

Toward Better Urban Transport Planning in Developing Countries

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ABSTRACT

This paper describes the defects in transport planning and the various approaches that have been adopted in order to find solutions, but which have had limited success. It includes a discussion on the deficiencies and problems of the "Big Plan" approach to transport planning with specific reference to developing countries and the causes of planning failure.

For satisfactory planning the paper puts forward an approach that makes a clear distinction between directional and design planning. Direction planning aims to signpost the direction in which the land-use and transport structure of a city is intended to develop with no detailed time scale. It recognizes the need for flexibility in case the socio-economic growth of the city proceeds very differently from the forecast. Design planning is confined to the short and medium term and is greatly constrained by the directional plan. The purpose of the design plan is to give a complete list of projects in sufficient detail for inclusion in a 5-10 year rolling program.

Preface

One of the most daunting problems faced by the cities of the developing world is that of urban transport. Congestion is generally as intense or worse than in the cities of developed countries of comparable size, despite levels of automobile ownership still only a fraction of those in the developed world. The future seems bound to aggravate existing trends. Many of the cities in developing countries are doubling in population and area in a decade or little more and automobile ownership is advancing even more rapidly. The cost of providing roads and other transport infrastructure and public transport vehicles to meet this expansion is rising more than proportionately and represents a considerable proportion of total public investment, sometimes significantly more than a quarter.

Failure to provide adequate transport facilities greatly increases trip durations and costs both for passenger and goods traffic, lowering productive efficiency and placing a particularly heavy burden on poorer groups of the population living in peripheral and other areas of very limited access. The difference between suitable low cost solutions and the costly conventional approaches used in developed countries can be a factor of several times--but the more expensive approaches may be preferred for lack of adequate analysis and political reasons.

Unfortunately, the detailed methodologies best suited to the conditions of developing-country cities are far from clear. Conventional approaches require more data, technical staff and regulatory capacity than exist in all but a few of the developing-country cities. Moreover, experience in the developed countries with the models generally used has been far from satisfactory. In developing countries with much more uncertainty concerning future growth, incomes and land uses, these models seem even less appropriate. On the other hand, the design of the transport network expansion can have a profound effect on the physical directions of urban growth, land use, and general urban efficiency as well as on modal choice in the conditions of developing countries where access is a much scarcer phenomenon than in the developed world.

One general approach is to concentrate first on making better use of the existing transport infrastructure and other facilities. Traffic management, minor engineering, road widening, limited paving in squatter areas, construction of short link roads and the improvement of public transport enterprises can produce high returns and delay the time when major new highways or rail facilities are required. The Bank has been actively engaged in promoting this type of approach during the last few years with considerable success.

However, it is evident that with the continuing rapid growth of city populations, incomes and areas, the day must come when such an approach needs to be complemented by major new transport investments. Moreover, there is always a risk that some elements of the short-term approach may prove not to be as consistent with the longer-term expansion as could be desired.

In these circumstances, the Bank is exploring new approaches to the longer-term planning and programming of urban transport investments specifically related to the low income characteristics of developing countries. These approaches range from the adaption of well-tried techniques already in use to the development of radically new ideas. This paper by one of the most experienced of urban transport planners falls into the former category of how existing techniques might best be adapted to the conditions of developing countries. As a basis for the ensuing suggestions, the paper first presents a "state of the art" perspective of existing techniques familiar to most urban transport practitioners. Trends already evident towards a two-level analysis of strategic planning and of a shorter-term design planning are then presented and carried to a further stage of consideration of what in practice would be involved in the context of developing countries.

We do not expect this paper to find uniform acceptance. In the very varied conditions of developing countries probably no single approach will be relevant to all of their major cities. The paper, moreover, does not purport to cover all the manifold aspects of the urban planning process. The assessment of the long-term impact of provision of transport facilities on land use in combination with provision of other necessary services remains elusive. Stimulus of multiple-activity centers by public transport modes needs further exploration both for the effect on transport requirements and for savings in time and energy. The balance between primary and secondary roads in conditions of very constrained resources and rapid expansion of urban area also poses many problems of evaluation. Realistic assessment of the current and longer-term scope for traffic and parking restraints remains much of an art as does the value to be given to flexibility of systems in such dynamic conditions and the role of monitoring in adapting programs to actual experience. And then there is the usual problem of how to evaluate urban transport proposals in the absence of an agreed transport/land-use strategic plan--a common situation. How far and in what conditions a corridor analysis presents a reasonable second-best approach after testing alternative strategic plans is a further issue.

Within this general context, we regard this paper as an important addition to the current debate. We are therefore circulating it in the wider forum of the Bank's "Working Paper" series, hopefully to elicit further responses and ideas. At the same time, a series of other papers with narrower focus including Institution Building for Traffic Management, Traffic Management Operations, Transit Pre-feasibility Guidelines, and Bus Components in Urban Transport Projects are being prepared for circulation in the "Technical Paper" series of the Urban Development Department.

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SUMMARY

It is about 25 years since the introduction of modern methods of urban transport planning based on computerized network models. These methods, while undergoing continual improvement, cost a lot of money and often gave disappointing results. The author, having been associated for a long time with this planning technology, is frankly critical of its deficiencies and the way it is sometimes applied. The first part of the paper describes the weaknesses of the methods and the difficulties that planners face when trying to use them, particularly in developing countries. The intention is not destructive, however, but rather to show where the methods need to be improved. The second part of the paper is an attempt to suggest a way forward towards a better planning technology.

The urban transport problem is fundamentally similar in all large cities. The basic causes are the same and so are many of the consequences, although there are some differences of degree between developed and developing cities. Despite the much greater level of vehicle ownership and higher rate of trip generation in developed cities, it is the developing cities that in general suffer most from traffic congestion, road accidents, environmental pollution (except smog), overcrowding of public transport and poor conditions for pedestrians and cyclists. On the other hand, developed cities tend to suffer more from parking difficulties and infrequent public transport. But while the problems are similar, the solutions are not. Rich cities can afford motorways, multistory car parks, rapid transit and sophisticated control systems, and can fund lavish subsidies if they so wish. Whether these things constitute real solutions is another question, but it is irrelevant to developing countries since they cannot afford them anyway. The only possible solution for them--apart from cities in a few oil-rich countries--is a low-cost solution, which in practice means extensive bus priorities, traffic management and traffic restraint, together with selective road improvements. Only rarely can motorways or rapid transit lines be justified. The task of transport planning is to determine cost-effective solutions of this sort.

In the 1960s, transport planning went through the "big plan" phase in which massive studies aimed to produce comprehensive, long-term plans for land use and transport in considerable detail. The models failed to reflect realistically the interactions between land use and transport, ignored traffic generation and could not reproduce adequately the phenomenon of congestion. The "big plan" took a long time to produce, tended to ignore budget constraints and neglected the role of demand management as an alternative to investment, thus ending with grandiose solutions that were often not feasible. In developing countries, these deficiencies were compounded by lack of data, rapid and uncontrolled growth, mixed bus systems and other problems, which tended to reduce confidence in the results. Many people concluded that these studies were a waste of time and money and attempted the impossible without achieving the possible, which was to make some modest improvement in the existing chaos.

The critical reaction against the "big plan" led to the "incremental improvement" phase in which planning was confined to immediate action and short-term improvements with strong emphasis on low-cost measures. Eyes were closed to the longer term and to the need sooner or later to make strategic decisions about the development of the city. The limitations of this approach were bound to be recognized before long.

A further criticism of both phases of planning was that the emerging plans were all too often not implemented because the power or the will to do so was lacking. Even if feasible from a technical and financial viewpoint, they were politically or administratively unrealistic.

It is tempting to look for a completely fresh approach to transport planning, but this path is rejected. In the author's view, transport planning is basically on the right path and does not need to be radically changed. One difficulty is that quite small technical errors, or faulty assumptions, can lead to disastrous results. Rather than abandon the whole approach, more care and experience are needed in planning the study process and the structure of the models to be used.

Before considering these technical matters, however, it is essential to recognize that planning is a continuous process and cannot be effective and efficient unless it is carried out by an organization with the capability and authority to do what is needed and the power of implementation. Responsibility must cover the whole metropolitan area and all strategic aspects of land use and transport. The planners must be able to coordinate their activities with those of the transport operators and agencies. They must be in close touch with the political authorities and administrators, have access to available data and information, and have means of collecting specific data and monitoring trends. Most important, their work must be based realistically on such powers as do and do not exist to control the development of land use.

It is perhaps more important to set up an organization with the political, financial and administrative capability to plan than to give instruction in the technique of planning. But both are important. The technical approach recommended here is based on a two-plan process--a directional plan and a design plan--with separate models, for which specifications are suggested. Directional planning points the way for major changes in land use, transport networks and policy and ensures that decisions made today will not prove inconsistent and irreconcilable with long-term goals. The directional plan should indicate the main elements in the transport system in approximately 20-25 years time, which include the standard of line-haul roads and intersections, the required bus fleet, the supply of parking in the central and other critical areas, tariff policies for public transport, traffic management policies, including traffic restraint policies. The purpose of the design plan is to give a list of projects in sufficient detail for inclusion in a 5-10 year rolling program. The projects included in the design plan should be designed to the point necessary to establish their feasibility; that is, they should be ready, after approval, to go to detailed engineering design without further study.

Many past failures are attributable to the attempt to combine strategic and design planning in the same model. The models have become too big and costly to perform all the runs needed for strategic planning and not sufficiently accurate for design planning. Separate models designed for the very different requirements of strategic (directional) and design planning are considered an essential feature of the recommended approach.

The model for directional planning should be designed to make broad comparisons of alternative land-use and transport strategies, studied at two points in time in order to facilitate economic and other evaluations. In developing countries, where population is rising fast, the geographical expansion is bound to be very wide. There are, therefore, likely to be several alternative land-use patterns, each of which may require studying with two or three transport strategies, at least. Hence it is important that the model be small and fast but it must give results that are reliable enough for the purpose.

In design planning, the purpose of modeling is to provide reliable traffic data for feasibility studies of projects and, in particular, to compare the performance of alternative road designs and management schemes with the constraints of a predetermined strategy and a fixed land-use pattern derived from the directional plan.

Agencies, such as the World Bank, are interested to know that plans have been produced that help justify the financing of projects and that the plans make sense. Both directional and design plans must therefore stand up to a number of feasibility tests. These tests include an examination of consistency between: predicted numbers of vehicles and estimates of population and income; peak-hour trip destinations and employment data; traffic volumes and road capacities and available modal choice. Also it is necessary to determine that the capital expenditure required by the plans is realistic, and that the plans are likely to be satisfactory to political authorities.

The Bank also is interested in the details of the planning methodology itself, and a recommended method is therefore set out at the end of the paper.

A sample Terms of Reference for an urban transportation study is attached as an appendix. Other appendices deal with questions of plan evaluation.

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PART 1: A CRITIQUE OF URBAN TRANSPORT PLANNING

Introduction

The World Bank is frequently involved with urban projects which are related, in one way or another, to transport planning. Some deal with the system as a whole, while others are concerned with just one aspect, for example, a major new road or railway that could affect the entire system in a significant way. Still other projects involve major housing or industrial schemes, which subsequently create large new demands on the transport system.

Thus it is important that all projects having a major impact on the demand for or supply of transport be consistent with the city's transport plans and policies, since development should not proceed in a haphazard manner. In this respect, the Bank is encouraging long-term planning of transport systems and the use of sound methods.

It is also recognized that a transport plan cannot be sensibly conceived without a land-use plan, and vice versa, the planning of land use and transport must go hand in hand. Thus long-term planning of cities with regard to their broad physical characteristics is a field in which the Bank is necessarily interested.

The purpose of this paper is to consider what sort of planning is desirable in the large cities of the developing countries and to suggest an acceptable way of doing it. There has been a good deal of experience in the last 20 years, some of it has been disappointing and frustrating, yet many lessons have been learned.

This paper is, to some extent a product of that experience. It briefly reviews the transport problem in large urban areas and looks critically at recent planning experience. Next, it describes the cities' basic planning needs and suggests guidelines for meeting them. While it is presumptuous to imply that there is only one way to produce a transport plan (and naive to imagine that all cities will adopt the same method), there are probably certain basic principles which should be generally observed. Therefore, the following guidelines are intended to present a planning method which is acceptable and which avoids a number of mistakes that have spoiled earlier efforts.

The Transport Problem in Large Cities

A transport plan is intended to tackle the transport "problem" as it presently exists and is expected to develop in the future. It is not likely to be a full solution to the problems, but should constitute the most effective way of using scarce resources that are also urgently needed for housing, sewerage, drainage, health and education.

The transport dilemma, although it has many facets, can be seen as a single complex problem of matching demand and supply. It is a problem that afflicts all large cities, in both developing and developed countries, and produces broadly similar results: congestion, parking difficulties, accidents, crowded public transport, environmental damage and bad conditions for pedestrians.

Superficially, the problem involves the large number of ways in which the transport system imposes difficulty or inconvenience on either the user or non-user. Of the various types of difficulties, the most conspicuous (though not necessarily the most important) is congestion, which, as measured by traffic speeds, is worse in cities in the developing world despite the fact that there are less vehicles per capita. As cities grow, congestion spreads, becomes more unpredictable, and the cost is alarmingly high in terms of time, energy and efficiency.

Closely associated with the growth of traffic is the shortage of parking space. Again, the parking difficulty is often worse than in cities in the developed world, because the streets are narrow and little off-street parking space has been provided. As a result, cars are parked on footpaths and in any available corner, causing danger, damage and inconvenience.

Third, because of bad roads, inadequate traffic management, poor driving standards and undisciplined behavior by other road users, accident rates per vehicle-kilometer are much higher in developing countries.^{1/}

The next two problems involve public transport. During peak hours, overcrowding is normal in cities in both developed and developing countries, but tends to be worse in the latter, causing passengers considerable delays and physical hardship. During off-peak periods, service is infrequent, but this is a greater problem in the developed world where car ownership is higher and residential densities are lower.

^{1/} Accident rates per head are not always higher, since traffic volumes are much lower.

Next there is the problem of movement by pedestrians and cyclists. Here again the position tends to be much worse in the developing world. The needs of pedestrians are largely ignored, as footpaths are inadequate and badly maintained. Conditions for cyclists are often extremely dangerous and unpleasant.

Finally, there are the environmental aspects. While smog is generally not a problem (since there are not so many vehicles), there is a great deal of exposure to traffic noise, and the visual impact of traffic is at least as bad as it is in developed countries.

Besides these problems, it is important to determine if the right journeys are made, and in the right way, since the real test of the system is whether people can obtain access to their activities without undue expenditure of time, money and effort. Accessibility, not mobility, is what matters.

Accessibility is a function of three factors: the pattern of land use, the distribution of people in relation to the land use, and the transport system. Each of these factors is influenced by the other two and together they form a triangle of forces that must be balanced if people in a large city are to obtain efficiently the many amenities and opportunities it offers.

One of the differences between cities in the developing and developed world is this balance of land use, land users and transport facilities. In some of the former, there are people who spend hours travelling to and from work, who sleep at their workplace and only go home at weekends, or who, for lack of transport, cannot obtain work at all. Further, it is particularly

difficult for the elderly who become largely confined to their homes as they have no suitable means of transport and the congested streets are unsafe for them to walk.

Causes

Before attempting to resolve the problems, it is useful to consider why they have arisen, virtually in all large cities. The essence of the urban transport problem is that cities have been unable to supply some quite simple amenities which are easily provided in small towns but become progressively more costly to offer as the towns are transformed into cities and the cities into metropolises. In a small town, motorists can drive to work easily and park without trouble, bus services are provided effectively along the main roads, pedestrians and cyclists have little cause for complaint, and there is no real environmental problem. In a big city, people want the same simple things, but cannot get them.

In fact, it is not impossible to provide these same amenities in a large city, but it would be so costly that none has yet done so. As cities grow, journeys become longer and densities higher, so that traffic flows increase disproportionately, particularly in the inner city, and complicated engineering methods are needed to provide sufficient road, rail and parking capacity, while the quality of the environment and good conditions for pedestrians and cyclists are preserved. This could be accomplished, by elaborate use of tunnels, multi-level structures, underground car parks, subsidized bus services and strict enforcement of emission controls and noise regulations, but the expense would be enormous.

The transport problem could thus be eliminated, or very nearly, if cities were able and willing to commit the resources. It is thus an economic problem, one of matching demand and supply in a situation where, as the city grows, demand for transport services and associated amenities grows rapidly, and the cost of supplying the demand grows more rapidly still.

In other sectors of the economy, the normal solution is the price mechanism. Higher prices stimulate supply and restrain demand until the two are in balance. However, in urban transport, for a variety of reasons the price mechanism is not used effectively to deal with the problem. No direct price is charged for using the roads, nor for destroying other people's environment. Economic pricing policies are seldom adopted for parking or for public transport. As a result, people often cannot get the services they want at any price.

The problem is thus due to the structure of transport costs and demand, together with a number of practical pricing difficulties, all of which are common to all large cities. The causes are embedded in the nature and technology of our cities, and this fundamental fact explains why the transport problem is found with little variation in metropolitan areas in all parts of the world.

In developing countries, the problem has arisen more rapidly and officials have been less able to deal with it. They have been unable to afford much in the way of major roads and the networks are generally small and of low standard. Hardly any extensive rail systems exist and most cities have

no rail facilities at all. Thus, in general, the whole burden of transport falls upon an inadequate road network. In the developed countries, on the other hand, apart from the United States where some cities have been built to accommodate practically universal car ownership, all cities of over two million people possess urban rail systems, and most possess fairly highly developed road networks, as well.

Beyond the failure to match supply and demand, the problem is exacerbated by a failure to use the available roads efficiently. Recently, a great deal has been done to introduce traffic engineering and improve the operation of bus enterprises, but it is still true that, in almost every respect, the management and maintenance of the total transport system is poor. Driving standards are generally low, and quite often, road junctions are poorly designed, road surfaces and edges are in bad condition, pedestrians are undisciplined, vehicles are not roadworthy, parking practices are chaotic, and traffic signals are inefficiently used. In addition, police control is sometimes weak.

In developed countries, there seems to be little more that can be done to get better performance from existing facilities: rather, the problem has clarified into a choice between expanding the facilities or controlling the demand. In developing countries, however, there is still room for improved performance, and this possibility has appeared as a solution to the overall problem. But increased efficiency is no more than a short-term palliative. In many cities where traffic engineers have already introduced the basic elements of their trade (though much could still be done to improve safety,