decentralized decisionmakers to select the type of adjustment best suited to their individual preferences. In the urban context, increased parking charges have benefited the environment by reducing on-street parking, as in Tunis, and by rationing restricted off-street parking spaces, as in Seoul. More sophisticated pricing approaches, such as the use of tradable permits for environmental emissions, are being discussed intensively in the industrial countries at present; the auctioning of a predetermined number of licenses to purchase new vehicles in Singapore has already demonstrated the technical feasibility of such an approach (OECD 1992). Electronic road pricing (as considered for Hong Kong and being implemented in Singapore) will have to be monitored closely before being introduced more widely; at this stage, it is premature and not cost-effective in many developing countries.

In the absence of direct emission charges, higher fuel prices have already become a means of mitigating part of the environmental impact of transport in a few countries, such as Mexico. Although changes in the use of fuel that are due to changes in price may be small in the short term, longer-term effects on the choice of vehicles and the location of residences make the ultimate impact of higher fuel prices considerably greater. The problem is that estimates of the cost of externalities vary by country and are still controversial (Bleijenberg 1988; Himanen and others 1989). On the basis of a review of recent studies in industrial countries, a conservative estimate suggested social costs in the neighborhood of 0.3 percent of GDP for noise and 0.4 percent for local air pollution (Quinet 1994). The United Kingdom Royal Commission on Environmental Protection more recently gave higher estimates of 4.6 percent of GDP as the lower end of a range of estimates of the cost of air pollution, noise and vibration, and climate change. Recent U.S. studies estimating the costs of damage caused by local air pollution have shown a similarly wide range; lower values—equivalent to less than \$0.10 per U.S. gallon of gasoline—for the national average impact, but relatively high values for major conurbations (for example, an estimated \$0.62 per gallon for Los Angeles; see Krupnick 1995). Accidents in the European countries are estimated to cost an average of about 2 percent of GDP (some of these costs are already internalized through insurance). Policy in developing countries should be based on local valuations. In light of the generally inferior vehicle technologies and vastly greater exposure to environmentally damaging traffic in countries with rapidly growing motorization, however, some of the major conurbations may suffer environmental impacts in excess of the levels experienced in Los Angeles. These environmental and accident costs should be charged to road-users. Methods of doing this, and the implications for structures and levels of taxation, are discussed in chapter 5.

Developing Complementary Policies on Public Transport Fares and on Road-User Charges in Urban Areas

Fares and service levels for public transport (whether supplied by state-owned enterprises or by the private sector) should be determined in a systemwide, multimodal context and be clearly related to comprehensive economic and social strategies for urban development and transport. Efficient charges for road use will increase the use of public transport; even if modal diversion does not occur, they will allow greater cost recovery. The option of charging efficient prices for the use of scarce urban road space, together with unsubsidized public transport, is therefore preferable to any alternative involving unpriced road use and compensatory public transport subsidies, not only because a superior incentive structure is created, but also because a lower fiscal burden is imposed. As long as road use (particularly the use of scarce road space) is underpriced, however, the financial viability of public transport will be prejudiced, and a “second-best” case can be made for setting public transport fares in such a way as to compensate for the undercharging of private road transport. This would involve linking moves to recover the full costs of public transport with moves to set appropriate levels of fuel taxes or road-user charges (as recently proposed in the strategy for secondary cities in Poland; see Mitric 1995).

Setting public transport fares below cost to countervail undercharging private road-users raises two major problems. First, fare revenues will be insufficient to meet full operational and vehicle replacement costs. Financial sustainability thus requires some other secure source of revenue. This might take the form of contract payments from government in association with annual performance agreements financed from general taxation or by earmarked taxation (as in Paris). Many municipal governments, particularly in Eastern Europe, have neither sufficient grant revenue from central government nor sufficient local taxing power to satisfy this requirement. In those circumstances, because failure to sustain the service will also involve failure to meet environmental and distributional objectives, financial sustainability must be the preeminent concern.

The second problem concerns management incentives. Where a public transport mode is expected to help reduce uncharged externalities such as congestion or pollution, efficient resource allocation does not require that the full cost of public transport be recovered directly from users. Similarly, existing facilities that have a large component of sunk cost of infrastructure, such as metros, may be sustainable, given lower ratios of total cost recovery than bus operations, although investment in fixed track systems should only be made in the first place if the expected benefits over the life of the system are greater than the costs—including the capital costs—of providing them. But in order to stimulate managerial efficiency and to prevent subsidies from being appropriated by employees, any support, whether in the form of a capital or an operating subsidy, must be based on a contract specifying clear standards of performance and effective penalties.

Managing Demand to Compensate for Pricing Deficiencies

In the absence of appropriate prices for road use, it may be necessary to resort to direct physical restraint of traffic. In Singapore a strict vehicle licensing policy, in combination with high import duties on cars, has helped restrain car traffic to a sustainable limit.⁵ In Europe car-free central districts have made a remarkable improvement in the quality of urban life and the attractiveness of central districts. However, such direct controls are not without problems (Bleijenberg, Velthuyzen, and Oegema 1990). For example, programs to exclude subsets of vehicles selected by license plate number from being on the streets on particular days, as in Athens and Mexico City (see Eskeland and Devarajan 1996), have had the perverse effect of making people reschedule their activities or buy more cars rather than restraining the total amount of traffic. In particular, without appropriate alternatives, such as sufficiently high-quality public transport and adequate facilities for changing from one mode of transport to another (bus to rail, bicycle to transit), congestion and adverse environmental effects are likely to spread rapidly to the periphery of cities (as in Asian cities such as Bangkok and Seoul).

Even public transport may contribute to local impacts enough to justify specific operational constraints, such as restricting the points at which public light buses pick up passengers, as in Hong Kong. Direct regulation and legal enforcement are also likely to maintain safety more effectively than any market process. Where an excess supply of public transport is damaging the environment, constraints can be reconciled with market forces by competitively tendered franchises, as applied in the central areas of Santiago. The environmental quality of the vehicle can then be one of the factors on which competition is based. The most important point is that the adverse spin-off effects of competition should be addressed by introducing selective controls, such as enhanced vehicle inspection and monitoring and enforcement of road behavior, not by imposing blanket restrictions on entry.

Integrating Urban Structure and Transport Planning

Transport infrastructure can provide access to new areas, thereby enabling changes in the patterns of land use. Once established, however, land-use patterns largely determine the demand for transport (Klaasen and van der Meer 1987; European Conference of Ministers of Transport 1991b; Matsuura and Numada 1992; Offner 1992). Distortions in land markets, such as existed (albeit for different reasons) in Russia and South Africa until the late 1980s, have left a legacy of transport demands that are costly to satisfy. In China, land-use policies in the 1950s enforced the close juxtaposition of workplace and residence, thus promoting the use of low-cost transport such as bicycles; with the liberalization of labor and land markets in the 1980s and 1990s, much longer journeys are being generated that will, in time, reduce the attractiveness of cycling (Doulet 1994). In countries such as Vietnam and secondary

cities in many developing and transition countries that are on the threshold of motorization, the existing land-use patterns have not yet foreclosed the option of development structured to maintain a better balance between public and private transport, as well as between motorized and nonmotorized modes (Rizet 1992). This has frequently led to proposals for more extensive control of land use and, particularly, of residential density. Such controls must be based on better knowledge of the wider development process.

In this context, it has been observed that low-density Australian and U.S. cities exhibit much higher fuel consumption per capita than higher-density cities elsewhere (Newman and Kenworthy 1991). Much emphasis has thus been placed on avoiding low-density land-use patterns, particularly where they occur because the private costs of mobility are much lower than the social costs. In practice, controlling the growth of urban areas is fraught with problems, which suggests that caution should be used in attempting to impose any rigid control of urban structure (Hayashi and others 1992; Miyamoto and Udomsri 1992). First, the relatively lower use of fuel and the high density in urban areas are usually associated with the disadvantage of high housing costs and a low level of residential space per person (see figure 3.3). Second, master plans typically underestimate urban growth and demand, and controls may prevent densities from growing as they might in some areas, while forcing them to be too high in others. For example, the demand for the Calcutta metro has been stifled by regulations effectively limiting development around stations. Third, master plans to date have not succeeded in controlling overall urban growth or in ensuring efficient use of urban land and urban transport.

The answer—particularly in rapidly developing cities where land markets are turbulent and land use can change rapidly—is to recognize and work with the underlying preferences being exhibited in the market. For example, growth tends to be concentrated initially in clusters on the major radial routes around cities. This is generally consistent both with the development of cost-effective mass transit facilities and with varying preferences for residential density. Although micro land-use control is neither feasible nor desirable, guidance is possible by determining the location of major public sector facilities and by influencing large-scale private sector developments that have a major influence on the efficiency of urban form (Frybourg 1992). This may include the development of a clear strategy on the reservation of rights-of-way and adequate space for transport infrastructure (Scholy and others 1993), the provision of limited-access trunk transport facilities (particularly rail-based systems), and the structure of public utility extensions (as in city development in Saudi Arabia). Although attempting to maintain a more localized balance between job and residence will tend to even out directional flows, this will not necessarily reduce the length of most journeys to work (Andan and D'Arcier 1992). The combination of a well-functioning land market and efficient charges for the use of transport infrastructure is essential in this strategy of working with the market because it will encourage the use of public transport on the

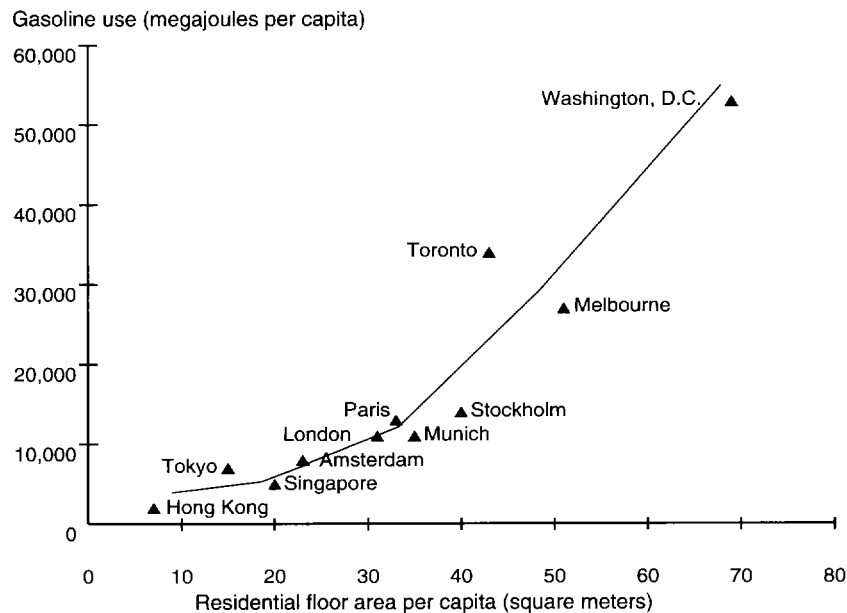
main arterial routes. Conversely, where transport prices do not reflect full social and environmental costs, the land market can generate inefficient land-use patterns (Egal 1994).

Changing the Balance of Modes of Transport

Some transport modes are more environmentally damaging than others. The balance between modes should therefore reflect their environmental, as well as their economic, characteristics.

THE POTENTIAL OF NONMOTORIZED TRANSPORT. Nonmotorized transport—particularly the bicycle—can benefit the environment by giving high local accessibility to the relatively sparse public transport network for longer-distance movement. Much more can be done at low cost to incorporate nonmotorized transport into an overall urban transport strategy. Appropriate measures might include the provision of routes and parking for bicycles and proper recognition of slow-moving vehicles within traffic management schemes, as demonstrated in countries like Japan and the Netherlands. The

FIGURE 3.3 GASOLINE CONSUMPTION VERSUS URBAN DENSITY



Note: Low gasoline use is associated with residential crowding; 89 percent of the variation in per capita gasoline use is explained by the square of floor area per person.

Source: Calculated from data on gasoline use derived from Newman and Kenworthy 1991 and data on floor area from World Bank.

actions necessary to overcome current impediments to nonmotorized transport are discussed in chapter 4.

THE ENVIRONMENTAL AND ECONOMIC POTENTIAL OF RAILWAYS. Transport modes differ in their potential energy efficiency. Inland waterway transport of bulk freight is very energy efficient and, where there is an appropriate waterway, should be encouraged. But the disadvantages of its network density will limit its scope. Rail transport does not appear to have the same limitations. A fully loaded train requires only one-third of the energy per passenger-kilometer of a fully loaded car and little more than one-tenth as much as a fully loaded airplane (over distances where substitution between the modes appears possible; see Kuerer 1993). Because the energy use and emissions of rail transport are usually less than for road transport, Austria, Hungary, and Switzerland have recently taken steps to divert road traffic onto rail. In general, however, the potential advantage of rail in energy consumption per ton-kilometer is limited by some characteristics inherent in rail operations. First, because rail transport has significant fixed costs, the commercial use of rail is restricted to certain domains where high levels of track and vehicle occupancy can be obtained. In fact, fully loaded trains are not the rule; rail passenger services in rural areas typically have low occupancy rates. Second, the quality of the service is also important. In the freight market the trend toward just-in-time logistic systems emphasizes the importance of precisely those attributes, such as flexibility, for which road transport has an advantage over rail. In the passenger market the importance that travelers attach to travel time, comfort, convenience, reliability, and flexibility increases as their income increases. Again, because road transport usually has an advantage in these dimensions, dependence on road transport tends to increase with income growth.

The actual achievement of the potential energy savings and environmental benefits of rail transport thus depends on the existence of a market-proven superiority of the rail mode in meeting customer demands, which only occurs in well-defined domains of business. Government intervention to expand those domains is only justified where the financial costs to the operator do not properly represent the true economic and environmental costs. To invest in railways that do not attract traffic is not only uneconomic but environmentally pointless (Gwilliam, Shalizi, and Thompson 1994).

Nonetheless, in any corridor where rail or road (or high-speed rail and air) are possible substitutes, all relevant cost-effective alternatives must be considered. In the case of freight, rail can have a clear competitive role, not only within the traditional market of long-distance movement of low-value products, but also within combined-transport container systems of high-value, high-bulk products. For example, the Bank is assisting Indian Railways to expand into this market. Despite its high costs of capital and energy, high-speed rail technology may be justified, even in relatively low-income countries, because it requires little space per unit of capacity. This applies particularly in high-density traffic

corridors, such as Beijing to Shanghai, and in high-density population areas (especially in parts of Asia) where wider corridors present serious resettlement problems. Suburban rail also has a potentially important role to play in metropolitan areas, as shown by recent projects in Pusan, Rio de Janeiro, and São Paulo (Nehashi, Ikoma, and Akiyama 1992; Pinheiro 1992).

In practice, many governments have encouraged or required their railways to perform roles for which they are poorly suited (for example, in low-density rural areas, buses are a better option for transporting passengers). This has often created a financially unsustainable burden, which has contributed to the general decline of railways. The policy objectives should thus be to identify an appropriate role for railways (taking into account their broad environmental impacts), to ensure that the market conditions, including charges for the use of road infrastructure, allow railways to fulfill this role, and to establish efficient management structures capable of adjusting to changing opportunities (Baumgartner 1992; Dürr 1992). Investments and operational support for railways should be considered in this context. Restructuring the railways (whether they are to be privatized or to remain in public ownership) often means that governments have to make difficult decisions about whether to abandon lines, shed labor, or restructure liability arrangements. A clearer separation of regulatory and operational roles will help railways fulfill their potential within a liberalized transport market.

APPRAISAL AND FINANCING ARRANGEMENTS FOR URBAN MASS TRANSIT. For urban corridors with high traffic volumes, mass rapid transit systems use space more economically and are less environmentally damaging than systems relying on the automobile. For medium-size and large cities, such as Abidjan, Bogotá, Lima, and São Paulo, where the bus is the backbone of mass urban movement, special busways, which other traffic is forbidden to use, have proved able to carry high volumes (up to 20,000 persons per hour per lane) at acceptable speed and at a fraction of the cost of metros (Gardner, Cornwell, and Cracknell 1991). Sometimes, however, as in São Paulo, busways have significant local environmental and blight effects that should be taken into account in comparing alternatives. Light rapid transit, operating at street level and with frequent stops, may have less environmental impact but rarely improves on the capacity of busways (Hugonnard 1994). In contrast, metros can handle peak flows of 60,000 passengers per hour or more and may be the only way to handle the heaviest flows in very large conurbations at reasonable speeds. Unfortunately, when cities are small, the corridor flows are rarely sufficient to justify the high initial costs of a metro, while by the time the corridor traffic volumes have reached levels that appear to merit a metro, the urban structure has developed to the stage at which the superimposition of a metro is inordinately costly in terms of land acquisition, system construction, and other capital expenses. This suggests the possibility of a phased approach (as recommended for Karachi) in which rights-of-way are protected at an

early stage of development, to be used for either busways or rail-based systems according to the changing volume of expected traffic over time.

This approach requires considerable foresight, capacity to plan, and willingness to commit to an urban structure. Success is possible, as exemplified by Curitiba, but the danger is that, as in Pôrto Alegre, subsequent development will follow an entirely different and unplanned pattern. Increased emphasis on urban rail thus requires the integration of plans for the rail network into land-use schemes, public support for direct pricing of the external costs of road use, and adequate provisions for modal coordination and interchange (Denant-Boemont 1992). The absence of such a comprehensive institutional framework has proved very damaging in such cities as Bangkok. Caution is also advised on other grounds. A study of metro systems in developing countries showed that, although metro systems are usually operated fairly efficiently, their finances, traffic, and impact on the urban environment have tended to fall short of expectations (Fouracre, Allport, and Thomson 1990). Their high initial cost inevitably preempts much other desirable expenditure, which may be of much greater value in situations with other, more pressing demands. Moreover, the burden of maintaining a system built at such high cost can cripple municipal finances, as shown by the experience of even relatively wealthy cities like Pusan. Nevertheless, although it may not be cost-effective to build new metros in straitened circumstances, such as those obtaining currently in Central Europe and the former Soviet Union, it is usually equally inappropriate to allow existing, functioning systems to fall into disrepair.

As noted earlier, cost recovery need not be based exclusively on fares. People who benefit from the existence of a public transport system may be charged in a range of ways. Auto purchasers may be required to buy a public transport bond, as in Korea. Car users may be required to contribute through the earmarking of part of the fuel tax for public transport. Property developers may be required to contribute to the costs of developing public transport, as in the London Dockland Railways. Employers may be taxed, as in the French *versement transport* (Lesne 1992). None of these devices is without difficulties, and any method chosen must have substantial public support and be compatible with the national legal system. The crucial point is that there should be a firm commitment, preferably established by law, to a strong financial instrument that will facilitate capital financing and ensure the continuing maintenance of rapid transit facilities where they are economically and environmentally justified.

Addressing High-Priority Problems

The most damaging environmental impacts of transport are those that directly threaten life or health. Road accidents and some of the more noxious local air pollutants clearly qualify on this basis and therefore merit high-priority treatment. There are also many other environmental impacts that, although not

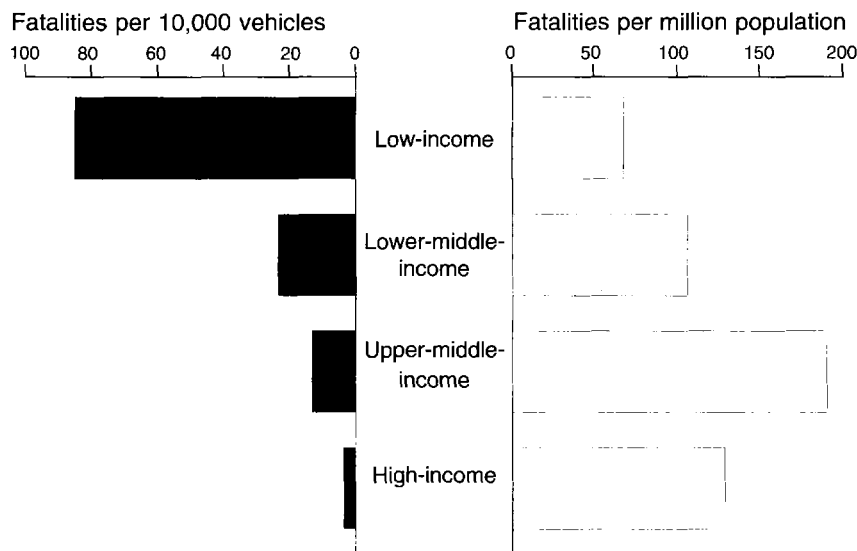
individually crippling, together damage the quality of life severely. Many of these—noise, visual intrusion, severance of communities, and disruption of activities—are a function of the level or location of traffic. In the absence of short-term technical solutions, finding ways to manage and restrain traffic thus also qualifies as a high-priority issue.

Road Safety

Road safety is a serious problem throughout the world. Each year, more than half a million people die in traffic accidents, and many more are injured. Motor vehicles are usually involved. Even in Shanghai, where nonmotorized traffic dominates, more than 95 percent of fatalities and nearly 75 percent of all registered traffic injuries involve motor vehicles. Worldwide, however, up to two-thirds of injuries are suffered by pedestrians, of whom one-third are children; in developing countries the injury rates of pedestrians and cyclists are much higher. In India only 5 percent of those killed or critically injured in traffic accidents were in cars. In addition to the immense human suffering involved, the economic cost of these accidents is high. In Kenya in 1990, it was estimated that traffic accident costs were equivalent to about 1.3 percent of GDP (World Bank 1990).

Fatality rates per capita tend to increase until relatively high levels of

FIGURE 3.4 ROAD ACCIDENT RATES, BY COUNTRY INCOME GROUP



Source: International Road Federation 1993.

also be paid to securing the commitment of nongovernmental organizations in order to create a strong constituency for safety improvements.

SEPARATION OF MOTOR VEHICLES FROM OTHER TRAFFIC. The high injury rates of pedestrians and cyclists highlight the need to design and manage roads so as to provide separate rights-of-way for pedestrians and nonmotorized vehicles and to make better arrangements for traffic flow at points where different types of traffic intersect. Institutionally this can be facilitated by conducting a safety audit on new construction and management schemes. Such approaches can yield significant safety gains at a cost much lower than would be incurred if problems were to be treated later in “black spot” programs of remedial works at locations with high accident risk. Safety is an essential element of environmental assessment.

EDUCATION, REGULATION, AND ENFORCEMENT. The rapid growth of motorization in some countries means that road-users, both drivers and pedestrians, lack experience in safe traffic behavior. For example, in Dhaka, nearly ten times as many pedestrians are injured while walking with their backs to traffic as are injured while facing traffic (Ross and Mwiraria 1992). Many vehicles of all kinds operate on China’s roads without lights after dark. Formal traffic education is rarely given to children in developing countries. Moreover, as a study of bus drivers in Pakistan found, driver training and testing are also less effective in developing than in industrial countries due to poor enforcement (Downing, Baguley, and Hills 1993). A general improvement in driver behavior thus requires not only training but also motivation, which can be created through targeted information campaigns, backed by good incentives and enforcement.

GEOMETRIC DESIGN STANDARDS ADAPTED TO LOCAL CONDITIONS. Rehabilitated roads often retain existing poor horizontal and vertical alignments, while new surfaces, wider seals, and straighter alignments can encourage higher speed and increase accidents if not matched by appropriate use of signs, design of intersections, and provision for the large number of vulnerable road-users common in developing countries (Kosasih, Robinson, and Snell 1987; Downing, Baguley, and Hills 1993). In these situations black spot programs can yield high returns. For example, the provision of road signs and markings and the introduction of traffic circles at intersections halved injuries in a road project in Papua New Guinea (Hills, Thompson, and Kila 1991).

Cost-Effective Technological Solutions to Automotive Air Pollution

Health-threatening air pollution is mainly an urban phenomenon. Although transport is not always the main source of most pollutants, it does release some major toxins into the atmosphere. Dramatic improvements in air quality

can be achieved with existing technology. In the case of lead, the necessary action is to control the quality of automotive fuels that can legally be supplied to consumers. In developing countries these fuels are generally dirtier than those available in industrial countries, with a lead content of gasoline as high as 0.8 to 1.1 gram per liter (compared with 0.15 gram per liter for leaded fuel in industrial countries). The sulfur content of diesel is more than 1 percent by weight in developing countries, compared with 0.5 percent or less in industrial countries. Additives to diesel can also reduce particulate emissions. Comprehensive emergency programs, such as that sponsored by the Thai government, have introduced lead-free gasoline and low-sulfur diesel, better inspection and monitoring of vehicles, and high standards for new vehicles. Transport fuel derived from biomass has substantial environmental benefit but is uneconomic when oil prices are below the peak reached in the early 1980s. It could only be a main fuel in land-rich countries like Brazil. In contrast, the substitution of liquefied petroleum gas and compressed natural gas for gasoline may be justified, both environmentally and economically, in many countries that have local gas resources.

The introduction of cleaner fuels must be supported by other policies. Adequate infrastructure is needed. In Jakarta a pilot program to substitute compressed natural gas for gasoline in public transport vehicles has been constrained by the absence of adequate filling stations and the perception of only a marginal advantage to the operator (World Bank 1993c). Relative fuel prices must also be adjusted to give efficient incentives to use clean technology and clean fuels. Misfueling occurred in Mexico where, despite annual emission inspections to ensure the use of catalytic converters, high-mileage-vehicle users opted for leaded fuel because it was cheaper. This practice destroyed the cars' converters, which then had to be replaced at each annual inspection.⁶

The average age of the vehicle fleet in developing countries is almost double that in industrial economies. Older vehicles pollute more. In addition, the typical domestically manufactured vehicle in China, Eastern Europe, India, and Latin America is only half as fuel-efficient as best-practice vehicles in industrial countries (automobile fuel consumption rates of 17–20 miles per gallon versus 40 miles per gallon). As a result, emissions characteristics are equivalent to those of 1950–60 vintage motor vehicles. Carbon monoxide and nitrogen oxides can be suppressed by the use of catalytic converters, but retrofitting old vehicles with catalytic converters is often not cost-effective in low-income developing countries, both because the gases suppressed are not usually the most health-threatening and because, in the absence of the capability to enforce maintenance of the equipment, retrofitting becomes ineffective. To be considered as an option, retrofitting should be focused on high-mileage fleets of taxis and buses, which can be monitored more easily. In many cases it will be preferable to introduce policies and efficient fiscal incentives to accelerate the scrapping of high-pollution, high-use vehicles such as older taxis, buses, and trucks (as in the

Taxi Modernization Program supported by the Bank in Mexico City and in the renewal of the bus fleet in Santiago) and to limit the second-hand import or local production of particularly polluting vehicles.

Whether or not retrofitting or scrapping is introduced, maintenance control remains a major challenge. Enforcement of mandatory regular inspections has already begun in Chile, and similar provisions are being made in urban transport projects in Indonesia and considered in Costa Rica. Increasing the number of random roadside inspections, as has happened in Taiwan (China) under the supervision of the local environmental protection agency bureaus, may be even more effective if the combination of inspection rate and penalty enforcement is well chosen. The Bank has assisted Sri Lanka, Thailand, medium-size cities in Mexico, and São Paulo to develop their capacity to monitor and control emissions. Success is contingent on strong support for specialized institutions with adequate equipment and trained staff.

Motorcycles and other simple motorized means of transport represent an affordable step-up in power, speed, and range from the pedal cycle. In many middle-income countries in South and Southeast Asia, intermediate transport vehicles already account for up to three-quarters of the vehicle population. That trend is being replicated in lower-income cities such as Hanoi and Phnom Penh and may be expected as more people emerge from poverty in Africa. Unfortunately, most of these vehicles are powered by two-stroke engines, which emit hydrocarbons and smoke at up to ten times the rate of modern four-stroke automobile engines. Thus, the most polluting vehicles are rapidly replacing the least polluting. To counter this, technical assistance programs should disseminate best-practice technology (as improved technologies for motorcycle efficiency and cleanliness are now appearing) and encourage the development of local conversion equipment.

Traffic Management: A Partial Solution

In the cities of developing countries available technology can improve traffic management. Sophisticated coordination of traffic signaling can increase effective road capacity by as much as 30 percent and increase speeds to levels at which emissions per vehicle-mile are much lower (World Bank 1992c). Traffic management can also protect environmentally sensitive areas and certain categories of road-users from vehicular traffic. In practice, however, implementation has often been handicapped by weak or nonexistent enforcement and by staff who are inadequately trained to design and maintain systems. As a consequence, simple management schemes, such as segregated busways or basic computer-controlled traffic signals, have often been considered more appropriate for developing countries. However, developments in electronics have reduced both the initial cost of equipment and the need for maintenance. Renewed support for applications such as giving buses priority at traffic

signals, on-line computerized traffic control, traffic enforcement, and electronic charging is now appropriate.

The weakness of relying on reducing congestion to improve air quality is that the impact will depend on where traffic is diverted and on the resulting distribution of traffic speeds (Guensler and Sperling 1994). Moreover, increasing the speed at which traffic moves may simply induce greater volumes of travel, so that, despite reduced emissions per vehicle-mile, total emissions are not reduced. The past emphasis on accommodating unrestrained growth in vehicular traffic on urban roads may be difficult to sustain. The new challenge will be to focus on moving people rather than vehicles.

Notes

1. The Montreal Protocol (1987) and its strengthening revisions in the second World Climate Conference in Geneva (1990) involved a public agreement in which fifty-five countries pledged to eliminate the use of CFCs within their boundaries. Fully halogenated CFCs are to be completely phased out of new vehicles by 2000 in industrial countries, while developing countries have an additional ten-year grace period.

2. Other agencies are also adopting formal environmental assessment requirements. For example, see Japan International Cooperation Agency (1992).

3. Almost all transport projects get at least a partial environmental assessment; more than 90 percent of the transport projects approved during fiscal 1991–94 received full (category A) or partial (category B) assessments. Full assessments are less common but are becoming more frequent. In fiscal 1991 only two of the nineteen projects approved were subjected to full assessments (10 percent), while in 1993 the percentage rose to 16 percent (five of thirty-two). In fiscal 1994 the proportion was even higher, with nearly one-fifth of the transport projects approved being subject to full environmental assessments.

4. Regionally, the majority of full environmental assessments are done in Asia: between fiscal 1991 and fiscal 1994 eight out of fourteen were done in China. The other Asian assessments were in Bangladesh and Pakistan. Two assessments were done in Africa (Botswana and Nigeria) and one each in Middle East and Northern Africa (Yemen) and Europe and Central Asia (Hungary). On a modal basis, however, the split is generally proportional to the modal distribution of Bank lending, with the greatest number of full assessments occurring in highway projects (five), followed by railways (three), ports (two), and urban transport (one). The remaining three full assessments were part of sector loans. Sectoral environmental assessments are proportionally more common because they are often used to design sector investment programs and to study sector investment alternatives; the effect of sector policy changes; institutional capacities and requirements for environmental review, implementation, and monitoring at the sectoral level; and the cumulative impacts of many smaller, similar investments that do not merit individual project-specific assessments.

5. However, if the emissions of the existing fleet are not effectively controlled, high import duties on new vehicles may make matters worse by extending the life of vehicles and keeping less efficient and more polluting vehicles in operation.

6. For example, in Mexico until November 1991, the price of leaded gasoline was

only 70 percent of that of unleaded. As a consequence, it was more economical to use leaded fuel, which destroyed the catalytic converter (thus increasing noxious emissions), and to incur the additional cost of a replacement catalytic converter so as to comply with legal provisions at the annual test than to use unleaded fuel, for which the device is designed. Since then, fuel prices have increased 55 percent for leaded and 25 percent for unleaded gasoline. There still remains, however, a price difference of 14 percent in favor of leaded gas.

CHAPTER FOUR

Social Sustainability

Transport strategies and programs can be designed to provide the poor with better physical access to employment, education, and health services. For the urban poor, adequate public transport, including the services of the informal sector and nonmotorized transport, is essential. For the rural poor, the provision and maintenance of rural access facilities can be improved by extending community participation in decisionmaking and project implementation. Effective arrangements are also necessary to address occupational and spatial dislocation and any distributionally unacceptable consequences of further commercialization of transport.

Through its effect on economic growth, transport improvement should be capable of acting as an instrument of poverty reduction. But it does not always do so. The poor incur high costs in time and money in marketing outputs and acquiring goods and in gaining access to employment, health services, education, and other amenities. Lowering these costs contributes directly to poverty reduction. Narrowly focused strategies oriented to growth of output tend to increase dependence on the automobile, which, in turn, tends to displace nonmotorized transport and reduce the variety of public transport available to the poor. The poor are also disproportionately displaced by the expansion of rights-of-way for transport infrastructure or are less able to afford higher prices as the transport sector becomes more commercial. For those reasons, transport policies and programs must be carefully designed to recognize and respond to the needs of the poor, differentiating between the urban and the rural poor where possible. At a minimum, programs must be established to prevent adverse spin-off effects that aggravate the condition of the poor.

Designing General Transport Policy to Help the Poor

Transport reduces poverty mainly by increasing economic efficiency. It has no special claim to be a cost-effective channel for redistribution of welfare to the poor. Nevertheless, there are some ways in which policy can be focused to give particular assistance to the poorest groups, either directly through concentration on the needs of particular social groups (poor workers or women, for example) or indirectly, through assistance to those modes of transport on which the poor are known to be particularly dependent.

Providing Adequate Public Transport to Places of Employment

The high financial cost of journeys to work can be a significant drain on the income of the poor, whose prospects for employment in cities in developing countries also suffer from lack of access to transport. This particularly affects people living on the periphery of cities, where the disadvantage of having a low income is often aggravated by poor connections to the main radial routes on which public transport service is concentrated. The high costs of freight transport also adversely affect the income, as well as the expenditures, of the poor, whether in urban or in rural areas.

Public transport subsidies are often a wasteful response to the mobility problems of the poor. First, they do not always focus explicitly on poverty. The Calcutta metro is a classic example of a subsidized system on which the poor cannot afford to travel. Second, even where subsidies are targeted in the form of reduced fares for selected categories of persons, they still often benefit the nonpoor, reduce the return on enforcement of payment (if those receiving concessions account for a disproportionate share of the patronage), and encourage fare evasion by those who should pay. Finally, some of the benefits of general subsidies on operations go to the management and staff of operating companies in the form of higher wages and slack operating conditions.

Where the problem is well-defined geographically (as, for example, in the black townships in South Africa), subsidies may be directly targeted by route. Where deprivation is geographically more diffused, income supplements are preferable to payments in kind. However, direct income transfers to the poor may be difficult to organize where income tax systems are weak (as in most developing countries) or where there is no adequate basis for recording and verifying income to support means-tested vouchers. In these circumstances, subsidies on journey-to-work tickets channeled through the employer may be a good way of targeting support. Unfortunately, this device, exemplified by the Brazilian *vale transporte* scheme, tends to miss the informal sector, where many of the very poorest are employed.

Attempts to use the operator of public transport as the instrument with which to protect the poor frequently fail. Controlling the fares of commercial

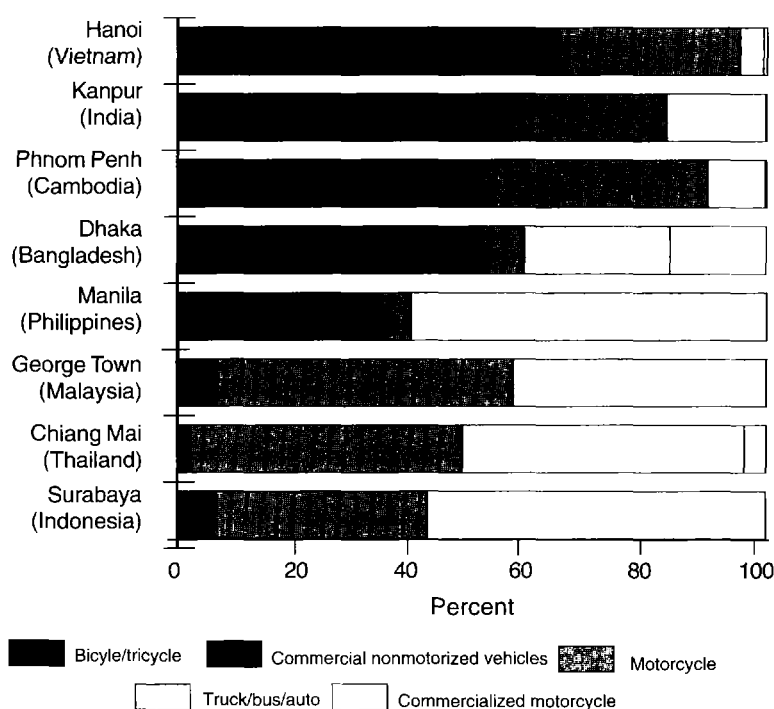
companies reduces profitability and normally has the perverse effect of reducing the amount of service provided (in some cases bankrupting the company). Restricting competition (often by protecting a state-owned enterprise) to create a basis for subsidizing unprofitable services from profitable ones not only is likely to increase costs but may also create a situation in which services to poor areas (where residential densities are high and demand is strong) subsidize services to wealthier areas. Periodic competition for monopoly franchises, either for specific routes (which may involve direct payments by the public authorities) or for specified packages of service designed to have acceptable cross-subsidy characteristics, may be used either to minimize the cost to government or to select the best combination of cost and quality of service. This requires that the public sector be capable of fairly and effectively administering the tendering and financing arrangements. Operators should receive transparent subsidies to compensate them for losses legitimately incurred on services provided as PSOs.

Eliminating the Impediments to Nonmotorized Transport

The balance between modes of transport depends heavily on income, at both the household and national levels. In Sub-Saharan Africa, where poverty is greatest, both rural and urban transport are largely nonmotorized (much being on foot). In medium-size towns in India, between 50 and 80 percent of trips are by nonmotorized modes (Hierli 1993). In Delhi 65 percent of people living in squatter areas walk to work compared with 10 percent of low-income and only 3 percent of middle-income workers. The dominant mode in China and in some of the smaller, poorer countries of Southeast Asia is the bicycle (see figure 4.1). Even in the public transport sector, the cycle is dominant in some countries (for example, the cycle rickshas of Bangladesh). During the early stages of development, nonmotorized transport also plays an important role in the freight market; 90 percent of nonmotorized traffic in rural Africa is for freight transport. This includes the use of wheelbarrows, cycle carts, and various forms of animal power, particularly in South Asia.

One of the best ways to help the poor is thus to improve nonmotorized transport. For the very poor, transport is walking, the security and convenience of which should be protected and enhanced. Even more dramatic improvement can be achieved by shifting from walking to cycling. For passenger transport, cycling offers speeds at least three times, and effective ranges of movement nine times, as great as walking. Both current Organisation for Economic Co-operation and Development (OECD) conventions and recent Chinese studies estimate that nonmotorized transport flow capacities between intersections can be high—more than 2,000 bicycles per hour per meter of road width (Navin 1994; Xiaoming, Shen, and Ren 1993). For a 3.5-meter lane width, this yields a capacity of about 8,000 persons per hour, which is similar to that of an unsegregated, frequent-stop bus lane and more than four

FIGURE 4.1 COMPARISON OF VEHICLE COMPOSITION IN EIGHT ASIAN CITIES



Source: Padeco Co. Ltd. 1995.

times that of an auto lane of the same width at normal levels of urban car occupancy. Recent Dutch studies suggest cycle lane capacities even greater than this (Botma and Papendrecht 1991). Where corridor traffic volumes are very high, fully segregated busways or rail lines use scarce space even more effectively than bicycles. Cycling may then be an efficient complement as a local distributor, allowing longer spaces between stops and higher speeds and flows through the corridor. For freight transport, a study in Ghana showed that it takes two person-days to move 1 ton-kilometer by head-loading compared with one person-hour with a bicycle and a trailer (Howe 1985). In low-income rural areas and in some local urban areas this form of distribution will remain important and may even grow, although its role in distribution outside local areas is likely to diminish as incomes increase. On hard-surfaced roads, trucks can move more than 1,000 tons per hour per meter-lane at an average speed up to 40 kilometers per hour, while nonmotorized vehicles are unlikely to exceed a productive capacity of 240 tons in the same road space at a maximum speed of 10 to 15 kilometers per hour (Padeco Co., Ltd. 1995).

Despite the potential of nonmotorized transport, its users have been disadvantaged in various ways. First, they are physically vulnerable, as a consequence of the failure to separate motorized from nonmotorized traffic—for example, by providing sidewalks for pedestrians and bike paths for cyclists (Jamieson and Naylor 1992). Even where cycle paths exist, users of nonmotorized transport are vulnerable to personal attack, which is a problem in, for example, Lima. Second, governments often discriminate fiscally against nonmotorized transport. For example, in Africa, the diminishing stock of bicycles is partly a consequence of high taxation on imports (which treats bicycles as a luxury). Markups on border prices have ranged between 200 and 500 percent in Ethiopia, Ghana, and Tanzania (see box 4.1). Third, there is usually no national manufacturing capability. About a dozen countries manufacture more than 90 percent of the world's bicycles. Attempts to establish local cycle industries in the 1970s in Kenya and Tanzania failed due to low product quality and the high cost of protected manufacturing. After a similar decline, partly attributable to the rationing of foreign exchange, production in Mozambique is now recovering. Frames are produced locally and then are assembled with imports of more specialized parts. Fourth, there is a lack of financing arrangements. Although the ownership of a bicycle may substantially reduce the real costs to the very poor of moving both passengers and freight, typically persons who are very poor cannot raise the capital to purchase a bicycle. Finally, there is the question of image. Nonmotorized transport is associated with poverty, and this association tends to make it something "planned against" rather than "planned for." The complementary role of nonmotorized and motorized transport is now being emphasized in high-income societies as a means of dealing with environmental and efficiency problems; this growing emphasis might be the basis for making policymakers in developing and transition economies more receptive to the incorporation of nonmotorized transport in overall transport strategies.

BOX 4.1 OVERCOMING THE PROBLEM OF FINANCING NONMOTORIZED TRANSPORT: SOME POSSIBILITIES

In 1992 a bicycle cost an average per capita income of seven months in Uganda, ten months in Malawi and Tanzania, and more than three years in Ethiopia. Although arrangements to provide relatively poor people with credit for nonmotorized transport are rare, several recent schemes have been successful. In Burkina Faso, India, and Zimbabwe these have been associated with government-financed

integrated rural development programs. In other cases, such as the development of credit schemes for bicycles and trailers in Bangladesh and Sri Lanka, private sector finance has been involved. The essential features for success appear to be a high level of decentralization, with nongovernmental organizations involved in the administration, and the intermediation of social or kinship groups to assume formal liability for loan repayments.

Source: World Bank 1994c.

**BOX 4.2 THE INFORMAL TRANSPORT
SECTOR AS AN ECONOMIC FORCE:
RICKSHAS IN BANGLADESH**

There are more than 4 million hand-pulled or cycle rickshas in the world, mostly in Asia and Latin America. The number is growing, and in several countries, the ricksha plays an important economic role. In Bangladesh it accounts for more than 50 percent of Dhaka's vehicles, 70 percent of its passengers, and 43 percent of its total passenger mileage. More than 1.25 million people are employed in this business, and 5 million poor people depend directly on rickshas for their subsistence, more than depend on the hand-loom textile industry or the whole of the modern industrial sector.

Two factors limit how much the

poor can benefit from the ricksha. First, despite attempts (as in Jaipur and Nagpur) to ban the ownership of multiple rickshas and to provide cheaper finance for owner-operators (as in the Dominican Republic), most operators rent their vehicles from owners who derive high rates of return on ownership. Second, restrictive licensing has often been used to encourage the replacement of rickshas by motorized modes. In poor countries this has failed to limit the number of rickshas but has fostered systematic corruption, transferring income from operators to the police. It has also worked to the advantage of larger ricksha owners, who are frequently better able to deal with the police.

Source: Gallagher 1992.

Mobilizing the Potential of the Informal Sector

State-owned public transport operators have often failed to maintain an adequate level of service at prices affordable by the poor and at subsidy levels sustainable by governments. In many countries the transport needs of the poor would be better met by ensuring that the informal sector is free to operate. The informal sector already plays an important role in public transport in many cities in Africa, East Asia, and Latin America and often provides services that are no longer available from the regulated operator (as in the case of the blue cars in Dakar, dolmuses in Istanbul, and jitneys in Manila; see Lia Biagone 1984). Encouraging the growth of the informal sector can also have significant, direct effects on reducing poverty because of the entrepreneurial and income-generating possibilities that it offers to the relatively poor (see box 4.2). The main problem with transport supplied by the informal sector is that it often involves small and old vehicles, which cause congestion and damage the environment.

Eliminating Gender Bias in the Provision of Transport

In most developing countries a man's primary role is to earn income, and the trip to work is the major transport activity for men. The concentrated flows of traffic at peak periods when journeys to and from work are being made are consequently viewed as more essential than other flows of personal transport.

From the supply side, these flows attract particular attention both because they define the system's capacity requirements and because they generate the most revenues.

In contrast, women perform three roles: as workers, as homekeepers, and as community managers. In rural areas most women are engaged in agricultural work and some small-scale commodity production and also, particularly in Africa and the Caribbean, in marketing the produce of the family. As homekeepers they are responsible for collecting water and fuel. Poor accessibility necessitates head-loading the goods to be moved. Studies in Mozambique and Tanzania show women spending more than four hours a day solely on local transport (three times the average for a man). As community managers, women are often instrumental in securing better facilities or making them effective. In urban areas many women are employed in the service sector. The availability of relatively cheap female labor in the rapidly developing economies of Southeast Asia has been an important factor in enabling these economies to enter global chains of manufacturing production.

Women tend to work nearer their homes than men do, and, particularly when they are raising a family, they have to make more trips for educational, health, and other welfare purposes. Their essential trips are hence more dispersed in time and location than those of men.

To date, transport policies have been geared primarily to the needs of men. Many of the activities with which women are engaged are of low status and are disregarded in resource allocation and planning. When public transport is commercialized, rural and off-peak urban services, on which women are particularly dependent, are sometimes lost. Within the family, women have less access than men to bicycles or cars owned by the family and are much more dependent on public transport and walking. In some countries this is accentuated by strong taboos against women riding bicycles or driving cars. Public transport is often particularly unsafe for women at night and in remote areas, which restricts their employment possibilities.

Many of the problems that stem from social and cultural norms or the deterioration of law and order are beyond the reach of transport policy to solve. Some are not. Using the simplest form of wheeled vehicle would immediately halve the amount of time that women require for local transport (Philpott 1994). Making services and commodities more accessible in rural areas, either by improving the way services are provided or by increasing access to transport, benefits the whole family by releasing a woman's time so that she can give her attention to other more important tasks. In urban areas public transport services can often be provided between peak times at low marginal cost. This both increases the probability that services can be supplied commercially for lower-than-peak flows and also means that the real costs of supporting them as a social service are much less than the costs of providing peak service. Failure to consider these possibilities for improving the lot of women often stems from inadequate analysis rather than excessive cost. Adopting a checklist of the effects

that transport projects and policy reforms could have on the socially and economically essential functions performed by women would sensitize the mainstream of transport policy and planning to these needs (Turner and Fouracre 1993).

Addressing the Particular Problems of the Rural Poor

In many countries the deepest poverty afflicts rural populations, especially those living in the more remote and marginal areas of cultivation. Addressing the needs of these people is a particular challenge.

Emphasizing Accessibility

Trunk roads in rural areas, particularly if designed for limited access, primarily offer mobility benefits to longer-distance traffic, whether originating in the rural areas or not. For the rural poor, however, the dominant concern is basic accessibility, both to local facilities and to the primary network. This is provided by the network of subsidiary (nonprimary) roads, unclassified roads, paths, and tracks. In many countries most rural roads, whether classified or not, have an earth or gravel surface and serve motorized traffic flows that are often exceeded by the flow of pedestrians, cycles, and animals (Riverson, Gaviria, and Thriscutt 1991). Research in Ghana has shown that the returns to providing reliable, basic access, even on the simplest of roads, are much higher than those to improving surfaces on low-volume roads.

Although roads, paths, and tracks are the main element in rural subsidiary networks, they are not always the only ones. Inland water transport performs the same function in parts of Brazil, China, and Zaire as does coastal and maritime shipping in the Philippines and Indonesia. In Nepal and Peru local air transport is an essential part of the link between remote rural areas and the main transport trunk routes. Upgrading these transport subsectors can contribute significantly to reducing poverty in some cases.

The state of these subsidiary networks varies by region. In Asia, particularly in China and India, the main problem is how to connect remote villages into a network to allow them to trade. In Africa and Latin America the main problem is maintaining the network. Recent Bank studies on Africa show a significant general deterioration in these assets (Riverson, Gaviria, and Thriscutt 1991; World Bank 1992a). The first priority of spending on rural roads should always be to maintain those roads that form a core network, that have been identified by users as functionally important, and that are currently in reasonable condition. This may imply that less can be spent on roads outside the core network. Durable alignments and structures are more important than high-speed surfaces. Given efficient maintenance, paving of gravel roads is not economically justifiable with traffic volumes of less than 310 vehicles per day; deficient maintenance may push this threshold down as low as 80 vehicles per day (World Bank 1988a). Returns are

particularly high to spot improvements and simple bridging expenditures that are critical to maintaining access. In a study of the dense road network of the Manikganj District in Bangladesh, only 58 percent of the second category of feeder roads and 77 percent of the first category were actually usable by vehicles because of gaps caused by incomplete or unrepaired drainage structures.

Enhancing Local Participation in Supply

Bank-assisted projects have tended to neglect opportunities to invest in transport at the community level. Although these investments are individually modest (for example, the introduction of a foot bridge or the encouragement of better forms of nonmotorized vehicles), they could have a significant impact if applied widely throughout rural areas. However, evidence in water supply projects indicates that rural communities are able and willing to sustain essential infrastructure when they are convinced of the need and the benefits. The Bank has already had some success in promoting the cofinancing of rural works, including roads, by a municipal fund and local communities, as in the Mexican Second Decentralization and Rural Development Project. The ultimate aim of rural funds is to allow communities to make decisions on the allocation of resources between transport and other services and between investment and maintenance on the basis of a realistic medium-term projection of resource availability. For communities to be responsible for identifying and implementing projects and accounting properly for resources, they need technical guidance on the available alternatives, their recurrent cost implications, and any necessary specialist skills.

In many cases failure is basically organizational. The capacity of countries to plan, fund, implement, and monitor rural road works is often inadequate because the appropriate local institutions or policy frameworks are missing. The institutional basis for improvement must be a coherent structure defining the ownership of rural roads and the responsibilities of various institutions for development, maintenance, and priority setting. The policy basis for improvement should be the simultaneous determination of the overall level of funding for rural roads and of the balance between new development, rehabilitation, and maintenance.

It is not realistic to expect the formal private sector to take a leading role in this process. However, the participation of local authorities is crucial because local agencies can generate the necessary information that is not available centrally and because local ownership of the process will increase the efficiency of implementation and maintenance. Furthermore, the participation of local beneficiaries should also be encouraged in assessing needs and setting priorities. For example, district development committees have been set up in Ghana, Kenya, and Uganda to strengthen local coordination and to give a degree of local autonomy in implementation.

Developing Labor-Based Local Transport Programs

Maintaining transport infrastructure using only capital-intensive methods or investing only in the skill-intensive production of transport equipment and vehicles does little to increase the job opportunities of the poor. This can be addressed in the selection and design of infrastructure projects. For example, the Maharashtra Employment Guarantee Scheme in India successfully targeted the very poor by providing employment in public works, including expanding the network of rural roads (Ravallion 1990; Goldstein 1993). The Albania Rural Roads Project generates an estimated 10,000 man-years of work in the region with the highest unemployment. Although some tasks, such as compacting of fill, cannot be done adequately by hand methods, for many tasks labor-based work methods can be cheaper and more reliable than capital-intensive works, particularly where wage levels are less than \$4 a day (EDI and ECA 1991). In Ghana, small contractors, with about four months of training in labor-based rehabilitation techniques and two months of trial contracts, were able to produce an average of 2 kilometers of high-quality gravel road per month at 15 percent less cost and up to 40 percent savings in foreign exchange over conventional capital-intensive methods. The Kenya Rural Access Roads Program established a rolling contract system, with one-man contractors (lengthmen), recruited from villages along local roads, who were responsible for the routine maintenance of a total of 7,800 kilometers of unclassified roads. The system worked so well that it was extended to part of the country's network of classified roads. Part-time routine maintenance work near their homes has been particularly popular among women in the Gambia (Kessides 1992). Experience in South Africa suggests that labor-based road work may also be effective in urban areas. Institutional reform and targeted technical assistance can help to develop the local technical and managerial skills necessary for successful implementation (Bongoy 1992).

These schemes need to be supported by strengthened implementation capability, which the Bank has assisted by funding institution building and innovative pilot programs and by making funding conditional on institutional reform, as in the Integrated Roads Program for Tanzania. Labor-based construction methods are often highly appropriate for rural road works, both because they are suited to the limited skills and equipment of local agencies and because they create employment for local unskilled workers (including women) while reducing costs. Contracting maintenance tasks to local workers can also improve implementation so long as contracting arrangements and monitoring are efficient. The use of project management contractors, as in the AGETIP (Agence pour L'Execution de Travaux d'Intérêt Public) agencies in several African countries, can improve contract management at the local government level. The establishment of an independent programwide audit system, as introduced in Kenya in 1991, can discourage misuse and encourage dissemination of best practice at a small proportion of the total program cost (estimated at 2 percent in Kenya).

Mitigating the Unwanted Social Effects of Transport Policies

Measures to improve transport efficiency can have a number of adverse spin-off effects, of which physical resettlement, occupational redundancy, and reduced transport affordability are the most critical. Measures to mitigate such adverse impacts are an essential component of better transport investment and policy reform operations.

Managing Spatial Relocation

Transport is now the largest cause of resettlement in the Bank's portfolio, accounting for 25 percent of projects active in 1993 that involved resettlement (World Bank 1994d). Resettlement is involved in 20 percent of transport projects, compared with the Bank's average of 8 percent. Moreover, in a few cases, displacement has occurred on a large scale due to the sheer size of the network under reconstruction (Vietnam Highway Rehabilitation), the need for significant excavation or the impact on land and water resources (Jamuna River Bridge in Bangladesh), or high population density in project areas (Jabotabek First Urban Transport Development Project in Indonesia). Transport is often the primary cause of resettlement in urban and industrial development projects. For example, 67 percent of the resettlement in the Surabaya Urban Project is associated with the project's transport components.

The Bank's commitment to assisting resettlers "in their efforts to improve their former living standards, income-earning capacity, and production levels, or at least to restore them" aims to encourage sensitive planning, design, and implementation of projects. Transport projects have already contributed much to the development of good practice in resettlement, as, for example, in the income rehabilitation planning in Bangladesh's Jamuna River Bridge, the development of the first national resettlement policy in Vietnam (in association with the Highway Rehabilitation Project), and the baseline surveys and staff appraisal reports examining the recent transport projects in China. In the case of the Indian Container Transport Project, redesign established a less disruptive option with minimal loss of benefits. Recent guidelines on the treatment of resettlement for road projects, as set out in a design handbook, emphasize the importance of continuing to focus on reducing resettlement in the design of projects and enforcing proper standards of treatment of the persons affected, even though these activities increase the cost of preparing and implementing projects (World Bank 1994e).

Managing Redundancy

The productivity gains for the economy (and the enterprise) arising from the redeployment of redundant labor are analogous to those arising from the

implementation of spatial resettlement. Technological change within a mode (such as a shift from steam to diesel locomotion in the Indian railways or containerization in Korean ports) and the increases in the efficiency of resource use associated with privatization can reduce the need for labor per unit of output. If the output of the enterprise is growing as a result of growth of the economy and diversification in the products being handled (as in the case of ports in Korea and Thailand), technological improvement can be translated painlessly into increased labor productivity. If this is not so, or if there is a protracted reduction in demand for a mode of transport, large-scale labor redundancy can occur. After being reorganized, railways in Argentina, Brazil, and Ghana, and both ports and railways in Chile, reduced staff by at least half with little loss of output (Galenson 1989).

The immediate costs to the national budget of retaining redundant labor in state enterprises may be very high. For example, the deficit of Argentine Railways prior to restructuring imposed a cost of 1 percent of GDP. The longer-term consequences of retaining excess labor are even more far-reaching. Within the enterprise, retaining excess labor may lead to a low and compressed salary structure, thus impairing morale, encouraging moonlighting, and inhibiting the employment of staff with higher skills. The inability to shed labor may be a serious impediment to reorganization and, particularly, to privatization.

Although eliminating excess labor is of long-term benefit, the short-term effects may be to create a new and concentrated pocket of poverty. As in the case of involuntary resettlement, therefore, severance of redundant labor should always be preceded by an exhaustive exploration of alternatives. Several possibilities exist. New products (such as premium services) may be produced within the organization. Workers may be redeployed to other public sector organizations, as happened in the Costa Rican and Uruguayan rail reorganizations. In some cases it may be possible to link private sector development with the process of eliminating redundant labor from public enterprises by transferring assets to employees as, for example, in the winding-up of the Jamaica Omnibus Company or in the privatization of the Ethiopian Freight Transport Company.

Where these possibilities do not exist, the use of voluntary retirement and limitations on recruitment may still yield substantial reductions over a long period. The staff of the Brazilian railway system was reduced by 60 percent over two decades in this way. This approach may sometimes adversely affect efficiency, however, as the better staff leave and crucial skills cannot be replaced. It may also prolong fiscal deficits during the long period of adjustment or fail because of a loss of resolve by the government, as in the case of the plan for reducing staff in the Sri Lanka transport boards and in the staff retrenchment associated with the abolition of the Marine Transport Authority in Ethiopia (which led to so much public protest and so many hunger strikes that the government has been reluctant to restructure other transport parastatals).

In many cases, however, voluntary solutions are not feasible, and the only way to avoid increasing poverty is by a combination of retraining and

compensation. For example, in the port sector in Benin and Chile, in the railway sector in Argentina, Brazil, Cameroon, Chile, Ghana, and Sudan, and, to a lesser extent, in urban public transport in Ghana and Sri Lanka, redundant labor has been reduced by severance pay arrangements. When designed carefully, these can have measurable economic as well as social benefits.¹ As shown in a study of state-owned transport enterprises in six countries, the long-run savings on the wage bill may enable governments to recoup costs in a short time (between four months and four and a half years in the cases studied), despite high levels of severance payments (Svejnar and Terrell 1991). Nevertheless, severance payments have to be financed. Sometimes this can be handled within the enterprise—for example, Mexican railways paid for their compensation payments by selling nonrailway real estate assets—but often it cannot. Where the cash flow of the enterprise is insufficient to meet the severance obligations, the enterprise may borrow for the purpose or, alternatively, look to the government for assistance either through budgetary transfers or domestic borrowing, with recourse to international borrowing only where local capital markets are not able to accommodate the need. Although it is preferable that such foreign borrowing should not be tied to specific investments, there may be cases where general borrowing is not feasible, and governments must explore the potential for financing severance payments externally within project loans.

Compensating for the Redistributive Consequences of Commercialization

Commercializing transport services sometimes has adverse consequences for the poor. For example, in many cities in Eastern Europe, public transport operators, including tram operators in Budapest and some Polish cities, are forced to choose between increasing fares and allowing services to deteriorate because they cannot afford to replace their vehicles. In these circumstances, subsidies may be justified, at least as an interim solution. The relevant considerations in designing such compensatory arrangements have been discussed. The essential requirement is to target the subsidies to carefully selected groups and to prevent them from leaking to unintended beneficiaries.

Note

1. Finding the appropriate arrangement is not easy. For example, Chile's approach of declaring redundancies with restriction on reemployment and paying severance prior to privatization appeared to be a good way of making purchase attractive to the private sector. However, because the restriction on reemployment hampered the ability of the eventual purchasers to recruit sector-specific skills, with hindsight it would have been better to have made severance payments only after the new ownership had selected the workers it wanted.

CHAPTER FIVE

Redefining the Role of Governments in the Transport Sector

The changing focus in transport policy implies a substantial change in the role of government, reducing its functions as supplier, but increasing its functions as regulator—the enabler of competition and the custodian of environmental and social interests. This means that governments need to create the proper institutional framework for competition, set economically efficient charges for the use of publicly provided infrastructure, appraise the allocation of scarce public resources carefully (both as an investor and as a purchaser—for example, of subsidized social services), and increase community participation in decisionmaking, particularly in those areas where markets work poorly.

It was argued in chapter 2 that the supply of transport infrastructure and services should, wherever possible, be shifted from the government to the market. The efficient working of a private market in transport depends partly on the existence of conditions conducive to market behavior, such as well-defined property rights, the rule of law, and the freedom of individuals and economic agents to respond to market signals reflecting true economic and social costs, which are not specific to transport. It also depends on sector-specific technological and structural characteristics, such as the extent of externalities, market distortions, and monopoly power in the sector.

These conditions are rarely satisfied. It is, therefore, necessary to redirect the activities of governments in the sector to make markets effective and to do what markets cannot. To accomplish this, governments must perform three roles. First, they must establish a market framework that gives efficient incentives to decentralized decisionmakers. Second, because some environmental and social objectives cannot easily be included in economic inducement systems, governments

must make critical judgments on societal objectives that cannot easily be subjected to market processes. Third, because issues regarding the distribution of welfare cannot always be dealt with through general social and fiscal policies, governments must protect or compensate those who suffer from the process of transport development. This may justify their intervention in the sector, both because general instruments of redistribution may be absent in societies with weak tax bases and undeveloped fiscal systems and because very specific and localized redistribution effects may result from sector policies.

Performing these roles requires that government be active in a wide range of ways. Establishing an efficient market requires the creation of a competitive framework and the ability to discourage anticompetitive behavior. Creating incentives for economic efficiency requires the introduction of proper pricing for public infrastructure. Both because of the high transaction costs of establishing markets for some infrastructure (such as urban and rural roads) and because of the strategic and distributional consequences of the absence of effective markets, governments must also continue to be responsible for *structural, fiscal and investment planning* to complement market activities in transport. Finally, in areas where markets do not operate, governments must establish effective nonmarket institutions and processes, requiring both *decentralization of political responsibilities and direct involvement of the local community*.

Establishing a Strong Institutional Framework

Enabling the private sector to play a larger role in the transport sector requires some general institutional and market conditions that are often absent in very poor countries. The development of an entrepreneurial culture in the provision of transport service requires that there be well-defined property rights, well-defined liabilities and risks, strong and visible demand in the sector, and a viably small scale of entry. Where state-owned enterprises have dominated the market, both privatization and structural deconcentration of these enterprises will be necessary to ensure effective competition. For the private sector to participate in transport infrastructure, where the viable scale of entry is greater, there will also need to be either a well-established local capital market or the involvement of foreign capital (these enabling conditions are discussed more fully in World Bank 1994f, ch. 5).

Changing the role of governments from having direct control over state-owned enterprises to exercising indirect guidance through regulation and pricing policy is likely to put greater demands on institutional capabilities in developing and transition economies than can be satisfied immediately. In some cases (for example, control of road vehicle overloading, vehicle safety and the behavior of road-users, and civil aviation regulation), improving regulations is largely a matter of strengthening the existing monitoring and

enforcement capability. In other cases (for example, the environmental effects of new infrastructure investment), it involves setting up participatory development and appeal processes. In yet others (control of cartels and anticompetitive behavior), whether there is a need for transport-specific institutions will depend on how these issues are dealt with at an economywide level. Identifying and providing for the necessary human and institutional development is thus a necessary precursor to major regulatory change (Heggie 1991).

Setting Charges for Use That Reflect Costs

Although the general principles of public sector pricing and taxation are well known (World Bank 1988b, 1994f), they have been difficult to implement in transport, particularly in the road sector. Most road infrastructure is publicly provided. Because of the difficulties of collecting tolls from users of local urban and rural roads, direct use-related charges have not been the primary basis of infrastructure finance, as they are in most other sectors. Instead, revenues are raised from road-users through various forms of taxation, occasionally supplemented by tolls on specific facilities. The way in which these revenue-raising devices are fixed creates the incentive structure for the behavior of the users and suppliers of roads. Getting this incentive structure right will increase the efficiency with which resources are employed in operating fleets of vehicles on the road infrastructure and in allocating traffic between roads and competing modes, such as rail. It can also provide a better financial basis for ensuring proper provision and maintenance of roads.

For purposes of integrating economic and environmental sustainability, user charges, in addition to their revenue-raising function, should be giving signals that induce the efficient use of available capacity (including scarce road space), an efficient choice of vehicles and fuels, an efficient split of traffic among modes, and the efficient maintenance and management of infrastructure. For social sustainability, it is usually considered desirable to avoid regressive taxation structures, as well as to ensure accessibility for the poor, which may involve providing some facilities and services for which users pay less than the real costs.

At the heart of the problem of setting efficient charges is the fact that road traffic exhibits three types of external effects. *Congestion externalities* occur mainly in urban areas where the presence of a vehicle on the road slows down all other vehicles. These externalities are caused by both motorized and nonmotorized vehicles and directly affect road-users. *Environmental externalities* have impacts beyond road-users. These impacts are caused by most types of motorized vehicles, whose emissions are related directly to the amount and type of fuel consumed and the technology employed in burning the fuel. Other effects, such as noise, depend more on the locations and conditions in

which the vehicles are moving. *Road damage externalities* occur when a vehicle contributes to the wear and tear of the road, which reduces speed and increases the wear and tear of the vehicles of other road-users. This occurs throughout the network and, because damage is approximately proportional to the fourth power of the axle weight, is caused largely by heavy vehicles.

In practice, few instruments are available for charging directly for road use. Until recently, direct congestion charges could only be implemented by a cordon of toll points around the congested area. This has worked well in Singapore but is suitable only when the number of toll points is small and enforcement is efficient and scrupulously honest. Simpler forms of charging vehicles to cross a cordon into the city (motivated by the potential to generate revenue rather than by the wish to alter behavior) have been introduced in some Scandinavian cities in the 1990s. New electronic tolling systems, such as that being introduced in Singapore, will make more complex time-sensitive applications easier in the future but are not yet proven for implementation in developing countries. Gasoline taxes that apply primarily to light vehicles, vary with use and hence offer a reasonable proxy for some air pollution effects. They do not, however, vary as significantly with road damage and as such are poor proxies for that purpose. In addition gasoline use does not vary much with time, location, and speed and is therefore a poor proxy for congestion and other location-related effects. Diesel taxes, which primarily apply to heavy vehicles, vary with distance but do not adequately reflect the variation in the degree of road damage caused by different vehicles. Annual vehicle taxes can be differentiated by type of vehicle, based largely on axle loading, both to correct for the imperfections of fuel taxes in allocating variable costs and to distribute fixed costs. In only a very few countries (for example, New Zealand and Sweden) has the tax related to heavy vehicles also varied by distance traveled, thereby making it easier to tailor the taxation burden according to the responsibility for incurring costs.¹ Direct tolls can be varied both by type of vehicle and by distance traveled but are costly to administer on a widespread basis.

Currently, despite their limitations, fuel taxes are the primary instrument through which any charge is made for road use in many countries. No unique retail fuel price is appropriate to all countries and circumstances. But it is possible to state the principles on which price should be established, to identify the components to be included in constructing the price, and to use international experience to suggest the broad orders of magnitude that this process of formulating prices will generate.

The following principles should determine fuel prices:

- Users should pay for the resource cost of fuel (generally the international border price).
- Users should pay for the other costs imposed on society by the consumption of fuel, such as externalities.

- Any taxation over and above resource and externality costs should be imposed on consumption goods but not on inputs to production.
- Any luxury or sumptuary consumption taxation should be set in ways that minimize the distortion of consumption patterns.

These principles suggest that when better and more direct charges for road use are not available, fuel taxation could be used to cover the resource cost of the fuel plus some of the environmental costs imposed by consuming the fuel plus some of the costs of road use (both road damage and occupation of scarce road space). Although fuel price is generally a very poor proxy for congestion charges, in cases where congestion occurs systemwide over the whole day, the fuel price may also be the best available proxy instrument for a congestion charge. Any additional taxation for general revenue purposes must be viewed as distinct from user charges and must be consistent with the principles of nondistortionary taxation.

The first component in a fuel charge should be the resource costs of the fuel itself. For internationally traded goods, such as fossil fuels, this is represented by the price at which fuel is imported (for net consuming countries) or the price at which it could be exported (for net producing countries). Pricing below border price (as in Russia) or even below local production cost (as in Venezuela) is difficult to justify (see figure 5.1).

The second component in setting fuel prices is the environmental impacts (primarily air pollution) that are presently not directly priced. Gasoline taxation should be set at a level that internalizes these environmental effects. Because environmental costs are notoriously difficult to estimate, the level of this component will have to be determined case by case. If future studies show high environmental costs related to the use of diesel fuel (for example, the health effects of particulates), higher charges on diesel may also be justified on this account.

The third component in a fuel charge is the proxy road-user charge. In the absence of any direct user charge (such as tolls), this component should reflect the cost of using road infrastructure. Recent U.S. studies have estimated this cost to lie in the range of \$0.03 to \$0.07 per mile, according to location (Gómez-Ibáñez 1995). Estimates of the long-run marginal costs of road space (that is, excluding congestion costs) for the United Kingdom are of the same order (equivalent to \$0.06 per car-mile on average and up to \$0.09 per car-mile on urban motorways; Newbery 1994). Assuming that vehicles average about 25 miles per gallon of gasoline, this suggests a fuel tax equivalent of at least \$1.00 per gallon.

Determining the appropriate way of charging freight vehicles raises some more difficult problems. Although much controversy remains over the allocation of total "joint" costs among categories of vehicle and, hence, over the "right" structure of road-user charges within the road mode, a key principle is that no category of vehicle should pay less than the incremental or attributable

costs that it causes. The first requirement for this purpose is that an account of total road costs should be compiled, accompanied by an analysis of how these costs can be attributed to different categories of vehicles. Good examples of how this can be done include the studies undertaken for the World Bank in Ghana and Zimbabwe and in Tunisia (Gronau 1994; Newbery and others 1988). Some general guidelines for tax and charging policies can also be derived from these studies. The most germane conclusions are the following:

- Where road damage by heavy vehicles is the primary problem, and heavy but not light vehicles are predominantly diesel-powered, diesel taxes should be set at levels that reflect the marginal costs imposed by heavy freight-carrying vehicles and by buses. These marginal costs can be determined either from increases in the costs of operating the vehicle associated with increased roughness of the road or from increased capital costs incurred by road agencies to forestall the former. The precise figures will depend, of course, on the nature of the roads and the volume of traffic. However, the studies of Ghana and Zimbabwe suggest diesel taxes of between \$0.15 and \$0.20 per gallon.

- This level of diesel taxation will not yield sufficient revenues to cover total maintenance costs because a proportion of the deterioration of roads is related not to use but rather to weather and subgrade conditions. Moreover, the costs of road damage caused by heavy vehicles vary more than the diesel taxes paid as vehicle size increases because larger vehicles use less fuel per ton transported. Nor are the costs of road capital included in the calculation. Distance-related axle-load taxes would be the best way of reflecting these considerations in a charging scheme. In the absence of such a tax, differential annual vehicle taxes related to gross vehicle weight and axle loads should be used to ensure that the full maintenance costs are recovered in a way that creates incentives for consumers to choose types of vehicles that minimize the total cost of road and vehicle use. The implication is that taxation on diesel fuel could be substantially less than that on gasoline if the costs of road use by heavy vehicles transporting goods were recouped from other forms of tax (such as annual registration fees).

Among those countries covering costs in total, there will be many for which charges do not cover costs for specific categories of vehicles (particularly very heavy vehicles), either because axle-related charges are not in use or, as in the case of Korea, because the tax on diesel is very low compared with that on gasoline, without there being any other more appropriate direct charge on heavy vehicles. The main thrust of national policy on transport infrastructure pricing should be to eliminate such major distortions. The problem for governments is thus to match a limited range of charging instruments to a complex set of objectives.

The elements considered so far represent user charges for social costs imposed. Wherever possible, these costs should be recouped through direct user charges. Where that is not possible, fuel taxation may be the best available

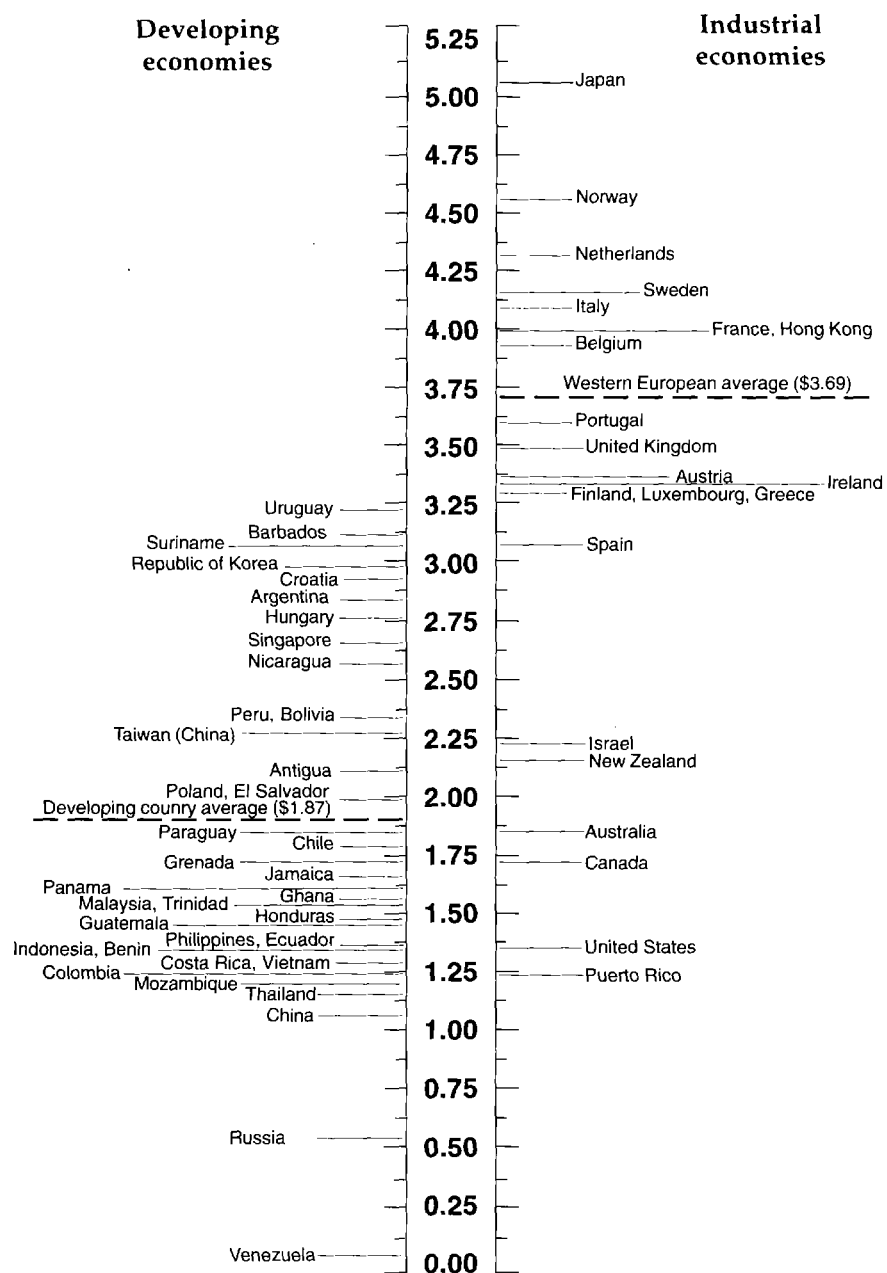
proxy. Fuel taxes set as surrogate road-user charges should be clearly distinguished from general tax policy. Countries with a weak direct tax base often rely heavily on gasoline taxation for general revenue. Such taxation is not the subject of this review. (Sumptuary taxation on gasoline may be politically acceptable, both because the inelasticity of demand for gasoline limits the distortion it causes and because, at earlier stages of development, gasoline is consumed disproportionately by higher income groups.) Ratios of fuel tax to total costs imposed by vehicles that are higher than unity, particularly for private cars, may thus be part of general tax policy but must be justified as such.

Broad orders of magnitude may now be put on these components of an optimum fuel price. The border price of fuel is approximately \$1 per gallon (figure 5.1). As discussed above, road-use costs (primarily road damage but not congestion) may add another \$1. For developing and transition countries, with rapidly growing levels of motorization, up to a further \$1 per gallon may be needed to cover environmental externalities, as discussed in chapter 3. This brings the indicative price up to the equivalent of low European levels without considering any component to proxy a congestion charge or any element of general or luxury taxation. (As such, this approach to setting fuel prices may differ from the actual practice in some European countries insofar as the suggested indicative price does not include a general tax but does include a Pigovian tax or user charge component.) This price does not include the costs of accidents or global environmental impacts. If these were included, a recent calculation suggests that existing fuel prices in Europe would be between 40 and 70 percent of the levels necessary to internalize environmental externalities.² Taken together, this evidence suggests that, if the gasoline price is the only instrument being used to recoup the costs imposed on society by road transport, European levels of retail gasoline prices may be a more appropriate benchmark for gasoline prices in developing countries than those in the United States. Few developing countries currently have gasoline prices as high as the European prices. These calculations are, of course, only indicative; actual prices should reflect the principles but embody locally based calculations of the magnitudes.

The transition to higher levels of fuel prices may be a source of political and social disruption, particularly in fuel-producing countries such as Nigeria and Venezuela, where the tradition of low prices for domestic fuel may be seen as an equitable way of distributing a national natural asset. The experience of countries that have attempted the transition does yield some lessons on making the shift to a sensible pricing structure for fuel more palatable:

- Link the price of fuel to measures that improve the performance of the transport sector (as in Bolivia, where a fuel tax increase was earmarked for the establishment of a road fund to improve road maintenance).
- Increase prices gradually (as in Nicaragua, where small increases were made each month over a prolonged period).

FIGURE 5.1 PUMP PRICES FOR PREMIUM GASOLINE

Source: *Energy Detente* (1994); World Bank.

- Avoid unjustified pass-through to public transport fares, possibly by rebating increases in the fuel tax to public transport. (In Venezuela, bus operators took advantage of a doubling in the fuel price in 1988 to double fares even though fuel only accounted for 10 percent of costs).

Some conclusions may also be drawn concerning the way in which revenues and expenditures could be institutionally linked in a more businesslike way. A basic tenet of price theory is that an excess of revenues over costs is a signal to expand supply. While the government's dependence on fuel tax for general revenues excludes the interpretation that all taxes on road-users should be spent on roads, increments in fuel taxes designed to function as proxies for road-user charges should be linked tightly to the use of the funds generated. This has some important implications. First, because road wear and tear is predominantly caused by heavy diesel-fueled vehicles, both diesel taxes and axle-load-related commercial vehicle taxes might appropriately be assigned to the road maintenance agency.³ Second, because urban congestion charges relate to the costs of the urban transport system, it would be appropriate for revenues from a congestion charge or tax to be assigned to an urban transport fund, to be spent on whatever urban transport expenditures (including public transport investment or revenue support) appear to be most cost-effective in improving the quality of the urban transport system. Clear evidence that the proceeds of a congestion charge are being devoted to improving the situation might help to overcome the historic resistance to such new charges. Because gasoline consumption is related to the level of air pollution, fuel taxation may be viewed as a partial surrogate for efficient environmental charges; some part of the gasoline tax revenue might therefore be allocated to the general urban transport fund. As in the case of road funds, the creation of urban transport funds must be associated with appropriate, accountable, institutional arrangements that enable the representatives of stakeholders to oversee expenditures (see the discussion below).

Strategic Public Planning to Complement the Market

The establishment of proper charges for road use will do much to improve the efficiency of user decisions but will not, by itself, be sufficient to ensure an optimum disposition of resources. In addition, a number of necessary complementary actions will remain in the public domain.

Structural Planning as the Basis for Private Sector Entry

Even where the private sector finances transport infrastructure, it will usually do so only in the context of public sector acceptance of responsibility for planning the overall structure of the network. The existence of a functioning land market is not sufficient to ensure an effective balance between the use of

space for private and public purposes (including space for traffic to circulate; see box 5.1).

The starting point for designing a project should be the identification of the problem to be addressed, rather than the presentation of a solution. The process of preparing a project should include an evaluation of the full range of modal possibilities, including nonmotorized transport and modal integration and interchange facilities within the sector strategies, as well as consideration of a variety of options at the project level. The potential benefits from making new investments must be compared with those from maintaining existing capacity. Priorities in maintenance must also be appraised carefully, particularly when (as in the transition economies) the structure of demand is shifting radically. Most importantly, the rationale for public intervention must be clear and explicit.

In this context, planning complements the market, ensuring that network effects are considered and that all stakeholders have access to needed information on the interrelated elements of a system. It should also provide a forum

BOX 5.1 WHY A STRATEGIC GOVERNMENT ROLE IS NECESSARY: THE CASE OF BANGKOK

The traffic problems of Bangkok are notorious. Average travel speeds in the city are only 10 kilometers per hour, falling to 5 to 6 kilometers per hour at the peak. Congestion-induced delays cost the city an estimated \$4 million a day, and water and air pollution cost \$2 billion a year. The emissions of all major transport-related air pollutants (carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, hydrocarbons, and suspended particulates) nearly doubled between 1986 and 1991. Although lead pollution has since been reduced by the introduction of lead-free fuel, the prospects for removing overall air pollution are not bright.

The explanation of this situation is complex. The proportion of urban space devoted to roads is low (11 percent, compared with 20 to 25 per-

cent in most Western European cities with well-developed metros, and more than 30 percent in some U.S. cities). Ownership of motorcycles rose an average 34 percent a year, and ownership of cars rose almost 13 percent annually during the decade from 1982 to 1992, encouraged by the development of a local manufacturing industry and the reduction of import duties on foreign cars from 300 percent in 1982 to 20 to 60 percent in 1991. While the roads are clogged with traffic, the river, canals, and railway carry very little, and there is no mass rapid transit system in the city. No effective instrument has been adopted for restraining traffic. In a very active (and, in some respects, very efficient) land market, rapidly escalating prices have made it difficult for the government to acquire land for local distributor roads and have encouraged both high-density central development and periurban sprawl, putting even greater strain on the in-

or process for reconciling conflicting interests, including “fair” implementation of mandatory eminent domain procedures. Furthermore, several components of the transport system facilitate “interface” among modes, among operators, and between the transport and other sectors. These interchanges are not always easily organized in a private market.

Economic Justification of Public Investments and Expenditures

Economic considerations should continue to be central in the design, phasing, and selection of public projects and interventions, with new emphasis put on some technical aspects of appraisal critical to sustainability. Cross-modal effects, including those on users of nonmotorized transport, should be included (Anderstig and Mattsson 1992). Time savings (correctly valued) are an important component of the benefits and should consistently be taken into account. Both the benefits to generated traffic and the effect of new traffic generation on the level of congestion should be incorporated in the appraisal.⁴

adequate capacity of local roads. A series of privately financed “megaprojects” to increase road capacity and to develop a mass rapid transit system has been long delayed (although an IFC investment in the “green” metro line was approved in 1995). Failure of the institutional arrangements to provide an appropriate strategic and structural framework is at the heart of these failures to address the desperate situation.

- The lack of infrastructure planning has accentuated the failure to provide adequate space for transport to circulate.

- The diffusion of responsibility for transport policy among a number of ministries and agencies has paralyzed attempts to construct a comprehensive strategy (a study of the megaprojects revealed thirty-three locations where construction, as designed, would be impractical due to conflicts between them).

- The absence of a strong core of professionals has also encouraged frequent political intervention that has discouraged private sector commitment (the Second Stage Expressway was taken out of commission for some time after completion due to an unresolved conflict over toll rates).

- The high risk of political intervention discourages private investors and concentrates their efforts on securing returns in ways that are not so vulnerable (such as the massive development rights granted to the Hopewell Rail and Road Project).

Without a resolution of these institutional weaknesses, including greater willingness of government to provide some strong and transparent structural guidance on development of the urban transport system, the prospects for improving the situation in Bangkok look bleak.

Source: Stickland 1993.

Contextual issues require particularly careful attention. Provision of adequate long-term funding for maintenance should be incorporated in the initial appraisal. The implications of charging incorrect fees for use should be considered in assessing the need to expand capacity, particularly in the case of urban roads. The major dimensions of risk faced by a project, including those associated with changes in the patterns of world trade, the macroeconomy, the development of competing or complementary modes, and the inadequacy of subsequent maintenance of facilities, should all be assessed in a common-sense way even when they are not susceptible to formal mathematical precision. Projects in sectors that are not entirely commercial may have high ERRs, but any negative fiscal impacts of such projects must be appropriately accounted for in the valuation (World Bank 1991, p. 78).

It is also important that effects on the environment and distributional effects be systematically taken into account in project design and selection (Deutsche Verkehrswissenschaftliche Gesellschaft 1990). Monetary evaluations, using the cost-of-impacts, cost-of-avoidance, or willingness-to-pay approaches, have been attempted for local and global air pollution and for noise impacts (Hall and others 1992; Button and Rothengatter forthcoming). Some Bank-financed project appraisals have already incorporated such valuations. But in many circumstances, there is still no acceptable basis for monetary evaluation. In those cases there must be an alternative process, either procedural (as, for example, the use of a well-specified multiple criteria evaluation format) or institutional (as, for example, a formal participation or quasi-judicial inquiry or review), to ensure that the environmental and distributional issues are properly considered. Both governments and the Bank should take these matters into account in interpreting economic evaluations. This may be particularly important, for example, in considering the changing role of railways in the transition economies of Eastern Europe.

Fiscal Planning to Ensure Proper Maintenance of Public Infrastructure

Economic sustainability requires that adequate finance be available for maintaining infrastructure and equipment to ensure that the expected and planned-for benefits from infrastructure actually accrue. All projects and programs should, therefore, be accompanied by a committed pricing or financing package that is sufficient to ensure that the asset is maintained through its effective economic life. In the case of urban public transport this sometimes includes local property or payroll taxes. In the case of roads it typically involves allocating part of the fuel tax or adding an appropriated charge to an existing fuel tax. All these devices may appear as forms of earmarking.

The Bank's general position is that the earmarking of taxes hampers effective budgetary control, leads to misallocation of funds, makes the revenue structure inflexible, and infringes on the policymaking powers of state

executives and legislatures (Deran 1965). However, the Bank makes exceptions if there are cogent arguments to the contrary (World Bank 1986b).

Several arguments for automatic assignment of some tax revenues to specified expenditures are applicable in the transport sector. First, the earmarking of taxes on inputs or outputs associated with use of an infrastructure (for example, fuel taxes allocated to road funds) may be the best available proxy for user charges. As such, they allow persons who value a particular service to pay to ensure its continued existence. Where the management of the funds is partly under the control of paying users of the services, it is less likely that competing interest groups would argue for overprovision of services that particularly benefit them. Second, if the budgetary system is weak, earmarking may protect a range of essential allocations, such as road maintenance, where the returns to public expenditure are often very high (Bird 1984). Third, earmarking funds for maintenance but not investment may counter a systematic bias against maintenance in countries where both are funded from the same sources. Priority is often given to road investment over road maintenance despite evidence of the high long-term costs associated with allowing roads to deteriorate to the point at which reconstruction is required. (Research on Chile and Costa Rica has estimated this to cost two and a half times as much as a policy of timely and effective maintenance; see World Bank 1988a.) Fourth, the greater security of funding associated with earmarking reduces costs by improving work scheduling, ensuring more efficient use of equipment and manpower in force account activities, and facilitating contracting out of maintenance, as in Ghana (Pankaj 1989; Gyamfi and Ruan 1992).

If government and budgetary systems are good and operational implementation is effective, there is no justification for earmarking. At the other extreme, where governance is bad and the government lacks self-discipline, earmarked funds will not be secure, and earmarking serves no purpose. However, many countries fall in the middle ground, where the benefits of providing better service may outweigh the adverse effects that earmarking has on the allocation of resources among sectors. For these cases the issue must be decided on a case-by-case basis. Earmarking should only be introduced as part of a general plan either to restore good fiscal governance or to secure greater reliance on user charges linked to institutional reforms in the administration of road maintenance. Earmarking funds for road maintenance or other transport purposes is thus particularly appropriate where there is a well-recognized need to protect a budget item that is highly productive (for example, there is a maintenance crisis) and where the efficiency of maintenance planning and implementation has been adversely affected by the insecurity of funding. But it is not a panacea and should be approached particularly cautiously where fuel taxes constitute a high proportion of total tax revenue and where many sectors have equally valid claims for special fiscal treatment.

Above all, whether earmarking is to support the maintenance of infrastructure or the operating deficits of public transport, appropriate legal and

institutional arrangements must be in place to ensure that the potential improvements in efficiency actually accrue. In the case of earmarking for road maintenance these would include a legal basis to protect against politically opportunistic raids on the funds; an independent executive authority with the primary role of formulating maintenance policy (raising and allocating funds) and ensuring effective implementation of policy; a management or monitoring system involving representatives of users, central government, local authorities, and the contracting industry, all of whom should have a strong interest in the efficient performance of the agency; and administrative competence and good operational criteria for expenditure. There should also be either a mandatory periodic review or a sunset clause causing the arrangement to lapse if transparent and independently verifiable performance criteria are not met. Earmarking for public transport provision must be supported by explicit and carefully monitored performance agreements between the public authorities and the operator.

Formulating Industrial Development Policy That Does Not Undermine Sustainable Transport Policy

Many developing and transition countries manufacture transport equipment not only for the domestic market but also for export (railway equipment in India, buses in Hungary, ships and cars in Korea, small aircraft in Brazil, and so forth). This sector is likely to increase in size as home markets expand and as manufacturers in the industrial countries outsource to countries with lower labor costs. There is no inherent reason why developing countries should not be engaged in this industrial sector if they have a comparative advantage in doing so.

There are, however, some aspects of the engagement of countries in manufacturing that affect the sustainability of domestic transport arrangements. First, insofar as countries protect the domestic market, they are likely to be increasing the cost of transport and may also be supporting the production of vehicles that are environmentally inferior (as in the cases of fuel consumption by Indian cars and the emissions of many Eastern European cars in the late 1980s and of most two-stroke motorcycles in China). Where efforts are being made to control externalities or to discourage consumption of luxuries, they should be made through domestic taxation and not through trade tariffs. Second, insofar as countries attempt to found an export market on a thriving domestic market, they may be tempted to pursue policies, particularly with respect to the domestic costs of motoring, that are inconsistent with the no-regret principles of sustainable transport development. That appears to have happened in Korea and is in danger of happening in China in the next decade. It is therefore important that countries not base the development of their manufacturing activities on domestic transport policies that are damaging and unsustainable. Consistency between IBRD/IDA and IFC/MIGA activities is particularly important in this respect.

Community Participation: A Necessary Complement to Markets

Effective market processes do not exist in many poor countries. Even where they do exist, they have not been used or cannot easily be used in some parts of the transport sector. This applies particularly to local roads for which direct charging mechanisms are not feasible and that involve complex balances of essentially local advantages and disadvantages. Being responsive to user needs in nonmarket sectors requires that responsibilities be decentralized to levels where the voices of those affected are more likely to be heard and management is not likely to be taken over by special interest groups. This criterion generally implies assigning responsibility for urban transport to city (or city region) governments and responsibility for rural infrastructure to the lowest level of government at which effective implementation can be managed. This is a necessary condition for improved governance in the transport sector in many large countries.

In the urban context the major problem is to create the basis for a comprehensive policy that provides for integration both among modes and between transport and land use at the local level. The probability of successfully achieving and sustaining this integration depends on the creation of institutions and skills capable of sustaining the activity (Dimitriou 1988). The Bank has supported very effective institutional reforms and technical assistance to aid the development of urban transport planning capability in several cities in Brazil (Belo Horizonte, Curitiba, Pôrto Alegre, and Recife), in medium-size cities in Mexico, and in some North African cities such as Tunis (see box 1.2). Proper implementation has several dimensions. Responsibilities should be explicitly and clearly located, with the local responsibility for execution of functions accompanied by an adequate system of accountability and incentives for efficient performance. Traditional functional rivalries (among land use, public transport, roads, and traffic enforcement) must be overcome, preferably by the creation of multimodal, multifunctional urban transport authorities.

In the rural context, the main problem is to bring local knowledge and skills to bear in the planning, construction, and maintenance of infrastructure. Evidence from recent studies in Sub-Saharan Africa suggests that highly centralized administration is an important reason for the failure to maintain rural transport infrastructure.⁵ For example, less than 3 percent of public employment is with local government (compared with 11 percent in the industrial countries), while highly dispersed (classified and unclassified) rural roads and tracks account for more than 80 percent of the length of the national transport network. Investments in this network are often centrally or externally financed without any attempt to identify the institutional basis for the network's subsequent ownership and maintenance. Local agencies that would be best placed both to plan and to maintain the infrastructure often have neither the resources nor the incentive to take up that responsibility. Effective

decentralization requires an initial inventory of the extent and condition of the rural network, a comprehensive assignment of responsibility for this network, and procedures to prevent roads from being constructed without the involvement of the agency ultimately responsible for maintaining them.

In both urban and rural contexts, governments typically set national policies and guidelines for allocating funds among sectors and districts within a decentralized framework. Local units are responsible for organizing the provision, monitoring, and maintenance of the facilities within their jurisdiction. Two resource limitations can subvert efforts to decentralize. First, if adequately trained administrative and professional staff are not available at the local level, the performance of facilities may actually suffer from decentralization (as appears to be the case in Zambia). Second, and most important, the transfer of responsibilities must be accompanied by an appropriate financial basis for implementation. This might take the form of adequate allocation from the central budget, assignment of a defined tax base, more revenue-sharing between central and local governments, or grants from central government to match funds raised locally. Failure to make such provisions is inflicting severe damage on municipal transport in many transition economies in Eastern and Central Europe.

Direct community involvement is also facilitated by decentralization. This is particularly important in the rural road sector. Most obviously, community roads and local paths and tracks are best left totally under the jurisdiction of the village council or its equivalent, possibly with access allowed to divisional engineers employed by the local government for technical advice if required (as in Ghana). For higher-grade roads, developing procedures for consulting people on the design of local facilities, accompanied by adequate procedures for compensation or resettlement, will usually minimize any conflict over new infrastructure that arises in the affected communities. Even at the national level, the establishment of representative road boards (with some power to determine both the revenues and the costs of the road authority) can include representatives of users who are likely to press for more and better road maintenance.

To maximize the participation of users in transport projects requires institutional change, more training in the necessary technical and administrative skills at local levels, and the development of locally based NGOs that encourage users to participate. If communities are to take a more active part in the management of their infrastructure, facilitators at the local level need to be trained in participatory methods, and trainers need to be identified who can develop the locally based NGOs that will facilitate greater responsiveness.

Notes

1. Good taxes do not necessarily survive. The Swedish kilometer tax on diesel vehicles, which made it possible to capture the combined effects of differences in axle

weights and distances traveled using the same instrument, was replaced by a flat tax on diesel early in 1994, ostensibly to conform with existing European Union tax structures.

2. Kågeson (1993). Note, however, that few countries currently establish fuel taxes explicitly on the basis of calculations of total user costs.

3. This prescription would not apply in countries like Nicaragua, where the differential between diesel and gasoline prices has resulted in a high proportion of diesel-fueled automobiles.

4. Failure to allow for generated traffic leads to an underestimation of the economic benefit in uncongested cases but may lead to an overestimation of rates of return where congestion is heavy and where charges for using infrastructure are substantially below marginal social cost.

5. Examples of institutional weaknesses include overlapping responsibility at the central level, inadequate local financing, and a lack of integrated budgeting, sometimes resulting in new works at the expense of maintenance. (See Riverson, Gaviria, and Thriscutt 1991.)

CHAPTER SIX

The Role of the World Bank Group in the Transport Sector

Making transport more sustainable requires major institutional and policy reform. Private sector involvement can be stimulated by IFC investment and by guarantees from the Bank or MIGA. Bank lending to governments, which will continue to be necessary in many areas where private finance cannot meet the pressing needs of transport infrastructure, is an important channel for broader reform, as is Bank-financed technical assistance for institutional and human resource development. Above all, the World Bank Group must continue to learn from its diverse experience and to foster partnerships at the local, national, and international levels to deal with increasingly varied and complex transport issues.

The World Bank Group has an excellent record in the implementation of physical transport infrastructure projects, which have created a good basis for development. Nevertheless, it has learned from experience that the physical completion of projects can fail to generate expected benefits if projects are undertaken in the context of poor policies or weak institutions. Moreover, a major transformation is under way in the transport sector worldwide that presents challenges for which the existing policy and institutional frameworks in most developing and transition countries are not adequate.

Improving the Performance of Transport Sectors

The objective of a reformed transport strategy is to find more economically, environmentally, and socially sustainable patterns of transport development. This book has suggested that creating a transport system with the flexibility to

respond to user needs is the key to success. This goal can be achieved by increasing the role of competitive market signals and the involvement of the private sector and by encouraging more direct participation of users and the community in deliberations on proposed changes to the transport system, particularly where markets fail. The World Bank Group can continue to play an important role in the transformation of the sector by becoming a financial catalyst and facilitator of private operation and finance (in which respect IFC and MIGA have a particularly important role to play), as disseminator of best-practice approaches to regulatory and concessionary designs, as promoter of more commercial management of public sector activities, and as appraiser and lender for major transport infrastructure projects.

Supporting Policy and Institutional Reforms

Three types of World Bank Group action are most important to support policy and institutional reform that enhances sustainability. First, actions that involve synergy among the different dimensions of sustainability are pivotal to the whole strategy. The most critical of these are the introduction of efficient charging for infrastructure and the development of competitive market structures within the sector. Second, some actions are urgent, either because they are basic to reform (such as actions to establish the institutional basis for a more competitive and commercial transport sector) or because they address problems that have already become critical (such as road safety and the most serious health-threatening aspects of urban air pollution). Third, some actions are relatively novel. These include measures to assist nonmotorized transport and to mobilize the potential of local authorities, communities, and NGOs.

Economic and financial sustainability in all transport subsectors requires that, both in selecting new investments and in deciding which assets to maintain and operate, resources should be allocated to the uses with the highest return. Efficient resource use is best achieved in competitive markets so long as any adverse distributional or spillover effects are corrected by regulatory or fiscal means. Expanding the role of the private sector as operator and financier is essential for ensuring competition both for and in the market. Many member countries have not yet taken full advantage of the potential for efficiency that can be generated by competition or by involvement of the private sector in the transport sector (see box 6.1).

Environmental and ecological sustainability has many dimensions. Although it will grow rapidly with unrestrained motorization, the global environmental impact (carbon dioxide emissions) of developing-country transport is currently less pressing than the local environmental effects of transport, particularly in large metropolitan areas. Available technology can eliminate much local air pollution, but this will take time and will require a mixture of market and nonmarket actions. Where there are major distributional or spillover effects, as is the case with some forms of transport, taxes and subsidies are the

preferable instruments for correcting market signals so long as subsidies are fiscally sustainable. Qualitative regulation of transport through the establishment of strategic priorities and performance standards is justified when a tax or subsidy is not feasible because of high transaction costs (such as the costs of administration). But quantitative restrictions are rarely desirable. The World Bank Group can assist in establishing these various processes (see box 6.2).

Social and political sustainability requires giving explicit attention to the needs of all segments of society, particularly those least able to fend for themselves. The World Bank Group can assist by ensuring that transport strategies explicitly incorporate the needs of the poor and that transfer programs are effective and fiscally sustainable (see box 6.3).

The shift in the role of the public sector from controller to enabler, and from supplier to regulator, will require that the public sector develop new skills and institutional capabilities and practices, such as conducting strategic planning as a complement to the market, regulating unfair or noncompetitive practices, designing and negotiating contracts with private providers of public services, monitoring performance and enforcing compliance with general standards, and creating processes for wider participation in developing and implementing transport policies and programs. There will also be a need to strengthen traditional public investment and implementation skills and capabilities, particularly to enhance the maintenance culture. Project evaluation and maintenance programming procedures need particular improvement.

**BOX 6.1 SELECTED RECOMMENDATIONS
IN SUPPORT OF ECONOMIC AND
FINANCIAL SUSTAINABILITY**

The objective is to increase the responsiveness of transport supply to user needs by creating competition and by enhancing user participation. The World Bank Group can assist countries in the following ways:

1. Increase the use of competitive market structures in transport *services*.

■ Encourage the *private operation of road, rail freight, air, and maritime fleets*

■ Discourage *cargo reservation and flag discrimination* in the absence of a comprehensive assessment of net benefits to the country.

■ Develop *better franchising and concessionary arrangements* to ensure competition for the market.

2. Increase efficiency in the use, provision, financing, and management of transport *infrastructure*.

■ Introduce *direct charges for infrastructure that closely reflect costs*, including the opportunity cost of nonmarketed effects.

■ Explore actively the potential for *corporatizing infrastructure agencies*.

■ Introduce proxy user charges based on *earmarking* of taxation to provide a cost-effective framework for infrastructure maintenance where there is a maintenance crisis and no direct user charges.

These are all areas in which the World Bank Group can be of assistance—for example, through training courses sponsored by the Economic Development Institute (EDI) that disseminate best practice among countries and through reimbursable technical assistance programs. Economic and sector work—particularly public expenditure reviews and fiscal analysis—has a crucial role to play. Many of the reforms proposed in this report—for example, deregulation of transport operations and direct charges for the use of infrastructure—will reduce the fiscal burden of transport. Some—for example, the replacement of internal cross-subsidy by direct compensation for a specifically defined PSO—may increase the burden. Public expenditure and revenue reviews are a useful instrument for addressing these issues and evaluating priorities (for example, between transport and other sectors or between maintenance and investment) as well as appropriate financing arrangements (for example, user charges versus taxes or earmarked revenues versus allocation of pricing authority). Lending can focus and facilitate the dialogue on sector reform, which needs to be more rigorously considered at the project initiation stage. However, the Bank must be willing, in most cases, to be involved in the reform process on a sustained basis. Policy reforms, particularly those that require the development of local institutions and capabilities, may take ten years or more to implement successfully (see box 1.2 on Tunisia).

3. Establish an enabling framework for competition.

■ Create or strengthen *regulatory institutions and performance standards* for transport to ensure fair competition, to avoid predation and cartelization, and to protect the public interest.

■ *Unbundle and restructure agency responsibilities* to enhance the potential for the sale, lease, or subcontracting of the provision, operation, and maintenance of transport infrastructure.

■ *Increase the capacity for creating private-public partnerships* by more clearly defining and fairly sharing the liabilities, risks, and returns in BOT and concessionary contracts for transport infrastructure.

4. Develop the necessary strategic planning and system management capabilities to complement the market.

■ Create or strengthen the public *strategic planning capabilities* necessary to complement and underpin a more competitive transport network.

■ Establish processes for the effective participation of *affected users and communities* in decisionmaking on the design, management, and maintenance of transport infrastructure and publicly sustained services.

**BOX 6.2 SELECTED RECOMMENDATIONS
IN SUPPORT OF ENVIRONMENTAL
SUSTAINABILITY**

The objective is to ensure that environmental issues are addressed as an integral part of transport strategy formulation and project design through actions that have a high ratio of benefit to cost or are cost-effective. The World Bank Group can assist countries in the following ways:

1. Address health-threatening impacts as a first priority.

■ Initiate benchmarked *safety programs*, particularly in road transport.

■ Adopt *cleaner fuel standards* to eliminate lead and sulfur emissions, combined with fuel supply and pricing policies encouraging the use of cleaner fuels.

2. Integrate environmental and economic elements in project appraisal.

■ Encourage the *preparation of*

implementable strategies for national or local transport that take into account environmental and economic considerations.

■ Encourage *more systematic estimation of the impact that transport programs and projects have on safety and air pollution* (including, where possible, a monetary valuation in economic rate-of-return calculations).

■ Assist efforts to use the *most cost-effective rather than the most technologically advanced* solutions to environmental problems.

■ Ensure that *effects on nonmotorized transport* are included in the design and evaluation of road projects.

■ Protect against the *adverse environmental impact of developments induced by roads and other transport networks on forests, wetlands, and other natural habitats, as well as on cultural heritage sites*, by requiring that the correct framework for protection be in place before the project is implemented.

Lending for Transport Infrastructure

It is still important for the Bank to continue lending for transport in order to facilitate reform in the sector and to meet investment needs that will not be satisfied by the private sector.

LENDING TO COMPLEMENT POLICY AND INSTITUTIONAL REFORM. Being directly involved in preparing and implementing transport programs and projects in the course of defining a lending operation is a good way for the Bank to identify critical institutional and technical issues in the borrowing country in question. In this way the Bank can tailor with the borrower a practical strategy for advancing policy and institutional reform. In fact, the Bank's credibility as an adviser in any given country arises in part from its association with that country in lending operations and in part from the experience it has gained from its lending operations in other countries. Even if project lending ceases to be the primary element in a policy and institutional reform strategy, it can

There is also a need to pay special attention to spatial issues and modal options now even though their benefits may only be realized in the long run.

3. Develop an environmentally sensitive strategic framework.

- *Better integrate the provision of circulation space and transport capacity with land-use development*, particularly in rapidly growing areas.

- *Develop local standards for the provision of nonmotorized transport*.

- *Develop strategies that enable urban mass rapid transit projects to be incorporated in a cost-effective way in the long-term development of growing conurbations*.

- *Establish road-user charges that reflect externalities* (road damage, air and noise pollution, congestion, and safety); where fuel taxation is used as a proxy, Western European levels are a more appropriate benchmark

than U.S. levels for developing countries on the threshold of rapid motorization.

- *Establish a general urban transport fund* and assign revenues from the fuel surcharge in support of expenditures on the most sustainable means of improving the performance of urban transport systems.

- *Ensure that urban public transport fares, service, and finance policies* reflect the need to reconcile the maintenance of public transport facilities while avoiding a costly and unsustainable shift to private automobiles.

- *Be sensitive to the obligations of member countries under international environmental agreements*, such as the International Maritime Organization's convention on maritime pollution (MARPOL), in preparing lending operations in the relevant sector.

ensure that the Bank's advice is relevant to local conditions. This is a strong reason for the Bank to remain involved in the financing of transport infrastructure. This involvement will have to be selective and vary according to country-specific priorities.

CONTINUED GROWTH OF INVESTMENT REQUIREMENTS IN TRANSPORT. Better pricing and the other demand management policies proposed in this book can reduce the extent to which capacity must be expanded, and, as such, should be central to a transport reform strategy. Some developments in information technology (such as telecommuting) may attenuate the growth in demand for passenger transport in developing countries in the very long run. However, in low- and middle-income countries where demand for both freight and passenger movement is growing more rapidly than per capita GDP, continued moderate or high rates of economic and demographic growth, as well as major changes in the location of economic activities and population conurbations, make it probable that the demand for transport services and supporting infrastructure capacity

**BOX 6.3 SELECTED RECOMMENDATIONS
IN SUPPORT OF SOCIAL SUSTAINABILITY**

The objective is to increase the social sustainability of transport by explicitly making poverty reduction an integral part of national and local transport strategies. The World Bank Group can assist countries in the following ways:

1. Target the transport problems of the poor (particularly the urban poor).

■ *Improve their physical access* to jobs and amenities and reduce "excessive" time spent walking.

■ *Reduce barriers to the informal supply of both passenger and freight transport* (subject to reasonable and enforceable levels of safety).

■ *Enable greater use of nonmotorized transport* by improving rights-of-way and interchange infrastructure and by eliminating fiscal and financing impediments to vehicle ownership.

■ *Eliminate gender biases* by integrating the transport needs of women into the mainstream of transport policy and planning.

2. Improve the approach and criteria for addressing the transport problems of the rural poor.

■ *Emphasize access* (for example, by ensuring that bridges and culverts are durable and do not collapse or wash

out) rather than high standards of performance (for example, by paving surfaces to increase speed) in low-volume rural transport networks.

■ *Support cost-effective, labor-intensive methods* for constructing and maintaining subsidiary roads.

■ *Ensure community participation* in decisionmaking on local transport investment and maintenance, establish extension services to provide necessary technical advice and training, and support the development of rural funds.

3. Protect the poor against the adverse effects of changes in general transport policies and programs.

■ *Minimize the amount of resettlement and, where unavoidable, mitigate the effects of resettlement* by ensuring that people displaced by transport projects are resettled expeditiously and fairly.

■ *Mitigate the effects of redundancy* in overstaffed transport enterprises and agencies by ensuring that constructive reemployment and severance financing arrangements are in place.

■ *Develop efficient subsidy schemes for "social service" public transport* by defining PSOs and establish fiscally sustainable contractual compensation arrangements.

will continue to grow in the medium term. This should be recognized in country assistance strategy documents.

PRIVATE SECTOR INABILITY TO MEET ALL TRANSPORT INFRASTRUCTURE FINANCING REQUIREMENTS. Private financing of transport companies and rolling stock is commonplace in many developing countries. However, private

financing of transport infrastructure has expanded dramatically only since 1988, and then only in a handful of countries in East Asia and Latin America. Policy reforms that create an enabling framework for the private sector to invest in and operate transport services and infrastructure will increase the potential for mobilizing financial resources on domestic and international private capital markets. This should be a priority objective for governments as well as for the World Bank Group. The IFC should continue to expand its activities in this field. Recent reviews suggest that the private sector is interested in financing future transport infrastructure projects in a much wider array of countries than in the past (including particularly, Eastern Europe, and South Asia; see *Public Works Financing* 1995).

In general, equipment and assets that are not long-lived and can be financed by suppliers' credits or commercial banking sources should not be financed by the Bank. Similarly, the Bank need not finance projects or long-lived assets where private funding is readily available—as in the case of some container ports. However, notwithstanding the private sector's growing interest in financing transport infrastructure and despite ongoing efforts to increase the commercialization and privatization of transport activities in many countries, most of the secondary and tertiary components of the transport network (such as rural roads, noncontainer ports, and suburban railways) will continue to be characterized by low volumes of traffic and an inability to restrict access—characteristics that make them unattractive for exclusive private sector financing. Improvements in these elements of the transport network will be critical to any development strategy in which the reduction of poverty is an integral objective.

With recovery in investment demand in industrial countries and competition from investment opportunities in other infrastructure sectors such as water, power, and telecommunications, how much the private sector is likely to finance transport activities in the future remains a matter of speculation. According to *World Development Report 1994*, developing countries currently invest \$200 billion a year in new infrastructure, some 4 percent of their national product. Only 12 percent (about \$24 billion a year) of this has been funded through overseas development assistance; one-third of that amount has been in transport (World Bank 1994f). Private financing only accounts for about 7 percent of the total. The \$250 billion of transport infrastructure projects in which the private sector interest has already been reported is consistent with the independent projection of a doubling of the private sector share to 15 percent of total financing requirements if all of the proposals were to come to fruition over the span of a decade (*Public Works Financing* 1995). Even in this scenario, the public sector is likely to continue to have a significant need for transport infrastructure loans for some time to come. Given the evidence that transport infrastructure is still a significant contributor to development, continued lending for this purpose remains consistent with the Bank's mission.

Guarantees and Extended Onlending Arrangements

The broad policy reforms outlined in this book are best promoted by sector investment loans that are not modal-specific (the Bank finances a time slice of a sector investment program that has been mutually agreed with the government) and, in some cases, by sector adjustment loans. Instruments that are not sector-specific have also been used to advance transport sector reforms (as was done in the public enterprise reform loan in Argentina and the structural adjustment loans in Chile) by creating a financial capability within which governments can handle difficult problems such as the financing of severance compensation. In addition, sequences of project loans have been used to advance components of transport sector reform in countries where no adjustment or general reform program is under way, as in China. In short, existing project and other lending instruments can normally be used to anchor a program to reform and to improve the performance of the transport sector.

Thus traditional lending instruments can provide a framework for reform. However, encouraging wider participation in the provision and operation of transport infrastructure and services, which is one of the objectives of sectoral reform, may be materially assisted by the greater use of instruments such as various forms of onlending arrangements (to involve lower tiers of government and NGOs more directly in the provision of transport infrastructure and services) and guarantees (to catalyze private sector financing of transport infrastructure).

Extended onlending arrangements to local authorities or NGOs may allow local knowledge and skills to be mobilized in the planning, construction, and maintenance of local transport infrastructure and services. Participation of local community groups can improve the setting of priorities and sequencing of project components and can activate local ownership, accountability, and willingness to pay. The Bank needs to assist governments to identify financial and nonfinancial intermediary institutions capable of channeling lending effectively to local groups (particularly for local transport infrastructure) and individuals (particularly for vehicles) and to develop their capability to facilitate project implementation and monitor project performance. Both NGOs and municipalities have already been involved in Bank-supported efforts to provide credit for nonmotorized transport for the poor (see box 6.4). The essential objective is to make this local finance self-sustaining. Where World Bank financing is involved through onlending arrangements including accounting and auditing procedures, it will be crucial that local groups develop standard business capabilities in tracking and servicing debt obligations.

Guarantees can have a useful role in transport (World Bank 1995b). Transport infrastructure projects (toll roads, rail systems, or air and water port facilities) require loans with long maturities and grace periods in order to ensure that amortization requirements do not necessitate excessively high user charges. Private funds with the requisite maturities and grace periods may not be available because of the perceived risk that government may not

**BOX 6.4 ONLENDING ARRANGEMENTS
FOR NONMOTORIZED TRANSPORT**

The participation of NGOs is exemplified by the World Bank-supported First Ghana Transport Rehabilitation Project (TRP I, 1987), which financed a facility to provide lines of credit on commercial terms and conditions for the commercial production and introduction of low-cost, nonmotorized transport vehicles (bicycle-trailers and other adaptations) for use in towns in northern Ghana. The Technology Consultancy Centre, a semi-autonomous agency attached to the University of Kumasi, was the implementing agency. A subsidiary grant agreement was signed between the Ministry of Transport and Communications and the Technology Consultancy Centre, specifying project implementation arrangements and payment terms. Under TRP II (1990), two NGOs bought bicycles and trailers with their earnings from collecting data during project preparation and distributed the vehicles on an installment basis to village women. This initiative was based on the experience under TRP I that

women were enthusiastic about bicycle-trailers and other intermediate modes but that their willingness to invest their own savings in them was thwarted by inadequate access to credit.

Onlending to individuals through local agencies was included in the Peru Transport Rehabilitation Project (1994), which finances a nonmotorized transport component involving provision of bicycle infrastructure, credit facilities, and a promotion and education campaign. The municipality of Metropolitan Lima, through its Nonmotorized Transport Program office, is the implementing agency for the component. A subsidiary loan agreement was signed between the Ministry of Economy and Finance and the municipality, defining project implementation conditions and arrangements. A revolving fund to provide credits for the purchase of low-cost bicycles was established at the Lima Municipal Bank for Popular Credit, which issued an operational directive, approved by the Bank, describing the procedures and conditions for approving such credits.

comply with its contractual obligations to the developers of the project. The Bank's partial risk guarantees can protect lenders against this risk and thus enable the extension of maturities, as well as reduce the costs of borrowing to the project. Partial credit guarantees can be used directly to extend maturities by the Bank's assurance of debt repayment in the later years of the debt term. In all cases the Bank requires a counterguarantee from the host government.

Bank guarantees are available to private lenders (but not to equity holders). A partial risk guarantee is triggered when a government action contravenes its contractual obligations and a default in debt repayment ensues as a consequence. Contractual obligations of the government may include general obligations, such as the conversion and transfer of foreign exchange and the agreement to pay compensation if cash flow is disrupted due to war or other major events, which might not otherwise be insurable. In the case of transport concessions, Bank guarantees might also cover government compliance with

its obligations in respect of tariff levels (maintenance of agreed pricing arrangements or freedom to set tariffs), government payments (PSO agreements or shadow toll commitments for motorways), initial conditions (agreements on property transfer, site clearance, or settlement of redundancy costs), and market structure (avoidance of subsidized public sector competition). By the end of 1995, no transport projects had been guaranteed by the Bank, although several were under consideration. A pragmatic approach is required that may involve technical assistance to governments to identify priority projects qualifying for guarantees; to develop policies, procedures, and concessionary agreements as a prelude to soliciting proposals; and to determine the scope of government undertakings for such projects.

MIGA guarantees can be used to mitigate the risk to foreign equity holders and commercial banks by insuring against the risks of currency transfer and inconvertibility, expropriation, and war and civil disturbance (as in the case of the Autopista del Sol toll road in Buenos Aires). Such guarantees also extend the range of business in which foreign companies are willing to participate (for example, by reducing the risk attached to long-term financing of vehicles and spare parts and components in Peru). Because of the World Bank Group's ability to work with governments, guarantees have a highly leveraged effect in facilitating foreign equity investment and debt finance.

Partnerships in Transport Reform

The World Bank Group should help to promote partnerships at the country level among the various actors and stakeholders, at the international level between the development community and the government, between the financial community and the sector, and among professional and nongovernmental organizations that are addressing the challenges of improving transport.

Partnerships within Countries

Many of the reforms envisaged in this book, such as railway and port restructuring, involve government decisions (such as changes in mandates regarding social obligations and financial liabilities) that cannot be addressed by sectoral ministries. Others, such as improving road safety or providing adequate rights-of-way in growing urban conurbations, can only be addressed through wide interagency collaboration. In such cases the Bank can be a helpful catalyst. Experience has also shown that those policy and investment initiatives in transport that are founded on consensus have a greater chance of being sustained. To this end, the Bank can play a constructive role in promoting more participation by informed and competent local governments and NGOs in developing and implementing policy and investment initiatives. These groups are generally closer to the ultimate users and beneficiaries of projects and policies and can offer more effective channels for improving and monitoring performance at the local level.

Partnerships with the Development Community

In recent years there has been a proliferation of both official and private sector sources of development funding. It has therefore become more difficult to advance the time-consuming process of policy and institutional reform solely through projects financed by the World Bank Group, and it has become more important than ever to develop a wide consensus on how best to assist governments, particularly in small countries. In that context the development of a common program by a group of borrowers and lenders can exploit the comparative advantage of different lenders or donors at relatively small cost to each. The Sub-Saharan Africa Transport Policy Program/Road Maintenance Initiative has been based on clear recognition by borrowing countries of the need for such an approach, the backing of a wide range of lenders and donors, and explicit commitment to timely steering and program management (see box 6.5). Much can also be achieved outside the lending program. EDI'S PROVIAL program of policy seminars on road management policy has been largely self-financed by program recipients, while there has been long-standing collaboration with such bodies as the Institute of Transportation Engineers, the International Road Federation, the Permanent International Association of Road Congresses, and numerous other institutions in training and dissemination of best professional practice.

Partnerships with International Capital Markets and Specialized Vendors

The World Bank Group has a role to play in nurturing and strengthening the links between countries and private capital markets, partly because of the value that other lenders attach to the special ability of the World Bank Group to work with governments. It performs this function in a number of ways. Bank and MIGA guarantees give comfort to private sector lenders and suppliers, enabling them to enter markets that they might otherwise avoid. The IFC can act as a lead agent in assembling loans to the private sector, even though its own commitment in any individual project may be relatively small. This may also be facilitated by the IFC taking a minority equity interest (typically only about one-quarter of its commitment is in equity). The IFC can take the lead in raising private sector equity for infrastructure. In the case of one infrastructure fund in Asia \$450 million had already been committed by the end of 1995, of some \$700 million assembled in the previous three years. Thirty percent of the committed equity has been in the transport sector. The IFC is represented on the board of the fund and is involved in making equity investments. The IFC can also use its experience to widen local ownership and commitment by helping companies to go public or to access local bond markets for capital.

The World Bank Group can also stimulate private sector involvement in less direct ways. In particular it can help develop an environment that enables the private sector to take a larger role in operating or financing transport

BOX 6.5 COLLABORATION AMONG DONORS

Projects funded by donors and other external agencies without a common policy objective can confuse or undermine the process of policy reform. For example, in the late 1970s and early 1980s, many donors were financing new road investments in countries even though the World Bank steadfastly recommended, on the basis of its assessment of research findings, that better maintenance of existing roads was a much more economic proposition. The strengthening of maintenance capabilities and the necessary reallocation of resources to this purpose did not take place because the combination of soft funds and politically high-profile projects was an irresistible temptation to many cash-strapped governments.

To make headway on this issue, it became necessary for governments and donor agencies to develop joint regional programs, based on the assumptions that (a) countries within a region have enough in common for

lessons learned in one to be applicable (with suitable adaption) to others and that (b) governments are likely to be motivated by evidence of success in other countries where similar conditions prevail.

The Sub-Saharan Africa Transport Policy Program is an example of a collaborative effort that is managed by the Bank and involves most of the countries of the region and several multilateral and bilateral development agencies. The program has now run for five years and has a range of impressive results to its credit. Under the Road Maintenance Initiative, in particular, countries are beginning to recognize the need to address the problem of independent road maintenance. Ten of them have already taken steps to set up road boards. Experience is being widely shared, with the countries themselves setting up a road information exchange. Donor consultation and coordination have improved, and projects emerging from the initiative are readily financed.

investments, including exploring the benefits of and potential for privatizing transport enterprises. The World Bank Group also has a unique role to play as an "honest broker" if requested to assist in evaluating strategic options where the number of competent potential providers is limited, as in the case of high-speed intercity passenger rail and local metros.

Some Fundamental Challenges for Global Partnerships

Creating a sustainable and integrated multimodal and intermodal transport system will be a difficult task because a number of problems are poorly understood, and headway can only be made by a concerted common international effort.

DEVELOPING A STRATEGIC APPROACH TO MOTORIZATION. Focusing on the most appropriate way of moving people (and goods)—rather than on specific

types of vehicles—highlights the need for more strategic sector work on how best to improve movement in urban conurbations as well as in major interurban corridors. Country- or locality-specific sector work, while necessary, may not be enough to address fundamental issues. The response to the growth in demand for mobility in developing countries has so far followed the pattern that prevailed in industrial countries and has been satisfied primarily by an increase in the use of automobiles and trucks. The centrally planned economies tried to avoid this outcome by imposing restrictions on movement by road, which now hampers their ability to respond with the flexibility required in market economies. Now that the transition is under way, motorization is growing in these countries as well. At low levels of motorization, the benefits often far outweigh the costs, but safety, pollution, and congestion become serious problems at higher levels. Unfortunately, incremental investments in durable and long-lived road infrastructure and facilities create a framework for movement that becomes increasingly difficult to alter.

Many developing and transition economies are not yet locked into a motorized transport system but are entering a phase of accelerated growth in motorization. As a result, many cities and interurban networks in these countries are experiencing severe congestion, safety, and pollution problems at earlier stages of development than their industrial-country counterparts. This suggests some urgency in identifying and implementing an alternate strategy with higher net benefits. Two different, but potentially related, issues must be addressed: the need to develop a more appropriate pace for motorization (that is, to balance decentralized private decisions on small capital outlays, such as vehicle acquisition, with society's ability to mobilize resources and implement large capital investments to expand road networks), and the need to identify a more balanced multimodal transport network, with fewer implicit or explicit subsidies, that could become the long-term objective of transport policy. To date, industrial countries have not been much more successful than developing countries in establishing a long-term transport strategy. *The Bank should therefore proceed on a case-by-case basis and should not expect borrowing countries to achieve easily what the industrial countries have found so elusive.*

The central problem is to identify one or more strategies within a market framework that are capable of simultaneously generating efficient and sustainable spatial structures and multimodal transport systems and of accommodating significant economic and population growth. Given that hundreds of billions of dollars are likely to be invested in surface transport over the next two to three decades in developing and transition economies, it would be appropriate to commence a process of consultation with various stakeholders through workshops and conferences on motorization. This would create a basis for gaining widespread commitment and contributions to an international effort to develop and nurture more sustainable alternatives to the dependency on automobiles. The World Bank Group should address the problems of

coping sensibly and successfully with increased motorization through its operations and operationally relevant research. In particular, the consistency between transport policy, focusing on managing the rate of motorization, and industrial policy, focusing on the development of the domestic automobile and bicycle industry, should be addressed at the level of country strategy.

CREATING A COMMON FRAMEWORK FOR EVALUATING THE PERFORMANCE OF THE TRANSPORT SECTOR. Many countries are experimenting with different institutional combinations and regulatory and pricing regimes to improve performance in the transport sector. Robust indicators are not yet available for the various dimensions of performance, however, and these are needed to enable different stakeholders—users, regulators, suppliers, and others—to measure and monitor the performance of the transport sector and the private or public suppliers involved (Gannon and Shalizi 1995). Comparisons within and between countries that clearly demonstrate poor performance and its consequences, as well as those that might help in diagnosing the problem, are likely to be powerful stimulants to improvement. An international commitment to provide resources for a joint effort to develop, test, and institutionalize indicators of the performance of the transport sector would reduce the cost to individual countries.

Learning Systematically from Experience

The Bank must be able to demonstrate what does or can work by being more effective in documenting successful interventions or policies. In the past in the highway sector, the Bank helped mobilize an international effort that made progress toward the development of the Highway Design and Maintenance Standards Model. It has also encouraged the systematic collection and use of information at the micro level to support the introduction of pavement management systems for road maintenance. Attempts to solve the problem of the underfunding of road maintenance by making institutional changes are now being undertaken in Africa and Latin America. These experiments need to be monitored carefully so that the lessons from this experience can be passed on. There is still much to be learned about many other aspects of transport in the process of development. These include, among other things, a better understanding of alternative competitive structures in transport and their regulatory requirements, better approaches to using and structuring franchises and concessions, better methods for valuing time savings and environmental and long-term structural effects in the appraisal of urban mass transit investments, better mechanisms (including tax and subsidy schemes) for ensuring that fiscally sustainable transport services exist to serve the poor, more effective beneficiary participation in developing and implementing transport policies and programs, and better approaches to implementing road-user charges and allocating road track costs by category of vehicle. To make headway on

these topics, the Bank needs to develop a program of more systematic learning through its lending activities and through wider dissemination of these results.

In summary, improving the performance of transport will require that the Bank interact more and more with other organizations and groups to ensure that policy reforms and investments are instituted that are not only socially and environmentally sound but also economically and financially sound. Closer collaboration is also required within the World Bank Group to ensure consistency between how it approaches industrial and transport issues, particularly with respect to IFC financing of transport equipment manufacturing and IBRD/IDA activities in the fields of traffic restraint, user charging, and environmental standards. The criteria for determining the level and nature of the World Bank Group's own involvement in the transport subsectors should be the clear contribution of the intervention to improving the quality of life and to increasing productive potential, the sustainability of project or program investments and policy reforms in financial and economic as well as social and environmental terms, and the comparative advantage of the World Bank Group as the channel for a particular form of intervention. The operational and budget implications of this book cannot be quantified explicitly, but the impact on total resources is not expected to be large. Any changes in the number of transport operations would be managed within the constraints of the country's overall program and budget for assistance work. The changed composition of the program will require the following principal changes:

- A shift in the skill mix in IBRD/IDA through recruitment in favor of specialists with experience in reforming transport institutions, sector pricing and financing, regulatory reform, urban transport, and environmental issues in transport.
- More training of existing staff to upgrade operational skills in line with the new demands
- More economic and sector work in transport to adapt the recommendations of this policy review to country priorities.

Glossary

Administrative market sharing. Allocation of shares of a market to suppliers through a nonmarket administrative process.

Benchmarking. Establishment of quantitative standards with which to compare performance.

Black spot program. Program identifying sections of a road network with high accident rates, targeted for remedial action.

Build-operate-transfer (BOT). A form of concession involving finance, construction, and maintenance of a facility for a specified period before ownership is transferred to a public authority.

Cargo reservation/flag discrimination. Practice of reserving all or part of the import or export cargo shipments of a nation to nationally flagged shipping companies.

Commercialization. Transition of public or nonmarket enterprises to commercial market-based behavior.

Commercial risk. Normal business risks associated with incorrect assessment of cost, patronage, or revenue.

Competition for the market. Competition between operators for the right to serve individual routes, to serve a whole network, or to undertake particular functions.

Competition in the market. Competition between individual operators, groups of operators, or modes in a market with no regulation on entry.

Competitive tendering. Solicitation of competing bids for franchise or concessionary rights.

Concession. Grant or sale by a public authority of a right to develop or operate assets owned by, or reverting to, the ownership of the authority, usually for an extended period.

Corporatization. Transformation of a state-owned enterprise or agency into a legal entity subject to corporate laws, including formal separation of ownership and management responsibilities.

Demand management. Use of fiscal or regulatory instruments to reduce the amount of transport service demanded (usually applied to the control of road traffic levels).

Earmarking. Guaranteed allocation of all or part of a tax revenue to a specific agency or expenditure category.

Economies of scale. The decline of average unit costs of production as output is increased over a large range.

Electronic road pricing/electronic cordon pricing. Electronic technique of charging road users for occupying road space according to the level of road congestion.

Externality. An unpaid-for effect of a transaction or activity on third parties.

Franchising. Giving or selling of rights to provide transport services for a defined (typically short) period.

Informal transport. Conveyance of freight or passengers by agents operating outside the corporate sector or the state regulatory and legal framework.

Internalization. Conversion of the effects of a transaction or activity on third parties into a direct cost to the agent.

Management contract. Agreement by a private agent to supply management services for publicly owned facilities.

Motorization. Transition to higher levels of ownership and use of road motor vehicles (motorcycles, automobiles, and trucks).

Noncommercial risk. Risk associated with the impact of specific government interventions on the profitability of a commercial operation (for example, political change).

Onlending, pass-through arrangement. Lending arrangement whereby the government acts as an intermediary between the Bank and municipal or state governments or between the Bank and private organizations or enterprises.

Performance agreement. An agreement between a government and a service provider linking financial compensation to the achievement of specified performance objectives.

Public service obligation (PSO). Obligation placed on suppliers of services to behave in ways contrary to normal commercial dictates in order to achieve defined public service objectives.

Regional infrastructure fund. Private financial resource pools established on a multicountry basis to be invested in commercially viable infrastructure.

Road reconstruction. Renewing the road structure, generally using existing earthworks and road alignments to remedy the consequences of prolonged neglect or where rehabilitation is no longer possible.

Road rehabilitation. Selective repair, strengthening, and correction to restore structural strength and improve the quality of the ride.

Routine maintenance. Local repair of roadways and pavement, grading of unpaved surfaces, regular maintenance of drainage, cleaning and control of vegetation, and maintenance of traffic furniture and control equipment.

Secondary and tertiary network. The transport system outside the main network of trunk facilities.

Severance payment. Compensation for job redundancy, typically a one-time cash payment.

Short-run marginal cost pricing. Pricing at a level reflecting the additional costs incurred in producing an extra unit of output given a fixed capital stock.

Tradable permits. Property rights or limitations that are conferred by governments and that can be bought or sold.

Transitional economy. Economy in the process of transition to a market-based system.

Transport infrastructure. All fixed physical facilities associated with the movement of freight or passengers, such as rights-of-way, track or terminals, and associated traffic management.

Transport services. All activities associated with the conveyance of passengers or freight.

Unbundling. Dividing an enterprise or activity into smaller, separable parts that can be provided on a competitive basis.

References

The word *processed* describes informally reproduced works that may not be commonly available through libraries. The source for conference papers is the sponsoring organization.

- Allport, R. J. 1994. "Defining the Role for Private Finance in Transport Infrastructure Provision: The Asian Experience." Paper presented to the Planning and Transport Research and Computation International Association, London, September. Processed.
- Andan, O., and B. Faivre D'Arcier. 1992. "La périurbanisation va-t-elle accroître la congestion des agglomérations?" Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Anderstig, C., and L-G Mattsson. 1992. "Appraising Large-Scale Investments in a Metropolitan Transportation System." *Transportation* 19: 267-83.
- Antle, J. M. 1983. "Infrastructure and Aggregate Agricultural Productivity: International Evidence." *Economic Development and Cultural Change* 31 (3): 609-19.
- Armstrong-Wright, Alan, and Sebastian Thiriez. 1987. *Bus Services: Reducing Costs, Raising Standards*. World Bank Technical Paper 68. Washington, D.C.
- Arrhenius, Erik, and Thomas W. Waltz. 1990. *Greenhouse Effect: Implications for Economic Development*. World Bank Discussion Paper 78. Washington, D.C.
- Baumgartner, J. P. 1992. "La séparation de l'infrastructure et du transport dans les chemins de fer." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Binswanger, H. P., M-C. Cheng, A. Bowers, and Y. Mundlak. 1987. "On the Determinants of Cross-Country Aggregate Agricultural Supply." *Journal of Econometrics* 36 (1-2): 111-31.
- Bird, R. M. 1984. "Intergovernmental Finance in Colombia: Final Report of the Mission on Intergovernmental Finance." International Tax Program, Harvard University Law School, Cambridge, Mass.
- Blackshaw, P. W., J. Flora, and R. G. Scurfield. 1992. "Motorways by BOT: Political Dogma or Economic Rationality." Paper presented to the Planning and Transport Research and Computation International Association, London, September. Processed.

- Bleijenberg, A. N. 1988. *Waardering van negatieve externe Effecten van het Autoverkeer*. Delft: Center for Energy Conservation and Environmental Technology.
- Bleijenberg, A. N., J. W. Velthuyzen, and T. Oegema. 1990. *Economische Gevolgen van Mobiliteitsbeheersing*. Delft: Center for Energy Conservation and Environmental Technology.
- Bongoy, M. 1992. "Problèmes de financement, de main-d'oeuvre et de maintenance tels que perçus dans le cadre de la deuxième décennie des Nations Unies pour les transports et communications en Afrique, 1991–2000." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Botma, H., and H. Papendrecht. 1991. "Traffic Operation of Bicycle Traffic." *Transportation Research Record* 1320: 65–72.
- Button, K. J., and W. Rothengatter. Forthcoming. "Motor Transport, Greenhouse Gases, and Economic Instruments." *International Journal of Environment and Pollution*.
- Carbajo, J., ed. 1995. "Motor Vehicle Air Pollution." *Journal of Transport Economics and Policy* 29 (1): 3–103.
- CEPAL (Comisión Económica para América Latina y el Caribe). 1992a. *Caminos: Un nuevo enfoque para la gestión y conservación de redes viales*. Santiago.
- . 1992b. *El efecto de los subsidios, la reglamentación y las diversas formas de propiedad en la calidad y eficacia de los servicios del transporte urbano en Latino América*. Santiago.
- Daimler Benz, A. G. 1990. *Strategy for the Development of Road Transport in China until the Year 2000*. Berlin: Forschungsinstitut.
- Darbera, R. 1993. "Deregulation of Urban Transport in Chile: What Have We Learned in the Decade 1979–1989?" *Transport Reviews* 13 (1): 45–49.
- Denant-Boemont, L. 1992. "Innovations en transport en commun et méthodes analyses de projets: Vers evaluation de systèmes de transport." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Deran, E. Y. 1965. "Earmarking and Expenditures: A Survey and a New Test." *National Tax Journal* 17 (4): 345–61.
- Deutsche Verkehrswissenschaftliche Gesellschaft. 1990. "Umweltökonomie und Verkehrsplanung: Sozialkosten des Verkehrs Schriftenreihe." Report B-136. Bonn.
- Dimitriou, H. T. 1988. "Urban Transport and Manpower and Training Needs of Four Asian Cities." *Habitat International* 12 (3): 65–90.
- Dimitriou, H. T., and G. A. Banjo, ed. 1990. *Transport Planning for Third World Cities*. London: Routledge.
- Doulet, J-F. 1994. "Structure urbaine et mobilité en Chine: L'espace bicyclette en question." *Transports Urbains* 83 (avril-juin): 17–26.
- Downing, A., C. Baguley, and B. Hills. 1993. "Road Safety in Developing Countries: An Overview." Paper presented to the Planning and Transport Research and Computation International Association, London, September. Processed.
- Dürr, Heinz. 1992. *Bahnreform und Industriepolitik*. Freiherr-von-Stein-Gesellschaft. Berlin.
- Easterly, W. R., and Sergio Rebelo. 1993. "Fiscal Policy and Economic Growth." *Journal of Monetary Economics* 32 (2–3): 417–58.

- EDI (Economic Development Institute) and ECA (Economic Commission for Africa). 1991. *The Road Maintenance Initiative: Building Capacity for Policy Reform*. Vol. 2: *Readings and Case Studies*. EDI Seminar Series. Washington, D.C.: World Bank.
- Egal, Y. 1994. "Des effets positifs de la densité urbaine." *Transports Urbains* 83 (avril-juin): 27-31.
- Energy Detente*. 1994. Vol. 15 (3-4) (February). North Hollywood, Calif.: Tele-Drop, Inc.
- Eskeland, Gunnar S. 1994. "A Presumptive Pigovian Tax on Gasoline: Complementing Regulation to Mimic an Emission Fee." *World Bank Economic Review* 8 (3): 373-94.
- Eskeland, Gunnar S., and Shantayanan Devarajan. 1996. *Taxing Bads by Taxing Good: Pollution Control with Presumptive Charges*. Directions in Development Series. Washington, D.C.: World Bank.
- European Conference of Ministers of Transport. 1989. *Environment and Transport Infrastructures*. Round Table 79. Paris: OECD.
- . 1991a. *The Role of the State in a Deregulated Transport Market*. Round Table 83. Paris: OECD.
- . 1991b. *Transport and Spatial Distribution of Activities*. Round Table 85. Paris: OECD.
- . 1993. *Transport Policy and Global Warming*. Paris: OECD.
- Ewers, H. J., and M. Fonger. 1993. "Gesamtwirtschaftliche Effizienz multimodaler Transportketten." Report 12. Institut für Verkehrswissenschaft und Universität Münster.
- Faivre D'Arcier, B., L. Clement, and L. Denant-Boemont. 1994. *Cohérence et intégration des projets de transports en commun en site propre dans une politique globale: Réflexions sur les finalités et les processus d'évaluation à priori*. Lyon: Institut National de Recherche des Études Transports et leur Sécurité (INRETS)/Laboratoire d'Economie des Transports.
- Faiz, Asif. 1993. "Automotive Emissions in Developing Countries: Relative Implications for Global Warming, Acidification, and Urban Air Quality." *Transportation Research* 27A (3): 167-86.
- Faiz, Asif, K. Sinha, M. Walsh, and A. Varma. 1990. "Automotive Air Pollution: Issues and Options for Developing Countries." Policy Research Working Paper 492. World Bank, Policy Research Department. Washington, D.C.
- Forschungsberichte Bundesministers für Verkehr. 1990. "Bericht über die Kosten der Wege des Eisenbahn-, Straßen- und Binnenschiffsverkehr in der Bundesrepublik Deutschland." Heft 34. Bonn.
- Fouracre, P., R. Allport, and J. M. Thomson. 1990. "The Performance and Impact of Rail Mass Transit in Developing Countries." Research Report 278. Transport Research Laboratory, Crowthorne, U.K.
- Frybourg, M. 1992. "Sustainable development et planification des infrastructures. Une nouvelle planification des infrastructures dans une économie globale." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.

- Frybourg, M., and D. Bureau. 1985. *Les coûts sociaux: La sécurité, les nuisances, la tarification de l'usage de l'infrastructure*. Paris: Ministère de l'Economie.
- Gakenheimer, R. 1994. "Six Strategic Decisions for Transportation in Megacities." In Roland Fuchs and others, eds., *Mega-City Growth and the Future*. Tokyo: United Nations University Press.
- Galenson, Alice. 1989. "Labor Redundancy in the Transport Sector." Policy Research Working Paper 158. World Bank: Policy Research Department, Washington, D.C.
- Galenson, Alice, and Lewis S. Thompson. 1994. *The Evolution of the World Bank's Railway Lending*. World Bank Discussion Paper 269. Washington, D.C.
- Gallagher, R. 1992. *The Rickshaws of Bangladesh*. Dhaka: University Press.
- Gannon, Colin, and Zmarak Shalizi. 1995. "The Use of Sectoral and Project Performance Indicators in Bank-Financed Transport Operations." Report 21. World Bank, Transport, Water, and Urban Development Department, Washington, D.C.
- Gardner, G., P. Cornwell, and J. Cracknell. 1991. "The Performance of Busway Transit in Developing Cities." Research Report 329. Transport Research Laboratory, Crowthorne, U.K.
- Gardner, G., F. Kuhn, and J. Rutter. 1994. "The Performance and Potential of Light Rail Transit in Developing Cities." Project Report 69. Transport Research Laboratory, Crowthorne, U.K.
- Goldstein, Ellen. 1993. "The Impact of Rural Infrastructure on Rural Poverty: Lessons for South Asia." Internal Discussion Paper 131. World Bank, South Asia Regional Office, Washington, D.C. Processed.
- Gómez-Ibáñez, J. A. 1995. "Pitfalls in Estimating Whether Transport Users Pay Their Way." Paper presented at the workshop on Measuring the Full Social Benefits and Costs of Transportation. Beckman Center, Irvine, Calif., July 6–8. Processed.
- Gouvernal, E. 1988. *Politiques maritimes et développement*. Paris: Ministère de la Coopération et du Développement.
- Gronau, R. 1994. "Fuel Taxes and Road User Charges in LDCs." *Journal of Transport Economics and Policy* 28 (3): 255–74.
- Guensler, R., and D. Sperling. 1994. "Congestion Pricing and Motor Vehicle Emissions: An Initial Review." In National Research Council, Transportation Research Board, *Curbing Gridlock: Peak Period Fees to Relieve Congestion*. Washington, D.C.: National Academy Press.
- Gwilliam, Kenneth, S. Joy, and Richard Scurfield. 1994. "Constructing a Competitive Environment in Urban Public Transport." World Bank, Transportation, Water, and Urban Development Department, Washington, D.C. Processed.
- Gwilliam, K. M., Z. Shalizi, and L. S. Thompson. 1994. "Railways, Energy, and Environment. TWU Discussion Paper 6 World Bank, Transportation, Water, and Urban Development Department, Washington, D.C.
- Gyamfi, Peter. 1992. "Infrastructure Maintenance in LAC: The Costs of Neglect and Options for Improvement." Vol. 4: "The Road Sector." Regional Studies Program Report 17. World Bank, Latin America and the Caribbean Technical Department, Washington, D.C.

- Gyamfi, Peter, and Guillermo Ruan. 1992. "Infrastructure Maintenance in LAC: The Costs of Neglect and Options for Improvement." Vol. 5: "Routine Maintenance by Contract." Regional Studies Program Report 17. World Bank: Latin America and the Caribbean Technical Department, Washington, D.C.
- HABITAT (United Nations Center for Human Settlements). 1987. *Global Report of Human Settlements 1986*. New York: Oxford University Press.
- Hall, J. V., A. M. Winer, M. T. Kleinman, F. W. Lurmann, V. Brajer, and S. D. Colome. 1992. "Valuing the Health Benefits of Clean Air." *Science* 255 (February 14): 812-17.
- Hamer, Andrew Marshall. 1986. "Urban Sub-Saharan Africa in Macroeconomic Perspective: Selected Issues and Options." World Bank, Washington, D.C. Processed.
- Hau, Timothy D. 1992. "Congestion Charging Mechanisms for Roads: An Evaluation of Current Practice." Policy Research Working Paper 1071. World Bank, Policy Research Department, Washington, D.C.
- Hayashi, Y., M. Wegener, K. Doi, and R. Suparat. 1992. "An International Comparative Study on Land Use Transport Planning Policies as Control Measures of Urban Environment." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Heggie, Ian C. 1991. *Designing Major Policy Reform: Lessons from the Transport Sector*. World Bank Discussion Paper 115. Washington, D.C.
- . 1995. *Management and Financing of Roads: An Agenda for Reform*. World Bank Technical Paper 275. Washington, D.C.
- Henry, E., and R. S. Pacheco. 1994. "Relations de pouvoirs entre entreprise d'autobus et tutelle: Réflexions à partir du cas du Brésil." In X. Godard, ed., *Les transports dans les villes du sud: La recherche de solutions durables*. Paris: Karthala.
- Heseltine, P. M., and D. T. Silcock. 1990. "The Effects of Bus Deregulation on Costs." *Journal of Transport Economics and Policy* 24 (3): 239-54.
- Hierli, U. 1993. *Environmental Limits to Motorization*. Geneva: Neidermann, A.G.
- Hills, B. L., N. M. Thompson, and K. Kila. 1991. "Accident Reduction in Papua New Guinea." Paper presented to the Planning and Transport Research and Computation International Association, London, September. Processed.
- Himanen, V., K. Makela, K. Alppivuori, P. Aaltonen, and J. Loukelainen. 1989. "The Monetary Valuation of Road Traffic's Environmental Hazard." Research Report 943. Technical Research Center of Finland, Espoo.
- Howe, J. D. F., ed. 1985. *Rural Transport in Developing Countries*. London: Intermediate Technology Publications.
- Hugonnard, J-C. 1994. "Le métro léger: Illusion ou solution pour les pays en développement." In X. Godard, ed., *Les transports dans les villes du sud: La recherche de solutions durables*. Paris: Karthala.
- INFRAS A. G., and Institut für Wirtschaftspolitik und Wirtschaftsforschung. 1994. *The External Effects of Transport*. Paris: Union Internationale des Chemins de Fer.
- International Road Federation. 1993. *World Road Statistics, 1988-1992*. Geneva and Washington, D.C.

- Jamieson, W., and B. Naylor. 1992. "Planning for Low-Cost Travel Modes in Ningbo, China." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Japan International Cooperation Agency. 1992. *Environmental Guidelines for Infrastructure Projects: XII Transportation Development*. Tokyo.
- Kågeson, P. 1993. "Getting the Prices Right: A European Scheme for Making Transport Pay Its True Costs." Stockholm: European Federation for Transport and the Environment.
- Kain, J. F. 1991. "A Critical Assessment of Public Transport Investments in Latin America." Report prepared for the Inter-American Development Bank, Washington, D.C. Processed.
- Kessides, Christine. 1992. "Note on the State of Knowledge and Experience with Labor-Intensive Public Works Programs." World Bank, Infrastructure and Urban Development Department, Washington, D.C.
- Klaasen, L. H., and J. van der Meer. 1987. "Urban Change and Public Transport." *International Journal of Transport Economics* 14 (2):123–32.
- Kogan, J., and L. S. Thompson. 1994. "Reshaping Argentina's Railways." East Japan Railway Culture Foundation, Tokyo. Processed.
- Kosasih, D., R. Robinson, and J. Snell. 1987. "A Review of Some Recent Geometric Road Standards and Their Application to Developing Countries." Research Report 114. Transport Research Laboratory, Crowthorne, U.K.
- Krupnick, A. J. 1995. "The Air Pollution Damages from Transportation: A Literature Review." Paper presented at the workshop on Measuring the Full Social Benefits and Costs of Transportation, Beckman Center, Irvine, Calif., July 6–8. Processed.
- Kuerer, R. 1993. "Environment: Global and Local Effects." In European Conference of Ministers of Transport, *Transport Growth in Question*. Paris: OECD.
- Lambert, J. 1986. "Nuisances sonores et coût social de l'automobile. Essai de quantification." *Recherche-Transports-Sécurité* 11: 41–44.
- Lee, K. S., and A. Anas. 1989. "Manufacturers' Responses to Infrastructure Deficiencies in Nigeria: Private Alternatives and Policy Options." World Bank, Infrastructure and Urban Development Department, Washington, D.C. Processed.
- Lesne, J. 1992. "20 ans de versement transport en France." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Lia Biagone, G. M. 1984. "Transport informel et intégration de la banlieue à la dynamique urbaine d'un pays du Tiers Monde. Application à la ville d'Abidjan." Thèse du troisième cycle, Université d'Aix Marseille. Processed.
- Martinand, C., ed. 1993. *L'expérience française du financement privé des équipements publics*. Paris: Economica.
- Matsuura, Y., and M. Numada. 1992. "The Effects of Transport Facility Improvements on Residential Location and Housing Size." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Messerlin, Patrick A., and Karl P. Sauvant, eds. 1990. *The Uruguay Round: Services in the World Economy*. Washington, D.C.: World Bank and the United Nations Centre for Transnational Corporations.

- Meyer, J. R., and J. A. Gómez-Ibáñez. 1993. *Going Private: The International Experience with Transport Privatization*. Washington, D.C.: Brookings Institution and Lincoln Institute.
- Midgley, Peter. 1994. *Urban Transport in Asia: An Operational Agenda for the 1990s*. World Bank Technical Paper 224. Washington, D.C.
- Mitric, Slobodan. 1995. "Rapid Transit Projects in the World Bank's Urban Transport Policy." World Bank, Transportation, Water, and Urban Development Department, Washington, D.C. Processed.
- Miyamoto, K., and R. Udomsri. 1992. "Present Situations and Issues of Transport Planning and Plan Implementation in Developing Metropolises from the Viewpoint of Integration with Land-Use Policies." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Morichi, S. 1994. "Urban Development and Transport Strategy in the Metropolitan Region." Paper presented to the international symposium on Sustainable Urban Development Strategies in the Twenty-first Century: Urban Transport and the Motorized Society, Sagamihara, Japan, June 4–8. Processed.
- Munasinghe, Mohan. 1993. *Environmental Economics and Sustainable Development*. World Bank Environmental Paper 3. Washington, D.C.
- Mwase, N. 1992. "The Liberalization and Deregulation of the Transport Sector in Sub-Saharan Africa." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Navin, F. P. O. 1994. "Bicycle Traffic Flow Characteristics: Experimental Results and Comparisons." *ITE Journal* (March).
- Nehashi, A., M. Ikoma, and Y. Akiyama. 1992. "Re-Evaluation of Urban Rail." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Newbery, D. M. 1994. "The Case for a Public Road Authority." *Journal of Transport Economics and Policy* 28 (3): 235–54.
- Newbery, David M., Gordon A. Hughes, William D. O. Paterson, and Esra Bennathan. 1988. *Road Transport Taxation in Developing Countries: The Design of User Charges and Taxes for Tunisia*. World Bank Discussion Paper 26. Washington, D.C.
- Newman, P. W. G., and J. R. Kenworthy. 1991. *Cities and Automobile Dependence: An International Sourcebook*. Aldershot, U.K.: Avebury Technical Publishing.
- O'Brien, Peter, and Yannis Karmokolias. 1994. *Radical Reform in the Automotive Industry: Policies in Emerging Markets*. IFC Discussion Paper 21. Washington, D.C.: World Bank.
- OECD (Organisation for Economic Co-operation and Development). 1992. *Climate Change: Designing a Tradeable Permit System*. Paris.
- Offner, J. M. 1992. "Les 'effets structurants' du transport: Mythe politique, mystification scientifique." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Oudho, R. A. 1992. "Urban Public Transport in Nairobi, Kenya." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Padeco Co., Ltd. 1995. "Non-Motorized Vehicles in Asian Cities. Part II: Technical Guidelines." World Bank, Transportation, Water, and Urban Development Department, Washington, D.C. Processed.

- Pankaj, Thampil. 1989. "Road Fund Experience in Ghana." Paper presented at the symposium on Earmarking, Road Funds, and Toll Roads. World Bank, Infrastructure and Urban Development Department, Washington, D.C. Processed.
- Paterson, William D. O., and Rodrigo Archondo-Callão. 1991. "Estimating Road Use Costs." World Bank, Infrastructure and Urban Development Department, Washington, D.C. Processed.
- Peet, G. 1994. "International Cooperation to Prevent Oil Spills at Sea: Not Quite the Success It Should Be." In *Green Globe Yearbook of International Co-operation on Environment and Development*, 1994. New York: Oxford University Press.
- Peters, Hans Jürgen. 1992. "Service: The New Focus in International Manufacturing and Trade Policy." Policy Research Working Paper 950. World Bank, Policy Research Department, Washington, D.C.
- . 1993. *The Maritime Transport Crisis*. World Bank Discussion Paper 220. Washington, D.C.
- Peuker, Axel. 1992. "Public Policies and Deforestation: A Case Study of Costa Rica." Report 10526. World Bank, Latin American and Caribbean Technical Department, Washington, D.C.
- Philpott, J. 1994. "Women and Nonmotorized Transport: Connection in Africa between Transportation and Economic Development." *Transportation Research Record* 1441 (October): 39–43.
- Pinheiro, M. B. 1992. "Impacts culturels de nouvelles technologies en transports dans les pays en voie de développement: Le cas du métro de São Paulo." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- PLANCO-Consult. 1990. *Externe Kosten des Verkehrs: Schiene, Strasse, Binnenschifffahrt*. Essen: Deutsche Bundesbahn.
- Pohl, Gerhard, and Dubravko Mihaljek. 1992. "Project Evaluation and Uncertainty in Practice: A Statistical Analysis of Rate of Return Divergences of 1,015 World Bank Projects." *World Bank Economic Review* 6 (2): 255–77.
- Prudhomme, Remy. 1994. "On the Dangers of Decentralization." Policy Research Working Paper 1252. World Bank, Policy Research Department, Washington, D.C.
- Public Works Financing*. Various years. Westfield, N.J.
- Quin, C., M. Houée, and A. Méyère. 1990. *Le financement des transports collectifs urbains dans les pays développés*. Paris: La Documentation Française.
- Quinet, E. 1992. *Transports et theorie economique*. Paris: Presses de l'Ecole Nationale des Ponts et Chaussées.
- . 1994. "The Social Costs of Transport: Evaluation and Links with Internalization Policies." In *Internalizing the Social Costs of Transport*. Paris: European Conference of Ministers of Transport.
- Ravallion, Martin. 1990. *Reaching the Poor through Rural Public Employment: A Survey of Theory and Evidence*. World Bank Discussion Paper 94. Washington, D.C.
- Riverson, John D. N., and Steve Carapetis. 1991. *Intermediate Means of Transport in Sub-Saharan Africa: Its Potential for Improving Rural Travel and Transport*. World Bank Technical Paper 161. Washington, D.C.

- Riverson, John D. N., Juan Gaviria, and Sydney Thriscutt. 1991. *Rural Roads in Sub-Saharan Africa: Lessons from World Bank Experience*. Technical Paper 141. Washington, D.C.
- Rizet, C. 1992. "Les transports au Vietnam: De la planification au marche." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Rommerskirchen, S., and others. 1991. *Wirksamkeit verschiedener Massnahmen zur Reduktion der Verkehrlichen CO₂: Emissionen bis zum Jahre 2005*. Basel: Prognos.
- Ross, A., and M. Mwiraria. 1992. "Review of World Bank Experience in Road Safety." World Bank, Washington, D.C. Processed.
- Saad, F. 1989. "Road Accidents and Safety Perception in Urban Areas." Paper presented to the second African Road Safety Congress. OECD, Paris, October.
- Savy, M. 1992. "Logistique et territoire." Paper presented to the sixth World Conference on Transport Research, Lyon, France, June. Processed.
- Scholy, Gerhard, and others. 1993. "Untersuchungen über die Struktur des Verkehrsraumes in städtischen Verkehrsnetzen." Heft 124. Forschungsberichte des Bundesministeriums für Verkehr. Bonn.
- Schumann, U. 1992. "Über den Einfluss des Flugverkehrs auf das Klima." Prepared for the Enquête-Commission Protection of the Atmosphere of the Federal Parliament, Bonn. Processed.
- Serageldin, Ismail. 1993. "Environmentally Sustainable Urban Transport: Defining a Global Policy." Paper presented to the fiftieth International Congress of the Union Internationale des Transports, Sydney, Australia, May. Processed.
- Shalizi, Zmarak, and José Carbajo. 1994. "Transport-Related Air Pollution Strategies: What Lessons for Developing Countries?" Discussion Paper 14. World Bank, Transportation, Water, and Urban Development Department, Washington, D.C.
- Shirley, Mary M., and John Nellis. 1991. *Public Enterprise Reform: The Lessons of Experience*. Washington, D.C.: World Bank.
- Siele, S. 1992. "Crise du financement des entreprises de transports urbains en Afrique Sub-Saharienne: Diagnostic et solutions nouvelles." Paper presented to the sixth World Conference on Transport Research, Lyon, June. Processed.
- Stickland, R. 1993. "Bangkok's Urban Transport Crisis." *Urban Age* 2 (1): 1-5.
- Svejnár, Jan, and K. Terrell. 1991. "Reducing Labor Redundancy in State-Owned Enterprises." Policy Research Working Paper 792. World Bank, Research and External Affairs Department, Washington, D.C.
- Tae Oum, W., G. Waters II, and Jong Say Yong. 1990. "A Survey of Recent Estimates of Price Elasticities of Demand for Transport." Policy Research Working Paper 359. World Bank, Policy Research Department, Washington, D.C.
- Thomson, Ian. 1992. "Urban Bus Deregulation in Chile." *Journal of Transport Economics and Policy* 26 (3): 319-26.
- Transportation Research Board. 1994. "Nonmotorized Transportation around the World." *Transportation Research Record* 1441: 1-150.
- Turner, J., and P. R. Fouracre. 1993. "Women and Transport in Developing Countries." Project Report PP/OSC/004/93. Transport Research Laboratory, Crowthorne, U.K.

- United Nations Economic and Social Commission for Asia and the Pacific. 1994. *Infrastructure Development as Key to Economic Growth and Regional Economic Cooperation*. New York.
- Walmsley, D., and K. Perrett. 1991. *The Effects of Rapid Transit on Public Transport and Urban Development: Summary Report*. Research Report 258. Crowthorne. U.K.: Transport Research Laboratory.
- Webster, F. V., P. H. Bly, and N. J. Pauley, eds. 1988. *Urban Land-Use and Transport Interaction*. Aldershot, U.K.: Gower.
- WHO (World Health Organization) and UNEP (United Nations Environment Programme). 1992. *Urban Air Pollution in Megacities*. Oxford: Basil Blackwell.
- World Bank. 1975. *Urban Transport*. Sector Policy Paper. Washington, D.C.
- . 1986a. "Project Performance Audit Report: Brazil Urban Transport Project." Report 5495. Operations Evaluation Department, Washington, D.C.
- . 1986b. "Road Funds from Earmarked Sources: Interim Guidelines." Transportation Note 1. Operations Policy Department, Washington, D.C.
- . 1986c. *Urban Transport*. World Bank Policy Study. Washington, D.C.
- . 1988a. *Road Deterioration in Developing Countries: Causes and Remedies*. World Bank Policy Study. Washington, D.C.
- . 1988b. *World Development Report 1988*. New York: Oxford University Press.
- . 1990. "Kenya: Urban Transport Development Issues." Report 7881. Eastern Africa Department, Infrastructure Division, Washington, D.C.
- . 1991. *Lessons of Tax Reform*. Washington, D.C.
- . 1992a. "Rural Roads Maintenance: Review of Completed World Bank Operations." Operations Evaluation Department, Infrastructure and Energy Division, Washington, D.C. Processed.
- . 1992b. "World Bank Approaches to the Environment in Brazil: A Review of Selected Projects." OED Report 10039. Operations Evaluation Department, Washington, D.C.
- . 1992c. *World Development Report 1992: Development and the Environment*. New York: Oxford University Press.
- . 1993a. "China: Highway Development and Management Issues, Options, and Strategies." East Asia and the Pacific Technical Department, Washington, D.C. Processed.
- . 1993b. *The East Asian Miracle: Economic Growth and Public Policy*. World Bank Policy Research Report. New York: Oxford University Press.
- . 1993c. "Indonesia: Energy and the Environment: A Plan of Action for Pollution Control." East Asia and the Pacific Technical Department, Washington, D.C. Processed.
- . 1994a. "Bank Lending for African Transport Corridors: An OED Review." Operations Evaluation Department, Washington, D.C. Processed.
- . 1994b. "Brazil-Northwest Region Development Program, Third Phase: Project Completion Report." Report 13197. Washington, D.C.

- . 1994c. "Nonmotorized Transport: Confronting Poverty through Affordable Mobility." Infrastructure Note UT-4. Washington, D.C.
- . 1994d. "Resettlement and Development: The Bankwide Review of Projects Involving Involuntary Resettlement, 1986–1993." Environment Department, Washington, D.C. Processed.
- . 1994e. "Roads and the Environment: A Handbook." Technical Paper 13. Transportation, Water, and Urban Development Department, Washington, D.C.
- . 1994f. *World Development Report 1994: Infrastructure for Development*. New York: Oxford University Press.
- . 1995a. *1993 Evaluation Results*. Washington, D.C.
- . 1995b. "The World Bank's Guarantees: Catalysts for Private Capital Flows, Cofinancing, and Financial Advisory Services." Washington, D.C. Processed.
- World Bank and the European Union PHARE Program. 1994. *Proceedings from a Policy Seminar on Road Safety for Central and Eastern Europe*. Budapest.
- Xiaoming Liu, L. D. Shen, and F. Ren. 1993. "Operational Analysis of Bicycle Interchanges in Beijing, China." *Transportation Research Record* 1396: 18–21.

THE WORLD BANK
A partner in strengthening economies
and expanding markets
to improve the quality of life
for people everywhere,
especially the poorest



Headquarters
1818 H Street, N.W.
Washington, D.C. 20433, U.S.A.

Telephone: (202) 477-1234
Facsimile: (202) 477-6391
Telex: MCT 64145 WORLD BANK
MCT 248423 WORLD BANK
Cable Address: INTBAFRAD
WASHINGTON DC
World Wide Web: <http://www.worldbank.org>
E-mail: books@worldbank.org

European Office
66, avenue d'Iéna
75116 Paris, France
Telephone: (1) 40.69.30.00
Facsimile: (1) 40.69.30.66
Telex: 640651

Tokyo Office
Kokusai Building
1-1, Marunouchi 3-chome
Chiyoda-ku, Tokyo 100, Japan
Telephone: (3) 3214-5001
Facsimile: (3) 3214-3657
Telex: 26838

Cover design by Joyce C. Weston

