

## **Analysis of feeder systems for the public transport system in suburbs of Hanoi**

### **Kurzfassung der Diplomarbeit von Tobias Pohlmann**

Along with the economic growth of some developing countries comes a higher degree of motorisation, leading to an overcharged road infrastructure and congestions inside the cities, high accident rates, environmental problems, noise pollution and unfavourable health conditions. One out of several complementary measures to relieve this strained situation is the provision of a good public transport of high quality, which also assures equality between the poor and the rich since the former rely much more on public transport than the latter. The quality of public transport can be improved by a multitude of possible approaches, one of which is its accessibility which must be considered to be the first resistance for potential passengers to use public transport.

The focus of this thesis lies on the improvement of feeder systems for the special case of Hanoi, capital of the Southeast Asian developing country and socialist republic Vietnam, which currently faces the problems described above.

The first part of the thesis closely describes the city and its transport system with strong emphasis on public transport, but also deals with the mobility behaviour of the Hanoians, the applied process of transport planning, and a short prognosis of the future mobility behaviour and traffic volumes.

Hanoi has about 2.9 million inhabitants. Especially in the historical centre extremely high population densities can be found. The city's land use is rather mixed. Motorcyclists have the highest shares among all road users, leading to so-called bottlenecks within the infrastructure, and ruling out the formerly most important bicycles. Cars are still marginal. Public transport has a share of about 10 percent.

In the last four years, efforts have been made in order to improve the city's formerly desolate public transport system. Today, a dense network is provided by 41 bus routes operating at high frequencies. The only operator so far is the publicly owned Hanoi Transport and Service Corporation (TRANSERCO), officially regulated by the city's Transport and Management Operation Centre (TRAMOC). An extraordinary increase in passenger volumes has been achieved, but public transport is still mainly used by people with low-incomes. Special future projects aim among other things at the introduction of a tramway and of a Bus Rapid Transit System.

Even though the network is very dense in the city centre, accessibility of public transport can still be improved in the suburbs and especially in the rural areas surrounding Hanoi, where the main part of the thesis aims at.

In a first step, possible demands on feeder systems are shaped, and a system of objectives is made up based on these demands. Good quality, being the first objective, can be achieved by a feeder ensuring social fairness and equality of opportunity, high availability and flexibility, as well as convenience. The feeder's ecological compatibility is divided into ecological friendliness and support of health. To promote safety and security, the feeder should expose its passengers neither to high amounts of injuries and fatalities nor to crimes. Its economic efficiency is influenced by its cost-effectiveness, its degree of being demand- oriented and future-oriented, and by its potential to provide a high degree of utilisation. For every of the mentioned objectives several criteria can be deduced.

In a next step, the actual state of accessibility along a chosen radial bus route is examined. For this purpose, bus no. 7 has been chosen. It leads almost from the city centre to the Noi Bai International Airport, lying 25 km to the north of the city. The bus runs through urban area as well as through a rural region with a low population density, scattered settlements, agricultural areas and industrial zones. It is operated at a high frequency and is well used, leading to capacity overloads during rush hours.

A passenger survey undertaken for this thesis revealed that most of the passengers use this bus daily in order to satisfy their basic needs of mobility, such as going to work, school or university or returning home. In the urban part, most of the passengers reach bus no. 7 by transferring from other buses, whereas in the rural part, the majority comes by foot or by bicycle. The remaining passengers mainly come by motorcycle. Access by bicycle and motorcycle is possible due to four officially and unofficially operated B+R facilities at some bus stops along the course of bus no. 7, where two-wheelers can be left for a small fee. Leaving them unattended is unwise since the risk of theft is high.

Motorcycle taxis can also be used to access public transport along the whole route. This unregulated service is called paratransit and is operated by private persons. It is less expensive than ordinary taxis, but more expensive than the bus. The survey revealed that their usage as a feeder is low in the rural area served by bus no. 7.

Most users need less than 20 minutes to reach the bus stops. Almost 100 percent of the interviewees in the urban area stated to be content with the actual accessibility, and about three quarters in the rural part. Therefore, the thesis only concentrates on the latter.

In order to identify deficiencies of the existent feeder systems, they are assessed according to the criteria of the system of objectives. A weak point of all present feeders is their inexistence of disability-friendliness, but given the actual situation of Vietnam, efforts must concentrate on other deficiencies first. As for low income groups, modes with smaller catchment areas are more suitable than motorcycles or the motorcycle taxi. Furthermore, the catchment areas for walking and cycling do not cover the whole bus route. The infrastructure for all modes is partly insufficient in terms of comfort and safety. The high accident rates in Vietnam unfavourably affect all feeders, whereas security is not a problem so far. Another weak point of the motorcycle taxi business and the unofficially operated B+R facilities is their unregulated status that does not guarantee a stable offer in the future.

The last part of the thesis deals with the analysis of possible measures, one of which is a completely new feeder bus. The others aim at improving the existent feeder systems. All measures are assessed by a value benefit analysis. Therefore, the criteria from the made up system of objectives are weighted, and the current importance of the respective feeder system that mainly benefits from the assessed measure is taken into account according to its actual share of usage. Finally, a ranking of all proposed measures is obtained. After comparing the benefit values to the roughly estimated costs for each measure, proposals for their implementation are made. Besides the highly recommended feeder bus, the physical improvement and official operation of all B+R facilities along the bus route is comparably beneficial. A desirable but very expensive improvement of the footpath and bicycle path network to the bus stops requires further investigations. The pedestrian crossings in proximity of the bus stops need to be improved, but this can be postponed to the advantage of less expensive measures. A better coordination between urban planning and transport planning in order to establish a better settlement structure for public transport should be implemented. An additional B+R facility at the middle section of bus no. 7 is also recommended. However, new

bus stops surprisingly are less important at present. Measures improving the motorcycle taxi service are not essential due to the low importance of this mode in the examined region.

For all road users and thus also for passengers on their way to the bus, the enforcement and improvement of traffic laws and traffic safety awareness, appropriate lighting, as well as sidewalks and bicycle paths along all main roads are desirable, but these measures are rather general and very expensive.

For bus no. 7, higher frequencies during peak hours are recommended, and disability-friendliness should be integrated into a long-term policy.

It is likely that these measures will attract more passengers to public transport and facilitate its usage for already existent passengers. More favourable settlement structures for public transport, however, have to be planned systematically. Due to the limited scope of the thesis, further investigations are necessary. Some advice in this regard is given at the end of the thesis. All in all, the work gives a good first orientation on the examined issue.