Policy Making and Planning for Nonmotorized Transportation Systems in Third World Cities: A Developmental Approach

HARRY T. DIMITRIOU

A developmental approach to planning for nonmotorized movement in urban areas is advocated as a basis for the formulation of more acceptable and appropriate policy frameworks for transportation systems in Third World cities. To illustrate some of the points raised, general reference will be made to Asian countries, and specific reference to Indonesia. Given current changes in emphasis toward environmentally more conscious planning and the needs of the urban poor, three areas of concern are highlighted: the call for a recognized and planned role for nonmotorized urban transportation systems within the broader spectrum of urban transportation networks; the need to acknowledge the productive and survival-support functions of nonmotorized transportation and identify ways that may be used to better assess them; and the requirement to link planned attempts at meeting nonmotorized travel needs with urban development planning and environmental protection efforts. Addressing these areas of concern by means of advocating a developmental approach to urban transportation planning, as opposed to an accommodative approach, offers an opportunity to reshape policy making and planning for urban transportation in a way whereby broader goals of sustainable development can be better achieved. An approach of this kind pays more attention to the "lowerarchy" of city transportation systems traditionally ignored by conventional planning and so important to nonmotorized movement.

It is apparent that a broad consensus is at last emerging in influential quarters of international development agencies that sees the past preoccupation with motorized and high-technology transportation systems as detrimental to almost all else—not only a partial view of urban transportation developments but a damaging one.

The inclusion of nonmotorized travel and environmental impact issues on the Asian urban transport agenda—along with the more conventional concerns for transportation operations efficiency and economic viability—is a belated acknowledgment by the international banking community that there are unacceptable costs to unlimited motorization. Significantly, many of these costs occur outside concepts of transportation systems optimization and optimal fiscal management usually associated with the sector. These external costs, as they are sometimes also known, have to do with less easily quantifiable concerns about the decline in quality of life, increased health hazards, and doubts about the survival of an ever-increasing number of underprivileged urban inhabitants. Unless adequately addressed, these costs bring about social and political disruptions in the face of single-minded efforts to increase productivity and economic growth.

To ensure that the new concern by international development agencies for nonmotorized travel and environmental impacts of transportation systems receives the full institutional support of such agencies, a strategy (indeed a package of strategies) is needed to rationalize the role of nonmotorized travel. To be effective, such a strategy must be linked to sustainable urban development policies (including environmental and social justice goals), economic productivity targets, and the more conventional operations efficiency concerns of multimodal urban transportation systems. The developmental approach to urban transportation planning advocated here is a strategy of this kind.

Center for Urban Planning and Environmental Planning, University of Hong Kong, Pokfulam, Hong Kong.

ASIAN URBAN TRANSPORTATION ISSUES

One of the most recent and well-researched accounts of current trends in Third World urban transportation is the report *Urban Transport in Asia* (*1*) published by the World Bank. Some of the key observations and conclusions of this report are summarized below.

Nonmotorized Transportation and the Urban Poor

It is common knowledge that the poor are most dependent on nonmotorized means of transportation for both personal and goods movement, particularly walking and cycling. Measures that address the needs of this kind of movement inevitably affect the opportunities of the underprivileged.

According to World Bank statistics, some 70 percent of the world's poor may be found in the Asia and Pacific (ESCAP) region. This implies that 700 million people in this region earn annual incomes below $370 (US). Although estimates indicate that Asia's share of the globe's poor will decline to 53 percent by 2000 (*2*), an increasing proportion of the poor is projected to reside in urban areas.

In 1988, one quarter of Third World urban inhabitants (some 330 million people) were estimated by the World Bank to be poor. By the turn of the century the urban population of Asia will increase by 420 million, from 1.2 billion to 1.6 billion.

On this basis, assuming the same proportion of poor living in urban areas of Asia, some 400 million Third World urban inhabitants will be poor by 2000. This represents a huge increased dependence on nonmotorized means of travel in cities, which has a number of serious ramifications. Among these is not only the much discussed mushrooming of motorized traffic in many Asian cities but also the rapidly mounting demand for affordable transportation facilities by the urban poor.

City Motorization Trends

Asia is endowed with the widest diversity of transportation modes in the world, especially nonmotorized means. There is, however, according to the aforementioned World Bank Report, only limited evidence of specific measures being taken to accommodate the needs of nonmotorized movement. More worrying is the growing evidence that this type of travel is increasingly constrained by governments to facilitate the needs of motorized traffic.

The rising tide of motorization that fuels traffic congestion has its roots in the high rates of urbanization and economic growth and increases in personal incomes in the region. The paradox of the Asian region is that it contains some of the highest and lowest motorization rates. At present Asia has just over 10 percent of the world's automobiles and over 25 percent of the global truck and bus fleet. In addition, numbers of motorcycles are also increasing dramatically [this mode is seen by some as a logical progression from the bicycle and a much faster alternative to the crowded public bus (*1*)].

According to the World Bank study, over the last decade the region has experienced a significant reduction in the number and use of nonmotorized vehicles outside China—although the converse is true within China. Overall, the most widespread mode of nonmotorized transportation in the whole region is the bicycle. There are at present some 300 million in China, 66 million in Japan, 45 million in India, and 6 million in Korea. Together, they account for more than 50 percent of the world's estimated total bicycle population of 800 million.

Other Emerging Problems

The problems associated with the motorization trends identified above manifest themselves in widespread traffic congestion and resultant declining travel speeds in the downtown areas for increasingly longer periods of the day, greater fuel consumption, rising pollution levels, and negative effects on the productivity of cities, estimated in Asia to often contribute to more than 50 percent of gross domestic product. These problems are further aggravated by the reluctance of politicians to deter rising vehicle ownership levels among the middle classes, which is seen as both a reward of modernization and a source of government revenue.

The results are unacceptable levels of vehicle emission, rising traffic accidents (costing in some cases as much as 1 percent of gross national product), declining levels of service of bus transport, and intolerable noise levels in urban areas. Perhaps most sinister of all, the World Bank study concludes, is that many new roads in Asian cities are beginning to separate rather than link people.

In attempting to provide capacity for more motor vehicles, many Asian cities have sacrificed their footpaths to widen roads and have neglected on a grand scale the "lowerarchy" of their city transportation systems, including the streets in squatter areas and alleyways of older parts of the city not easily accessible by motorized traffic.

Fortunately, the World Bank and other international development agencies are belatedly recognizing what many NGOs have long been arguing: that nonmotorized vehicles not only offer low-cost personal mobility but are also nonpolluting, users of renewable energy, labor intensive (and thus offer greater employment opportunities), and well suited for short trips (the largest number in urban contexts). As a result, there is now widespread acknowledgment that nonmotorized vehicles need to be planned and managed as an integral part of a city's entire transportation system and that technical guidelines of the kind advocated in the latter part of this paper are needed.

Proposed World Bank Strategy

Given the circumstances described, the World Bank study advocates a six-point strategy to tackle the challenges currently emerging in the region's urban transportation sector:

1. Subordinate urban transportation lending to overall urban development objectives and policies;
2. Clearly articulate the role of transportation in enhancing economic productivity, the personal mobility of the urban poor, the urban environment, and financial viability;
3. Take into account the performance of the entire urban transportation system when making specific investment decisions;
4. Lend on the basis of both traffic demand management and environmental management;
5. Make urban transportation lending more responsive in terms of timing; and
6. Achieve faster responses in lending operations and greater sustainability.

For this strategy to work, the agency recognizes that it cannot operate alone but rather that it should play a catalytic role in the urban transport sector by providing a forum, framework, and rationale for future action. It is hoped that the ensuing discussion will contribute to these efforts.

TRANSPORTATION AND SUSTAINABLE DEVELOPMENT

Changes Needed

It is clear from both the preceding and other writings [also see Replogle (*3*)] that major changes are needed in urban transportation priorities in the Third World if development is to meet a broader spectrum of human needs rather than primarily benefiting the current elite. Similar conclusions (from a different perspective) were arrived at by Newman and Ken-

worthy (*4*) in their international study of automobile dependence in cities of the industrialized world.

The belief that it is time to recognize the need to incorporate social as well as economic development considerations in urban transportation planning exercises is similar to concerns expressed elsewhere by the author (*5*) that a new direction in urban transportation planning be taken in which nonmotorized modes have a significant role.

Sustainability and the Urban Transportation Sector

Before outlining the developmental approach to planning for nonmotorized transportation as an appropriate response to the concerns discussed earlier, it is appropriate to define what sustainable development is and what the ingredients of a sustainable transportation strategy are.

A recent low-cost travel mode study in China funded by IDRC (*6*) describes sustainable development as

> a key term in the vocabulary of many organizations and planners [where] . . . there is a general agreement sustainability reflects a concern for reducing resource and material consumption to ensure the ability of future generations to sustain themselves.

Replogle (*3*) claims:

> Sustainable transportation calls for a more holistic approach to policy and investment planning to achieve a diverse and balanced mix of transportation modes and sensible arrangement of land use that enables conservative use of energy and capital to fulfill mobility needs. Sustainable transportation strategies are those that can meet the basic mobility needs of all and be sustained into the foreseeable future without destruction of the planetary resource base.

The literature on the subject indicates that the ingredients of such a strategy display a concern, among other things, for the following:

1. The provision of modal diversity and integration of urban transportation systems;
2. Lower-cost transportation systems and the planning and management of the "lowerarchy" of urban transportation networks, especially for pedestrian and bicycle movement;
3. The movement needs of the urban poor and underprivileged;
4. The distributional impacts of urban transportation investments;
5. The proportion of foreign exchange consumption by the urban transportation sector, particularly in the case of Third World countries with limited reserves;
6. Employment opportunities associated with transportation (directly and indirectly) both in the formal and informal sectors;
7. The limited investment in research and development in nonmotorized travel and low-cost, energy-efficient transportation systems;
8. Land use configurations that encourage heterogeneous patterns at a small scale and mix of housing types at different cost levels; and
9. Efforts to minimize the need to travel and associated negative environmental impacts.

DEVELOPMENTAL APPROACH TO PLANNING FOR NONMOTORIZED URBAN TRAVEL

Approach

The developmental approach to planning for nonmotorized travel in urban areas is part of a broader developmental approach to urban transportation planning that has regard to the translation of principles of development planning into the urban transportation sector first advocated by Dimitriou and Safier (*7*) and subsequently expanded upon in two recent publications (*6,8*).

The components and principal characteristics of the approach are shown in Figure 1. The approach relies on matching settlement and community size considerations with developmental policy contexts and the use of appropriate urban transportation technology. What essentially differentiates the developmental approach to urban transportation planning from more traditional methodologies is that the former relies much more on using transportation planning as an agent of planned development rather than merely as a tool of transportation systems optimization.

To ensure that urban transportation planning is subservient to efforts designed to achieve wider development goals (and is therefore developmentally effective), the complexities of the development context need to be better reflected within the transportation planning process. Development goals as well as development costs and benefits not only must be clearly stated (and wherever possible quantified) but also must be capable of disaggregation for targeted socioeconomic groups (such as the urban poor and nonmotorized travelers) and particular geographical areas.

The implementation of a developmental approach to planning for nonmotorized travel looks to measures aimed at improving the productive potential of cities, achieving a better distribution of urban opportunities, and improving the social life and physical environment. This approach, which was applied to Indonesian cities of differing sizes in Java (*9*) (discussed further later in this paper), advocates a strategy that focuses on the importance of nonmotorized movement, efforts at achieving strategic self-sustaining economic growth, the use of urban transport in the service of basic needs, and the integration of urban development efforts.

Matching Transportation Technology to Settlement Hierarchies

To encourage urban transportation technologies that are developmentally effective and simultaneously operationally efficient for the environment in which they are to be used, it is essential to discriminate between these two levels (and types) of transportation performance criteria, highlighting the subservience of the latter to the former.

"Developmentally effective" transportation technologies contribute to and are consistent with indigenous (national and local) development objectives that facilitate sustainable economic growth in a manner sensitive to development (including ecological) constraints. "Operationally efficient" transportation technologies, on the other hand, optimize the use of transportation facility capacities and resources at minimum

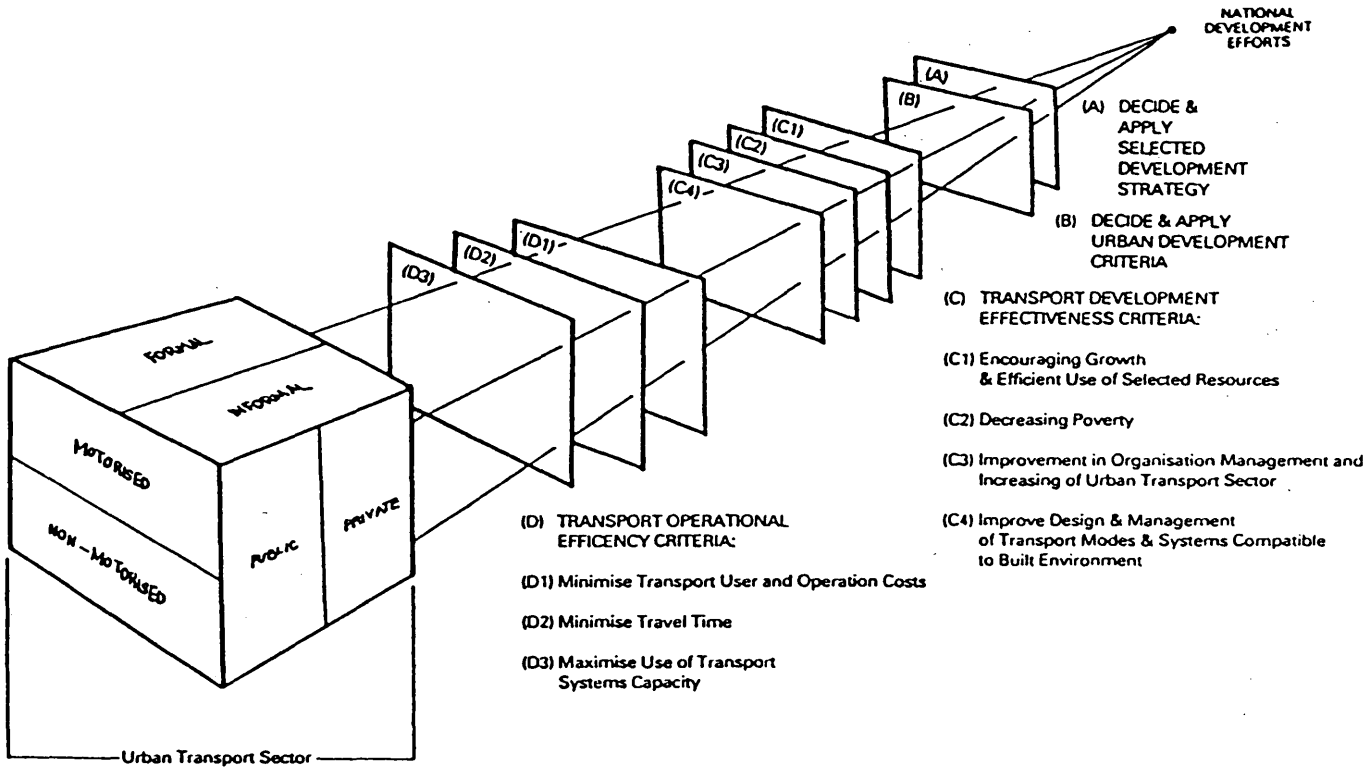


FIGURE 1 Developmental approach to planning urban transport (*5*).

cost to users and operators—this being typically measured in terms of capital, operational and user costs, systems revenues, and engineering efficiency.

Transportation Technology and Operations Efficiency

Bouladon (*10,11*) in research investigating the operational engineering efficiency of various transportation systems based on speed/distance and acceleration limitations, arrived at a "unified theory of transport" in which each transportation system is placed into its rightful role from the point of view of the engineering requirements it is to satisfy. He divided the transportation field into five areas (see Figure 2) and claimed that there should be an optimum means (in engineering terms) of transportation in each.

Bouladon's research indicated that in practice this is so in only three areas—those areas in which the pedestrian, the car, and air transportation dominate. He concluded that there are in fact two transport gaps—one between the pedestrian and motorcar users and the other between the conventional airplane and the space rocket. Between these areas, many other methods of transportation are currently in use but give less satisfaction in operational efficiency terms.

What is particularly significant about these conclusions is that had Bouladon's research been conducted in Asia, rather than in an industrialized world context, he would have identified a host of nonmotorized means of travel and would not so readily have concluded that there is a transport gap between the pedestrian and motorcar users. However, the type of infrastructure and transportation hardware investments presently being made in Asia suggests that a gap of the kind identified by Bouladon at the city scale is rapidly in the making and that the absence of a unified theory of transport integrating the use of various transportation modes will rapidly duplicate the type of unbalanced transportation systems that many Western cities have created.

Transportation Technology and Settlement Hierarchy

Sasaki (*12*) further developed Bouladon's theories regarding the operational efficiency of transportation systems by correlating transportation technology efficiency criteria with settlement and community size considerations.

Sasaki hypothesized that a given type and size of settlement requires a consonant type of transportation mode and that if the settlement's internal community organization follows a hierarchical pattern, it may have several types of transportation systems, each serving different functions and distances operating at maximum operations efficiency. He further argued that the absence of transportation technologies consonant with the needs of a settlement hierarchy is the fundamental cause of many urban transportation problems, and that since settlement growth and transportation developments are closely interrelated, urban transportation technologies must match the needs of the settlements they serve.

Viewing the role of nonmotorized travel in Asia (indeed in any context) from this perspective highlights how much more significant nonmotorized travel is for cities than conventional urban transportation planning practice has led us to believe. This is especially true at the local community level and in the context of providing linkages to urban public transportation services of all kinds.

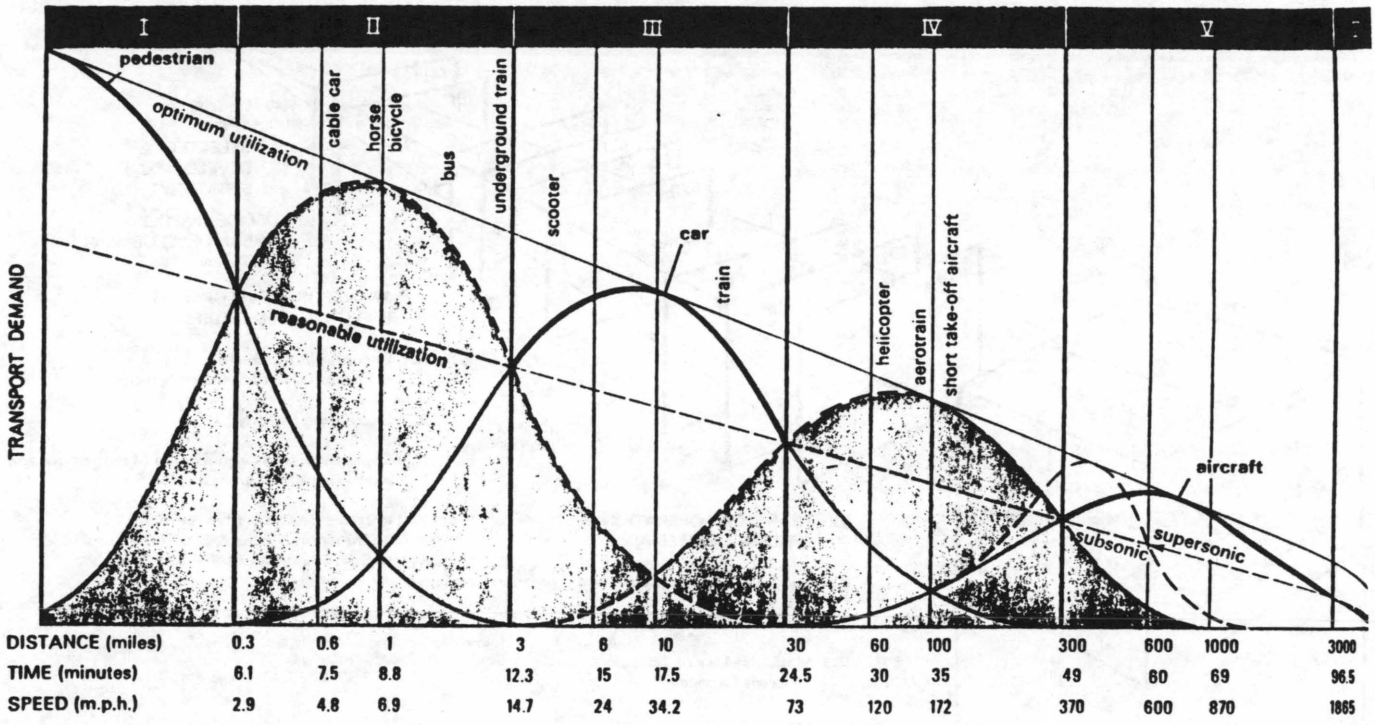


FIGURE 2 Transport gaps (*10*).

Sasaki elaborates on his propositions by claiming that one may positively relate the hierarchy of a settlement (with its constituent communities) to the hierarchy of trip distribution patterns for each type of community. From this, he deduces, different kinds of communities within the same settlement generate a demand for consonant means of transportation of which nonmotorized transportation is a critical component.

Importance of the Development Context

The conclusions presented by Bouladon and Sasaki are, as already pointed out, based on industrialized world experiences. For their conclusions to become more pertinent to Asian cities, there is a need to pay more attention to the development context of urban transportation technologies adopted, especially with regard to the following:

1. National development policies, priorities, and planning systems of the country or region in question;
2. The institutional and political contexts of the place; and
3. The resource constraints and riches of the location, especially vis-à-vis financial resources, per capita income levels, and skilled labor and management capabilities.

Different combinations of the above contextual considerations generate different development contexts within which urban transportation technologies operate and city growth takes place. For example, a specific transportation system may be considered the most appropriate in engineering and urban planning terms in accordance with Bouladon and Sasaki's technical criteria for a city of a particular size in Japan, but the unavailability of local technical expertise to manage, operate, and maintain this same system in Vietnam may make it developmentally unsuitable for this country until measures are taken to overcome these constraints.

INDONESIAN CASE STUDY

An UNDP/UNCHS study (*9*) that sought to apply a developmental approach to transportation planning to cities of varying sizes in Java and that greatly emphasized aspects of nonmotorized transportation [also see Soegijoko and Horthy (*13*)] found that speed/distance relationships went a long way toward explaining many of the observed travel patterns and transportation modes used in such settlements. The analysis conducted for this study revealed a hierarchy of typical trip distances (see Table 1). The hierarchy suggested that for settlements of less than 150,000 persons, trip lengths below 2.1 km fall within the range that can be considered appropriate for nonmotorized travel. Interestingly, problems of motorized

TABLE 1 Typical Community Size and Trip Length Characteristics (*9*)

Community Level or City Size	Median Population	Median Area (ha)	Typical Trip Length (km)
Rukun Tetanggas	250	2.5	0.08
Rukun Warga	1,500	15	0.19
Kelurahan	10,000	100	0.5
Kecamatan	70,000	700	1.3
Medium City	300,000	3,000	2.8
Large City	750,000	7,500	4.4

traffic in such settlements were found to be mainly derived from interurban and peripheral traffic flows rather than from traffic generated within the settlement.

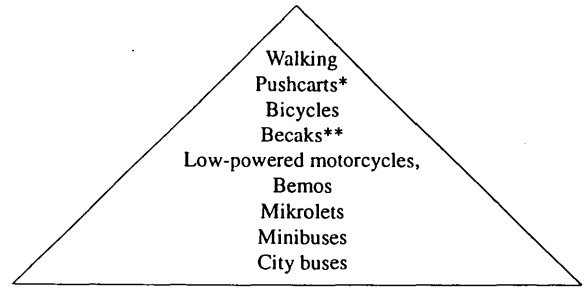
Urban Communities and the Road Hierarchy

Indonesian cities are administratively divided into large communities (kecamatans), which are in turn divided into smaller "urban village communities" (kelurahans and rikan wargas), and these are further broken down into neighborhoods (rukun tetanggas). This provided a good opportunity for testing the application of Sasaki's thesis and the relevance of Bouladon's premise regarding the use and misuse of transportation modes in urban areas. These "urban villages" are typically serviced by narrow, often unpaved walkways wide enough only for pedestrian and two-wheeled movement. Next up the road hierarchy are footpaths 1 to 2 m wide, which again are only able to accommodate pedestrians and two-wheeled vehicles. The next higher level is community roads 2.5 to 4 m wide, sufficient to allow one pedicab to pass another. Some roads are wide enough to accommodate four-wheeled motorized vehicles, but access to them is dangerous because of the competing pedestrian and other nonmotorized movement. These roads generally connect with local roads serving motorized travel, which in turn are linked to major and minor arterials.

Transportation Modes To Be Encouraged

An examination of the Javanese settlements revealed a rich choice of nonmotorized transportation modes on offer. It provided an opportunity to draw up a comprehensive hierarchy of preferred dominant transportation modes (see Figure 3) to be matched against Indonesian settlements and communities of different sizes, simultaneously indicating modes considered to be inappropriate at the local community level. Such vehicles included certain animal-drawn vehicles, high-powered motorcycles, motorized pedicabs, and motorcars.

The observed absence of continuous routes for nonmotorized travel at the local community level led the UNDP/UNCHS



* Gerobag or kakilima
** Substituted by bajajs where road gradients make bekaks inefficient

FIGURE 3 Proposed hierarchy of public transport modes in Indonesian cities (*9*).

study to recommend the introduction of "continuous transport networks" based on different "speed bands" (see Tables 2 and 3). The provision of such routes, it was argued, has the benefit of relieving the higher-class roads of modal conflict and much unnecessary traffic congestion as well as air pollution. The recommendations particularly emphasized the development of the "lowerarchy" of city transport networks, especially those servicing the needs of nonmotorized travel, including the following:

1. Urban village footpaths and community roads with no motorized or restricted access,
2. Local roads with a low volume of motorized traffic,
3. Sidewalks and nonmotorized lanes along roads with higher traffic volumes,
4. Pedestrian and nonmotorized crossings at roads with higher traffic volumes, and
5. Pedestrian bridges or underpasses at roads with the highest traffic volumes.

The underlying principal of the recommended system was the provision of greater segregation of fast-moving motorized modes from slow-moving modes (as well as pedestrian movement) at all levels of the road hierarchy. This, it was believed,

TABLE 2 Speed Bands for Urban Transport Modes in Indonesia (*9*)

Speed Band (Range 1-4)	Speed Range (km/hr)	Transport Mode
Speed Band 1	About 5	walking pushcarts
Speed Band 2	10-20	bicycle becak
Speed Band 3	25-40	bemo bajaj low power motorcycle
Speed Band 5	50-100	mikrolet minibus city bus motor car

TABLE 3 Matching Speed Bands with Urban Road Hierarchy in Indonesia (*9*)

Speed Band	Road Hierarchy/Infrastructure
Speed Band 1 uses only:	Sidewalks along any kind of road Pedestrian bridges, pedestrian crossings, and narrow footpaths (less than 1.5m wide) in densely populated residential areas
Speed Bands 1 & 2 share:	Community roads (2m to 4m wide), Low density bike lanes (where there is no footpath)
Speed Band 2 uses:	Bike lanes and bike lane crossings
All Speed Bands share:	Local roads with very low traffic volumes
Speed Bands 2,3 &4 share:	Local roads with footpaths
Speed Bands 3 & 4 share:	Indonesian Class III roads
Only Speed Band 1 uses:	Indonesian Class I and II roads

would favor both fast-moving traffic at the higher levels of the urban road hierarchy and slow-moving traffic at lower levels.

To successfully implement such recommendations, however, it was concluded that the priority for pedestrians and other nonmotorized means of travel at the lower levels of the urban transportation system needs to be incorporated into both infrastructure design and enforcement of traffic regulations. These measures, in turn, need to be accompanied by a vibrant and aggressive educational publicity campaign designed to reverse current trends of transportation mode and infrastructure misuse. The campaign should highlight the rightful place of nonmotorized transportation in enhancing sustainable urban growth within environmental constraints.

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