

Urban Transport Strategy Review
The development of logistic services

The World Bank Group

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Summary

The World Bank has invited ARCADIS Bouw/Infra to perform the study 'The development of logistic services in third world cities'. The general objective of the study is to investigate the impact on urban freight transport arrangements on the health of the city economy, as well as the impact on the quality of life. Because of their excellent experience in urban development in the Netherlands, ARCADIS Bouw/Infra has subcontracted the Urban Planning and Housing Department of the Municipality of Rotterdam (DS+V).

The study starts with a comparison of the main characteristics of the cities of Nairobi and Dhaka with Rotterdam. The study continues with an analysis to verify the applicability of western logistic concepts in third world cities. The logistic concepts have been split in three categories: process related logistic concepts, urban distribution concepts and flanking measures.

Comparison of Rotterdam with Dhaka/Nairobi

The historical development of the city of Rotterdam showed some important similarities with the development of Nairobi and Dhaka today. This knowledge can be used to develop new urban plans/zoning plans/infrastructure plans, in which this knowledge is incorporated. The insight in the probable developments, translated into conceptual zoning and infrastructure plans, could help to speed up the development of the cities and could help to prevent projects with a low return on investment. Such zoning/planning strategies seem to have a high priority for third world cities.

Applicability of western logistical concepts

A distinction should be made between facilities and logistic concepts. Facilities are physical entities, such as production plants and warehouses. A logistic concept can be regarded as the strategy to control the goods flows in and between plants and distribution networks. These logistic concepts aim to optimise the total costs and the quality of products. A logistic concept can be regarded as an operational strategy.

The validity of a process/company related logistic concept depends on the local situation. In western countries, labour is very expensive and logistic concepts basically aim to improve the labour efficiency. The labour in developing countries is very cheap and labour efficiency is not a big issue. As a result, logistic concepts in developing countries aim to minimise costs by preventing investments in equipment, buildings and other means. This strategy seems very inefficient in western eyes, but is optimal from logistical point of view.

It is not recommended to foster western process related logistic concepts in developing countries. The improved labour efficiency could result in additional unemployment and the actual production costs could increase as a result of the required investments. These consequences are not desired. Labour intensive working methods can be regarded as the cheapest and most effective working methods for developing countries.

Western urban distribution concepts and flanking measures have been developed as a means to fight the poor accessibility of western cities. This situation resembles the situation in the congested third world cities. As a result, some of these concepts and measures could be considered as an alternative to relieve the problem areas in third world cities. However, the feasibility of each concept is related to the local circumstances and it is impossible to give a general effective advice. The case studies in this report showed some possibilities for the 'city distribution concept' in Dhaka.

The health of the city economy

Feasible western logistics concepts are related to urban distribution concepts and flanking measures. These concepts aim to reduce the traffic congestion at problem areas. The concepts often require additional handling of goods, without adding any value to the products. As a result, such concepts will not result in a real additional spin-off to the city-economy. On the other hand, a congested area is not attractive for new activities and as a result, a solution to the traffic problems will improve the economic climate.

The analyses in this report showed that third world cities have a very internal oriented economy. Export flows are very low. As a result, people earn their money from each other and there are no real incoming cash flows to finance further developments of the city. Export can be considered as an important way to attract new cash flows and to improve the economic situation. First condition for export activities is a good outgoing and incoming link with the rest of the world. Specialised logistic services and warehouses can provide this link between the city and the national and international markets and are required to secure integration into global production and distribution chains. These logistic services are available in third world countries. However, the demand is very low and this has not resulted in a big development of these facilities.

The import/export related logistic services and warehouses should not be confused with the present traditional warehouses and distribution activities. The traditional facilities are related to the present goods flows (mainly food and building materials), which are related to relative short distance transport. From this point of view, the export/import oriented warehouses and logistical services have to be regarded as additional facilities.

The Distriparks with export/import oriented warehouses and services will be facilitating to export/import related companies. Large (western) export/import related companies are likely to establish at the edge of the city. This way, these

goods flows will not influence urban transport. Small traditional export related companies within the city (garment industry) could also make use of the logistic services. However, it is likely that companies will continue to use the existing distribution networks. These networks require smaller transport distances, which can be managed by non-motorised means of transportation. On long term, the development of Distriparks could result in a movement of the traditional industries to the peripheral zones.

Although the logistic services will not affect the goods related urban good flows on short term, it can surely contribute to the city economy. Nevertheless, the export market cannot be fostered by the provision of logistic services alone. It will also require the development of new export-oriented activities and the construction/improvement of road/rail/water infrastructure. The present activities within the city cannot justify the realisation of new logistic services and warehouses.

The recommendation to develop the logistic services seems to be in conflict with the recommendation not to foster western logistic concepts, but it is not. The warehouses and services must be regarded as facilities and the logistic concepts are only related to the control of the goods flows in and between these facilities. This implies that the facilities can operate with, in western eyes, less efficient and labour intensive working and distribution methods.

The impact on the quality of life

Reducing congestion and improving the safety in the city can improve the quality of life within the city.

The goods-related traffic in western and third world cities has a relative small contribution to the congestion in the city. For that reason, western policies aim to reduce the commuter traffic to cope with these problems. Basically, the same policy could be applied in third world cities.

Third world cities are often old cities, which are provided with specific areas with old and very narrow infrastructure. This infrastructure is hardly accessible for heavy vehicles. For these areas, truck bans or different distribution concepts can help to solve the problems within these problem areas, improving safety and reducing traffic congestion, thus improving the quality of life.

Dutch policies aim to reduce goods-related motorised traffic by greater efficiency of road transport, kilometre-reductive vehicle technology and multi-modal transport. These policies include financial grants for companies to investigate alternatives. Programmes only seem successful when commercial advantages can be found. As indicated in this report, such techniques and concepts would improve labour efficiency and would result in additional unemployment. These side effects are undesired for developing countries.

Urban development

Urban transport is influenced by the layout of the city. Cities in developing countries are mega cities with strong integration of activities. The urban goods and person flows are dependent on the organisation of the city.

Western strategies are often based on the creation of independent districts with their own segregated residential, commercial and industrial zones. These districts have a limited size, what results in a better manageable structure. As people live and work in the same area, the travel distances (persons and goods related) decrease considerably.

Urban planning seems to be a very useful means to improve the goods and persons related urban transport.

Conclusions and recommendations

- It is not recommended to foster new (process related) logistic concepts on the short term. These concepts do not fit in the economical climate.
- It is recommended that each city will develop a city/zoning plan based on the probable developments as described in this report. New projects should fit in this strategy to make sure that investments have a long-term effect. Zoning plans should be made by the local authorities, however, the World Bank could assist by educational programmes in this field.
- Improvement of the economic situation is very important. Distribution parks could provide an efficient and cheap link to the foreign countries. Fostering distribution parks would provide the required facilities to promote export flows. It is recommended to foster distriparks under the condition that simultaneous programmes will start to actually develop new export oriented activities.
- New export-oriented activities can be initiated by attracting western companies or to stimulate new local activities. It is recommended to foster both possibilities. Western companies can provide new employability in a relative short period. Profits will flow abroad, resulting in a limited contribution to further development of the city. The local activities will not result in a big contribution to the employability, but the profits will be used for further development of the city. This will have a long-term structural effect.
- The use of the available infrastructure is not always as efficient as in western countries. Traffic management by the introduction of new traffic lights or traffic policemen could improve the use of the infrastructure, reducing congestion.

1 General

1.1 Introduction

Over the last decade, the World Bank has significantly increased its intervention in the urban transport sub-sector. As a consequence, the Transport Sector Board of the Bank has decided that the development of a new urban transport strategy, consistent with the World Bank's general transport policy framework and its new urban development strategy, should be a priority activity for this year. This activity, called the 'Urban Transport Strategy Review', is the first comprehensive and detailed examination of this subject since the previous urban strategy was published in 1986. The objective is to obtain insight in relevant worldwide experience and use this experience to formulate operational guidance to the World Bank's urban transport activities for the next 10 years. Within this framework, the Netherlands Trust Fund has funded a number of studies. These studies should review the urban transport strategies in developing countries and in the Netherlands.

ARCADIS Bouw/Infra was invited to perform the study 'The development of logistic services, including planning and implementation of urban transshipment centres'. Because of their excellent experience in urban development in the Netherlands, ARCADIS Bouw/Infra has subcontracted the Urban Planning and Housing Department of the Municipality of Rotterdam (DS+V).

1.2 Objective of the study

The general objective of the study is to investigate the impact of urban freight transport arrangements on the health of the city economy, as well as the impact on the quality of life.

The study should contain an inventory of Dutch experience in urban transport planning and administration in large and medium size towns and an analysis to see whether Dutch concepts are applicable to other third-world cities.

1.3 Structure of this report

This report contains 6 additional sections:

- Section 2 Project Approach.
- Section 3 Inventory of the actual situation in Rotterdam, Dhaka and Nairobi.
- Section 4 Inventory of Dutch logistic concepts
- Section 5 The applicability of the Dutch concepts to the cities of Dhaka and Nairobi.
- Section 6 The conclusions and recommendations.
- Annex 1 Evaluation of the questions of the World Bank

2 Project approach

2.1 Project phases

The objective of this study is to analyse whether Dutch urban transport concepts can be applied to third world cities. Before such an analysis can be performed, it is required to have an insight in the actual situation in third world cities and make an inventory of Dutch urban transport concepts.

The cities of Dhaka (Bangladesh, South East Asia) and Nairobi (Kenya, Africa) have been used to make an inventory of the actual situation in developing countries. These cities have been selected considering the following aspects:

- Local ARCADIS offices are available in Nairobi and Dhaka;
- Due to the difference in culture between Africa and Bangladesh, we expect that these cities will require a different approach. This will indicate the sensitivity of possible solutions.

The study is divided in three phases:

- Phase 1: inventory
- Phase 2: analysis
- Phase 3: review

These phases will be described in the next paragraphs.

2.2 Inventory

This phase involves an inventory of the actual situation in the cities of Rotterdam (as a reference situation), Nairobi and Dhaka, as well as an inventory of Dutch urban transport concepts.

Inventory of the actual situation in Dhaka, Nairobi and Rotterdam

The amount of traffic within a city mainly depends on the configuration of the city and the vitality of the city. The city configuration is determined by:

- The lay-out of the infrastructure for the several transport modes (road, rail, water, (air));
- The location of transport nodes, such as:
 - Goods transfer points (rail transfer points, ports, distribution buildings);
 - Warehouses, production plants and so on;
 - Points of destination (shops, goods transfer points and so on)
- Transport characteristics (transport frequencies, time of these transports, means of transportation and so on)

To determine the city configuration, our local staff has been assigned to collect topographical, logistic and commercial data. Additional information is collected from Internet, desk studies and other sources. The information has been translated in graphs or 'city models', which illustrate the simplified city structure. Several graphs have been prepared to indicate the several modes of infrastructure (road, rail, water) and the location of the several transport nodes.

The experience of our local staff has been an important input to understand the goods-related situation in the investigated cities. To secure that their input has been processed in the right way, the city models and the report have been returned to our local staff for verification and approval.

Inventory of Dutch urban transport concepts

The second part of the inventory involves an inventory of Dutch urban transport concepts. These concepts have been collected in brainstorm sessions with several experts in the field of logistics and urban development.

2.3 Analyses

The objective of the analyses is to project Dutch/Western concepts to third world cities and to determine the feasibility, the impact on the health of the city economy and the impact on the quality of life. Further to this, the analyses include market-related questions, economic questions, industrial questions, social questions and technological questions as summarised in the Terms of Reference (see Annex 1).

As indicated in paragraph 2.2, the goods-related traffic flows within the city are basically determined by the city configuration. The effects of new logistic concepts and urban strategies to the goods-related traffic flows are qualitatively determined by logistic analyses. Although the effects cannot be quantified, the typical city models helped us to interpret the qualitative consequences. For specific questions related to the local circumstances, our local staff has been assigned to investigate the situation.

The study focuses to the logistic aspects of goods-related urban transport. Nevertheless, the feasibility of a new concept is not only determined by the logistical characteristics of this solution. Social aspects, human aspects, political aspects and local circumstances are at least even important. To stay focused to the questions in the Terms of Reference, we have indicated possible sensitivities towards other relevant aspects.

The analyses will pass through four steps:

- Confrontation of the Rotterdam city model with the models for the typical cities in Africa and South East Asia in brainstorm sessions.
- Confrontation of Western/Dutch logistic concepts and urban development strategies to the typical city models of third world cities in brainstorm sessions.
- Elaboration of the results by the core team;

- Final analyses;

The combined experience of all team members guarantees a good judgement on comparing the situation in the western hemisphere with the, on some aspects, fundamental different situation in third world countries.

2.4 Review

To prevent misinterpretations by the Dutch staff, it is of utmost importance that the conclusions, remarks and recommendations are verified by the local staff. For that reason, the results of the analyses and inventory have been verified and adjusted by our local staff.

3 Inventory of the actual situation

To determine the present situation in Rotterdam, Dhaka and Nairobi, we have consulted our local offices to provide maps and information concerning the (infra) structure of the city. This information has been translated to 'typical' city models, which can be regarded as a simplified reflection of the city structure. The maps will be used as an aid to analyse the effects of alternative urban transport concepts.

In addition to the local investigation, a desk study has been performed. For this desk study, the following documents have been used:

- Working Paper No. 25 'Commercial Goods Movement', Government of Bangladesh, Planning Commission, United Nations Development Program.
- Information from internet (www.worldbank.org; www-wds.worldbank.org; www.minbuza.nl; www.odci.gov/cia/publications/factbook and others)

This study will focus on the company-related good flows. The last step of the logistic chain, the goods flow to the consumer, is only considered if the transport is executed by a company.

3.1 Rotterdam

Rotterdam consists basically of a port area and a residential/working area and hence, a lot of good handling occurs between the port and the hinterland and within the city itself. Figure 3.1 illustrates the basic layout of the city and the surrounding region. The analyses will mainly focus on the working/residential areas.

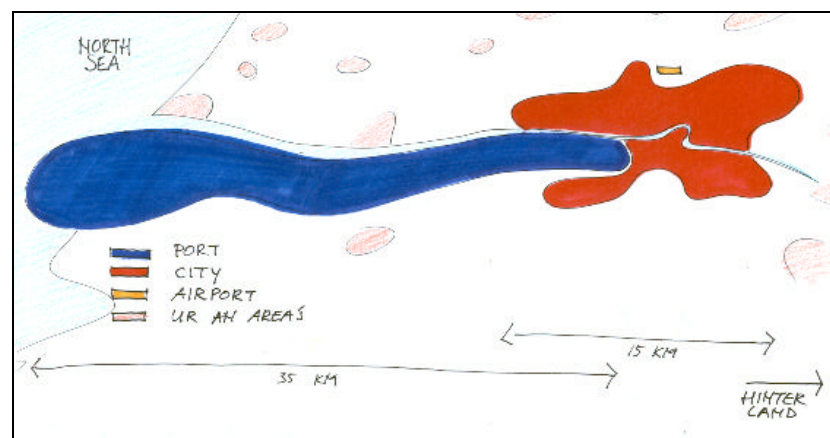


Figure 3.1: Basic lay-out of Rotterdam

For a reference, Rotterdam has a total population of approximately 500.000 inhabitants. This makes Rotterdam a relative small city in relation to the cities of Dhaka and Nairobi. If the region of Rotterdam is included, the total number of residents increases to 2.000.000.

Infrastructure - roads

As illustrated in figure 3.2, the road infrastructure can be divided in three categories.

- Highways around the city (motorised traffic only, minimum speed 80 km/h)
- Main infrastructure connecting the highway with the several city districts
- Secondary infrastructure connecting the main infrastructure to the individual streets

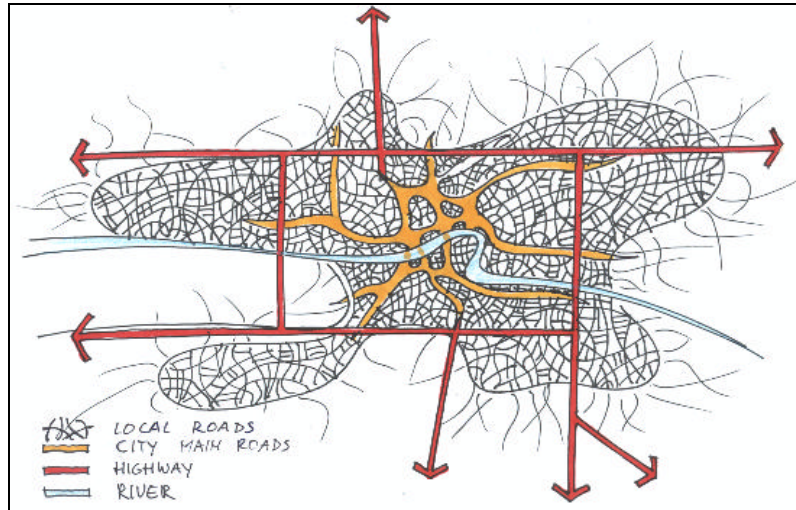


Figure 3.2: Road infrastructure

The highway around the city is free of crossings and is provided to pass the city without entering it. This highway can process very high intensities. The main infrastructure in the city is star-formed and gives access to the several city districts. The last group of infrastructure gives access to the individual streets.

Infrastructure - rail

The rail infrastructure of Rotterdam is illustrated in figure 3.3.

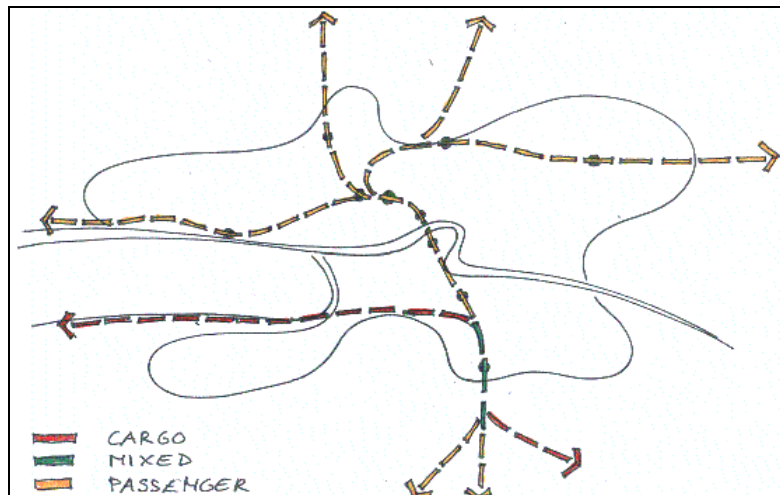


Figure 3.3: Rail infrastructure

Figure 3.3. illustrates that goods are only transferred from/to rail in the port area. The port is facilitated with multi-modal handling facilities. Rail stations and rail facilities within the city are only persons-related, so no significant operational goods transfer points exist within the city.

Infrastructure - water

As mentioned, the city of Rotterdam is a real port-city. A river, giving direct access to the sea and a very wide hinterland, crosses Rotterdam.

Although small ports are available in the city itself, the major port facilities are located at dedicated areas outside the urban areas.

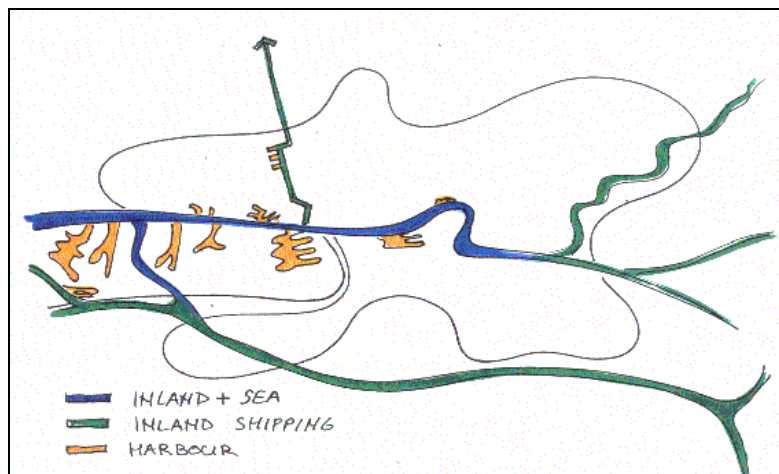


Figure 3.4: Infrastructure- waterways

Goods generating areas

There are several types of goods-generating activities. The following activities can be regarded as goods-generating activities:

- Rail, sea and barge to road transfer points
- Warehouses and distribution activities
- Production plants, engineering works, and so on
- Furniture centres, etc.

Figure 3.5 illustrates the goods transfer points in Rotterdam. Most rail/sea and barge to road transport is realised in the port area. Heavy industries, such as oil refineries, chemical plants and so on are concentrated in the port area as well. The cleaner industry, such as engineering works, maintenance works and other 'clean' activities are mainly concentrated in dedicated industrial zones in the peripheral zones of the city. These areas are linked with the highway around the city, which provides an excellent access to these industrial areas. Large furniture shops are often located in the industrial zones as well. Most industrial activities in Rotterdam are related to a wide market, and hence, just a little percentage of the goods processed in these areas has the destination Rotterdam. Most goods will be transported to other destinations.

The centre of the city can be regarded as a concentration of business and commercial activities (shops). The areas between the centre and the highway are mainly residential mixed with some commercial activities (shops).

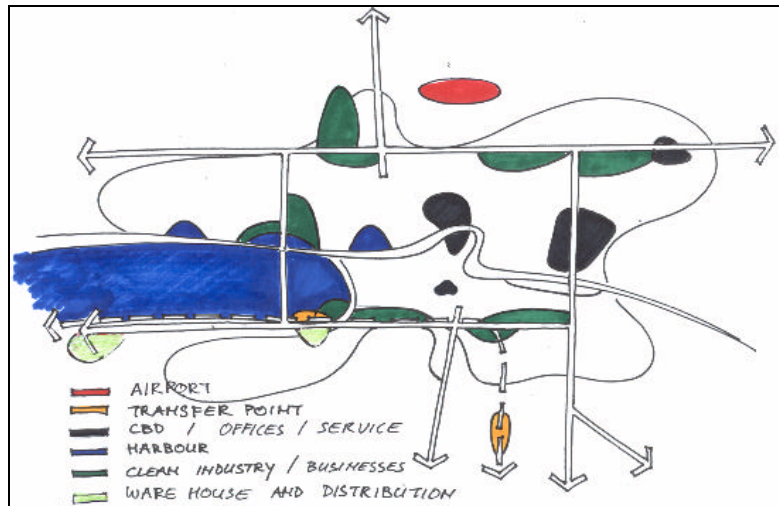


Figure 3.5 goods transfer points

Goods related activities take also place in the city itself. However, these activities are of a minor scale. Examples of such in-town goods generating activities:

- Office related works, such as reproduction facilities and catering
- Non office related activities, more traditional activities
- Shops

Most companies in Holland are large and medium size professional companies with a very high labour and transport efficiency. These companies are mostly located at the edges of the city or in the port area. More traditional activities, in the form of small and specialised companies, also exist, but these activities do not contribute much to the total employment. The last group of companies are spread over the city.

Goods-receiving areas

All good-generating activities are also goods receiving activities. For example, plants need raw materials and barge/sea/rail to road transfer points will also transfer from road to barge/sea/rail. In addition to this, the good receiving activities include:

- Shops
- Office buildings (supply)
- Construction works (raw materials)
- Gas stations
- Individual houses (furniture, water)

The last group is located all around the city. The higher the density, the higher the goods flows to that area will be.

Transport characteristics

Goods flows in the city of Rotterdam are basically facilitating to the city. The origin/destination of major good flows (between factories and warehouses) are mainly located outside the city and do not influence the urban transport.

The goods-related transport modalities within Rotterdam are mainly trucks and vans. This is possible due to the consolidation of goods. For instance, supermarkets are often related to a large chain or franchise organisation. The individual shops are supplied through a central warehouse that is able to ship the complete assortment in one single load.

Vans are used for smaller deliveries, such as dedicated deliveries to small individual shops, supplies for office buildings, mail services and so on. Further to this, mopeds are used for fast and small deliveries, such as mail and pizza's. Mopeds are very fast through the city traffic, but mopeds do not dominate the street scene. Non-motorised, goods related, transport equipment is not common.

Although truck transport is very important, van transport is increasing as a consequence of Internet. Due to e-commerce activities, more and more individual products are being transported to individual consumers. Vans seem to be the modality for such transport activities. This concept is in contradiction with the original concept of the retail chain, where goods are transported in a consolidated manner. The unconsolidated transport in vans will result in additional goods-related movements. On the other hand, the person-related movements of shoppers will decrease. However, it is expected that increasing e-commerce activities will result in additional transport movements.

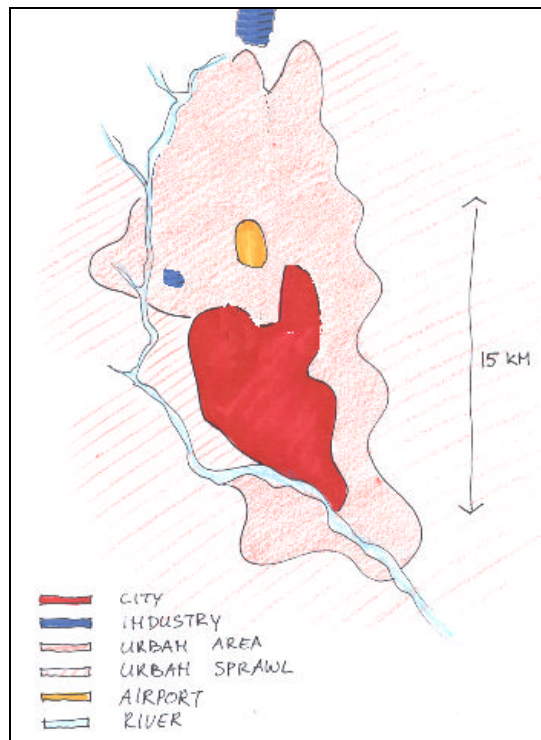


Figure 3.6: Basic lay-out of Dhaka

3.2 Dhaka

Dhaka is basically a residential/working city and hence, a lot of activities and goods flows occur within the city. Figure 3.6 illustrates the basic layout of the city.

Dhaka has a total population of approximately 13.000.000 inhabitant. This makes Dhaka a very large city in relation to Rotterdam.

Infrastructure - roads

The roads in Dhaka consist of main roads through the city and secondary roads, giving access to individual streets.

Traffic passing the city is forced to cross the city. Two major through-going routes can be distinguished, a route north south and a route east west. Both routes can be regarded as 'goods-corridors' through the city.

Most crossings are equal crossings, what delays the through-going traffic considerably. Missing traffic lights in combination with rectangular street structures result in frequent gridlocks.



Figure 3.7: Road infrastructure

Figure 3.8: Rail infrastructure

Dhaka did plan a ring road at the east side of Dhaka city to relieve the centre of the city. The ring road will be realised when funds will be available.

Infrastructure - rail

A railway, used for passenger transport as well as cargo, crosses Dhaka. There are several rail cargo stations within the city, one of them specialised for containers. Railroads are located at the same level as the roads, what results in frequent congestion and accidents.

Infrastructure - water

Dhaka is provided with rivers and several port facilities. Disadvantage is the fact that the rivers silt up and dredging is required to give access to barges. The transport by water is relatively important for the local transport of building materials, grains and food. A container terminal is being planned, but requires extensive dredging. The terminal is not realised so far.

The waterways are mainly used by relatively small vessels, which are used for in-town and regional transport. These vessels can be compared with the rickshaws in the street. The Buriganga through Dhaka is not really considered as a means of transportation for consolidated industrial goods.

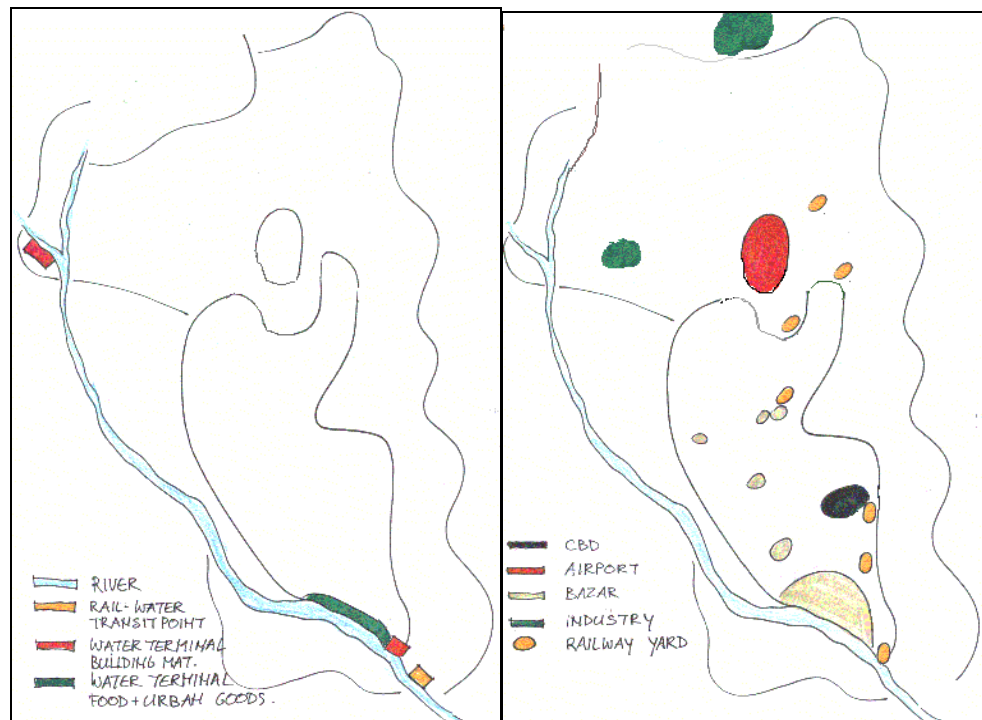


Figure 3.9: Infrastructure- waterways Figure 3.10 goods transfer points

Goods generating areas

Within Dhaka two major types of industrial activities can be distinguished. The first type is mainly clustered in the industrial zone in the north of Dhaka. This zone is provided with a mixture of chemical industry, clothing industry and other (often western oriented) industries, which are attracted by the relatively low labour costs in Dhaka. The goods produced in this area are mainly for export and just a minority will be used for the internal market of Dhaka. A relatively small part of the professional industrial companies are located at other locations in the city (in the north and south-east).

The second type of industrial activities is the traditional (small scaled) activities, such as retail, merchandising, warehousing, repair shops, machine engineering and so on. These traditional companies have a very limited market area. As a result, the traditional companies are spread over the city with concentrations near the traditional and modern market areas (bazaars).

Some of the traditional companies have export/import related activities. These companies are spread over the city. The connection between the individual companies and the rest of the world is realised by shipping agents and forwarders, which are located at strategic locations within the city, for example nearby railroad stations. These shipping agencies/forwarders have the facilities to consolidate shipments.

In contrast with the situation in western countries, most people earn their living with the traditional activities. The professional activities have a minor contribution to the total employment in the city.

The city centre can be regarded as a concentration of modern business and commercial activities (shops). Within the city several market places exist, some traditional, some modern. The remaining areas are residential, to be divided over modern residential areas and slum areas.

Goods-receiving areas

All good-generating activities are also goods receiving activities. In addition to this, the good receiving activities include:

- Shops
- Office buildings (supply)
- Construction works (raw materials)
- Gas stations
- Individual houses (furniture, water)

The last group is located all around the city. The higher the density, the higher the goods flows to that area will be.

Transport characteristics

Dhaka is mainly a destination for goods and building materials and hence the majority of goods will go into the city and will be used for the internal market. Due to the location of the traditional and professional companies, all goods flows will contribute to urban transport.

Due to the fast expansion of the city of Dhaka, the transport of building materials takes approximately 40% of all tonnage and 25% of all truck transport. The transport of food and grain is the second important flow and takes approximately 20% and 10% of the total tonnage. The market for food products has a regional/national function and as a consequence there are major incoming and outgoing food related transport flows. [Source: Government of Bangladesh - Greater Dhaka Metropolitan Area – Integrated Transport Study - Working Paper 25: Commercial goods movement].

Dhaka makes use of water, rail and road transport. Transportation by water is very important for local transport, especially for heavy building materials and foodstuff to the traditional markets. From other directions, truck transport is the main modality. Rail transport is getting less important, due to a limited integration with truck transport and the higher handling times. However, container transport by rail is still increasing.

The trucks are almost all 5/6/7 tons trucks and smaller. In relation to the trucks in Rotterdam, these trucks are relatively small. The trucks are mainly used for long distance, for instance between the seaport (Chittagong) and the city of Dhaka. Trucks are mainly parked within the city at dedicated trucks stands or just within the streets. As the capacity of the truck stands is limited, most trucks are parked along the street, hindering through-going traffic. The occupancy of trucks is rather low; the average occupation of a truck is 3 or 4 hours per day. During rush hour, Dhaka has introduced a truck ban. Trucks are not allowed to drive during these hours.

For short distances, pick-up trucks and other motorised and non-motorised vehicles, such as rickshaws, rickshaw vans and pushcarts, are an important means of transportation. Especially the non-motorised vehicles cause a considerable friction of the traffic by their slow speed. Due to their limited load, a large number of these vehicles are required to transport an equivalent of one truckload. The non-motorised vehicles are the main modality for intra-city goods movement, especially near the old city. The necessity of (non-) motorised vehicles is also caused by the infrastructure; some roads are just not suited for large vehicles.

The differences that occur in Dhaka are illustrated in figure 3.11



Figure 3.11: The many faces of Dhaka

3.3 Nairobi

Nairobi is basically a residential/working city and hence, a lot of activities and goods flows occur in the city. Figure 3.13 illustrates the basic layout of the city.

Nairobi has a total population of more than 1.500.000 inhabitants. This makes Nairobi a large city in relation to Rotterdam.

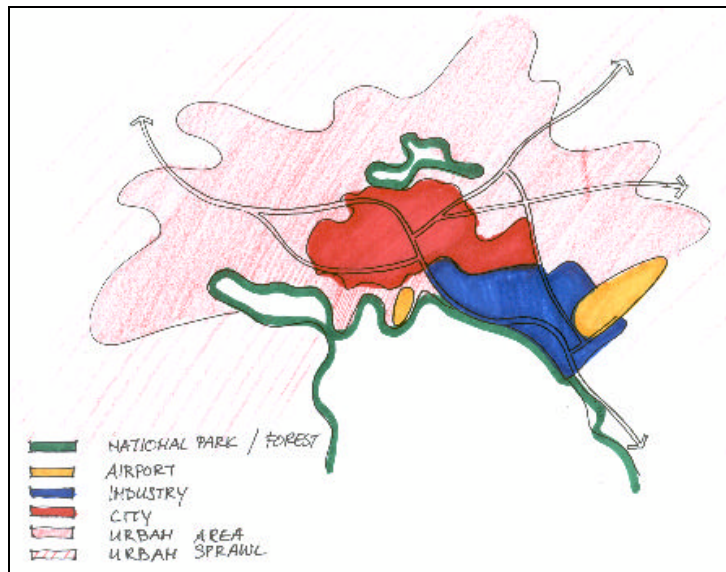


Figure 3.12: Basic lay-out of Nairobi

Infrastructure - roads

The infrastructure of Nairobi includes three types of infrastructure, see figure 3.14:

- Main roads from the surroundings to the centre of the city;
- Secondary roads, which connect the main roads with the several districts and individual streets
- Dedicated motorways

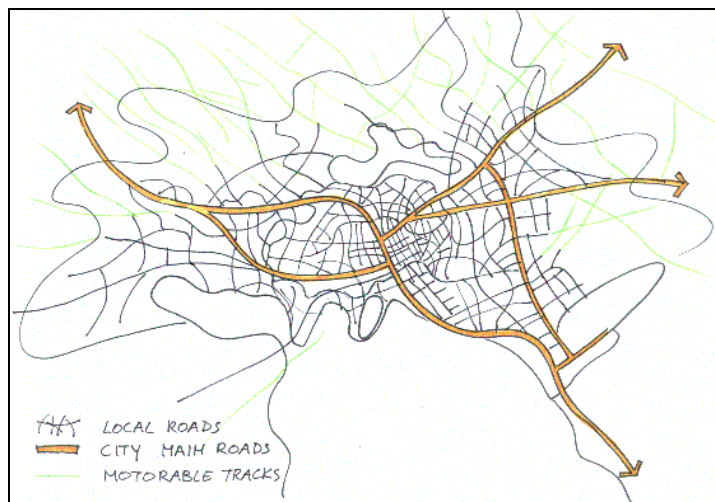


Figure 3.13: Road infrastructure

Most crossings (road-rail, road-road) in the city are equal crossings. The crossings result in a limited road capacity. However, some of the major roads are provided with flyovers, traffic lights and bridges. This gives Nairobi a more modern infrastructure than Dhaka. The secondary roads give access to individual streets.

Additional roads (motorways) are provided for motorbikes and mopeds. This infrastructure is additional and is not located next to other roads.

The road structure shows an initial development of a ring road within the city. These roads offer the possibility to drive around congested areas. Nevertheless, traffic with another destination than the city is still forced to drive through the city. The city still functions as a 'goods and persons corridor', what results in a high occupancy of the internal infrastructure.

Infrastructure - rail

A railway, used for passenger transport as well as cargo, crosses Nairobi. The industrial zone in Nairobi is provided with a maze of railways, giving good rail access to individual companies.

Cargo is only handled at the industrial zone. Other goods-related rail transfer points are not provided within the city.

Infrastructure - water

Nairobi is provided with several rivers. These rivers are not suited for barges due to falls and currents. Transport per inland waterway is not a mode of transport for Nairobi.

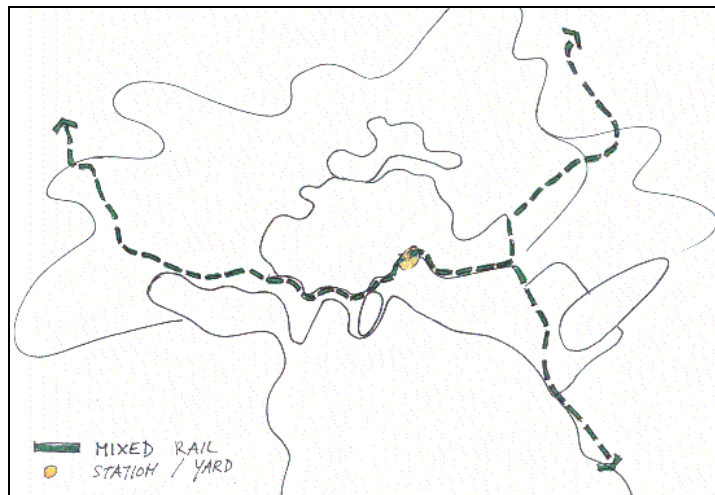


Figure 3.14: Rail infrastructure

Goods generating areas

The goods generating points can be divided in two main categories. The first group involves the large professional industries, warehouses and other activities. This group is mainly located in the peripheral zones of the city in dedicated industrial areas. These industrial areas are accessible by road and rail. Due to the fact that no road is provided around the city, a lot of transport is forced through the city to reach these areas. The industry that is available is in a high extent facilitating to the city. Hence a lot of goods-flows occur between the industrial zone and the city. Export

and long distance transport of products from the industrial zone to the surroundings are less existing.

The second group of activities are the small-scaled activities in the form of traditional (small scaled) activities. These kinds of companies are located all around the city, with a higher density near the markets and business centres in the city. In relation to Dhaka, the traditional activities in Nairobi have also a big contribution to the total employment, but it seems that the professional activities in Nairobi have also a fair contribution to the total employment.

The main city centre can be regarded as a concentration of modern businesses and commercial activities (shops, hotels, offices). Within the city several sub-centres and market places exist, some traditional, some modern. The remaining areas are residential, divided over modern residential areas and slum areas.

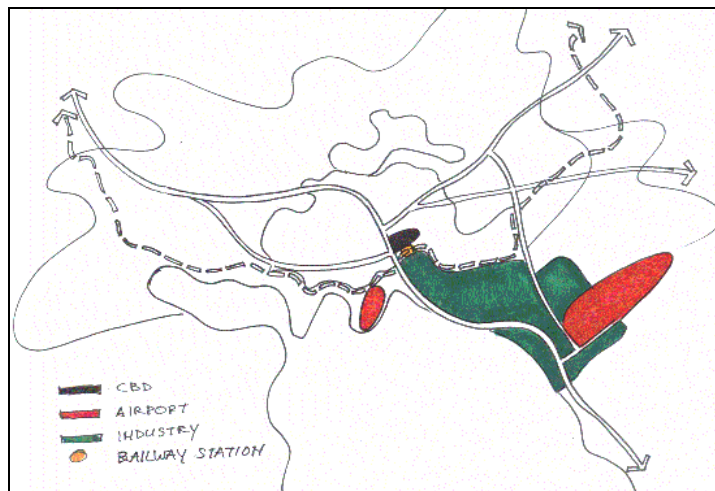


Figure 3.15 Goods transfer points

The traditional companies are characterised by frequent transport of small quantities in relative small transport equipment. Due to the fact that these companies exist in very large quantities, these companies result in a high occupation of the existing infrastructure. The traditional activities in the city are mainly commercial. Other small-scaled activities such as garages and machine engineering works are more located in the peripheral zones of the city.

Some of the traditional companies are export oriented. These companies are often located in the industrial zone. The transport between Nairobi and the rest of the world is realised by forwarders and shippers, which are mainly located in the industrial zone. These shipping agencies/forwarders are able to consolidate shipments.

Goods-receiving areas

All good-generating activities are also goods receiving activities. For example, plants need raw materials and barge/sea/rail to road transfer points will also transfer from road to barge/sea/rail. In addition to this, the good receiving points include:

- Shops
- Office buildings (supply)
- Construction works (raw materials)
- Gas stations
- Individual houses (furniture, water)

The goods receiving areas are spread over the city. The higher the density, the higher the goods flows will be.

Transport characteristics

Due to the fast expansion of the city of Nairobi, the transport of building materials is one of the major transport flows. In addition to this, transport of food, consumer goods and the supply of the industrial zone are the major goods flows within Nairobi. Although Nairobi shows the first developments of ring roads and dedicated industrial zones, most major goods flows are still related to the city, resulting in a high contribution to urban transport.

The available trucks are a mixture of old and modern trucks. This mixture includes also the modern trailer combinations as used in Europe. If non-motorised vehicles are used, it is normally a pull cart or a horse or mule driven cart. The pull carts are mainly used in the near surroundings of the markets. Horse and mule driven carts are vanishing from the street scene.

The differences that occur in Nairobi are illustrated in figure 3.16.



Figure 3.16: The many faces of Nairobi

4 Inventory of Dutch urban transport concepts

Dutch urban transport concepts have been collected during brainstorm sessions with several logistic and urban development experts. During this session, it appeared that urban transport strategies include more than just logistic concepts. The urban transport strategies are very strong related to urban development.

A distinction should be made between facilities and logistic concepts. Facilities are physical entities, such as production plants and warehouses. The logistic concept can be regarded as the strategy to control the goods flows in and between plants and distribution networks. With logistic concepts, companies aim to minimise the costs and maximise the reliability and quality of their activities/products. Logistic concepts are mainly related to the operational processes of companies.

Due to the congestion in main cities, the government and companies have also developed new logistic concepts for urban distribution. These concepts often result in double handling and additional costs, but are required to guarantee the accessibility of the city. Further to this, the Dutch government makes use of flanking measures to promote alternative ways of transportation.

This chapter describes the several possibilities and is divided in three sections:

- Process related logistic concepts
- Urban distribution
- Flanking measures

4.1 Process related logistic concepts

With new logistic concepts, companies will try to optimise the balance between costs on the one hand, and reliability and quality on the other hand. The most optimal concept for a company is very dependent on the actual costs for labour, the reliability demanded by the clients, the kind of industry, the scale of the company (regional, national or international) and so on.

Most logistic concepts involve the production process and/or the physical distribution. This study will investigate the western concepts with an impact on physical distribution.

4.1.1 Just in Time production (JIT and zero stock production)

Just In Time (JIT) production is a logistic concept to control production in such way that the stocks in the production units and warehouses are minimised, while the clients get their products exactly at the moment that these products are required.

As the stocks are minimised, the space requirements and the interest costs over the work in process are minimised. This makes the JIT concept very attractive for relatively high value goods, which are produced in relatively expensive areas.

The Just in Time concept has an important impact on the physical distribution. As stocks are kept low, Just in Time deliveries will occur more often and with a reduced load per transport. This has a negative effect on the amount of driven miles. However, for high value industries, the increased transport costs are more than compensated by the lower interest costs and the reduced space requirements. The JIT concept in combination with low value goods in low value areas can be regarded as not feasible.

A very important aspect of JIT is time. The reliability of the deliveries is very important and late deliveries are often accompanied by contractual penalties. This implicates that a JIT driven process must have a very reliable planning and a very reliable process. Failures and mistakes must be prevented and therefore JIT oriented companies aim to realise a 'zero fault production'.

JIT is originally Japanese, where this logistic concept is very often applied. The concept is in Holland not as frequently applied as in Japan, partly caused by the difference in culture, partly by the type and scale of production. Just in Time production is frequently applied in the automobile industry and other high value industries where the interest on stock has a major effect on the total costs.

4.1.2 Order based production

The order-based production is a logistic concept, which is especially suited for factories that manufacture specialised products. These products have to be manufactured according to the client's specifications. As all products are different, it is not possible to keep a stock of standardised finished products. Frequently used raw materials are kept in stock, but less frequently used material will be purchased for the order. The concept can be regarded as an 'old-fashioned' concept, which is especially suited for more traditional activities.

Order based production is frequently applied in developing countries, also for standardised products. This strategy prevents investments in stocks and even provides the possibility to have the raw materials pre-financed by the client.

As the stocks are relatively low, the system looks a bit like the JIT system. However, the JIT concept is a time-driven concept and the delivery Just in Time is one on the main aspects of the concept. With order based production, the delivery date is very uncertain. This date can be influenced by the deliveries of the raw materials (not Just in Time) and the availability of production capacity. The time between order and completion is relatively long, as the products still have to be produced.

In western countries, the order-based concept is frequently applied for specialised engineering works. However, the importance of the concept is decreasing as more and more products are being standardised.

4.1.3 Consolidation

Consolidation is a logistic concept where the loads of one or more clients are combined in one transport. The concept is often used by specialised companies, which offer logistic services to other (producing) companies.

Consolidation results in decreased transport frequencies with bigger loads. The concept results in decreased transport costs for each client. Specialised companies provide these logistics services to their clients (consolidators, stuffing and stripping facilities), however most of these services are based on national and international transport. Often logistic services can be found nearby multi-modal nodes, such as seaports and industrial zones, where the several services are clustered in so called 'distriparks'.

4.1.4 Door to door service

A special form of consolidation is door-to-door transport. Door to door service is the strategy where one logistic company takes care of the transport of materials from its origin to its destination. The client doesn't have to care about the transport, which is completely arranged by this company.

The logistic company that offers such a service often has the disposal of a network of warehouses throughout the world. As this company will serve a large number of clients, they have the possibility to combine loads and make sure that the means of transportation are efficiently used. The transport between the warehouses is very efficient and the operator can choose the most economic way to transport the goods within the time frame as required by the clients. Due to the consolidation concept, transport frequencies are minimised.

Transport to and from the client are often realised in individual loads. As a result, the advantage of consolidation can be found in the route between the warehouses and not the route between client and warehouse. This advantage is normally found on the national and international routes and not on the urban scale.

4.1.5 Franchising and chains

The companies that sell to the consumer are the last link in the logistic chain. In Holland, these companies are often part of a big chain or they operate on a franchise base.

The stores have the disposal of a central warehouse, where the complete assortment is stored for all affiliated stores. The central facility is able to buy products at a large scale, what results in minimised purchase costs.

The individual stores are supplied from the central warehouse. As the complete assortment is available, a store will be supplied with one single load. A traditional store is visited by a large amount of trucks and vans, as each product is delivered by individual companies.

Advantages of franchise constructions and chains:

- Reduced purchases due to large orders;
- Reduced logistic costs, as a single shop will be supplied with one large load instead of several small loads of several companies.

The existence of franchise organisations and chains gives an enormous reduction of transport frequencies. It can be regarded as 'organised' consolidation within one or one group of companies.

4.2 Urban distribution

As mentioned at the introduction of this chapter, the inner cities of western cities are getting more and more congested and special measures are required to assure the accessibility of the cities. Logistic concepts related to this definition are summarised in this section.

4.2.1 City distribution

Some Dutch inner cities are provided with a very narrow infrastructure, which is hardly suited for truck transport. A parked truck in such a street blocks the through-going traffic. With low intensities, incidental truck loading/unloading can be accepted, but as intensities rise, alternatives should be found. This has resulted in a tendency to use smaller vans and trucks to supply the locations at the inner cities. To maintain the concept of consolidation, the city distribution concept has been introduced. This concept is a relatively recent concept and it covers the handling from large trucks into smaller vehicles at a transfer point at the edge of the city. The loads arrive in consolidated form and the city distribution itself is realised in small loads. Two major forms of city distribution can be distinguished.

In the first form, a large truck will drive to a parking lot at the edge of the city. The load of the truck contains products for several shops in the city. The clients are waiting at the parking lot with smaller vans and the goods will be unloaded from the truck and loaded to the several vans.

Specialised logistic companies became aware of this concept and provided warehouse facilities at the edge of the cities for temporary storage of goods. This way the second form of city distribution was created.

The city distribution has two major advantages:

- Large trucks don't have to enter the inner city
- Shops require relatively small storage; most is stored at the major warehouses at the edge of the city.

The costs to establish in the inner city are relatively high. Companies in these areas prefer to store their goods and products in less expensive areas. This is the second advantage of city distribution. The shops can store their products at the warehouses at the edge of the city and optimise the available area in the city centre.

The city distribution concept results in additional traffic (several vans instead of one truck), but due to the limitations of the infrastructure of the inner city, the circulation of the traffic improves considerably. The accessibility of the inner city would improve as a result of the city distribution concept.

City distribution is not very successful yet. The double handling of materials result in additional costs and most companies choose to proceed in the traditional way. Some of the city distribution projects, initiated by the Dutch authorities, have failed completely. Although the concept doesn't seem to be very successful, some branches, among which the flower and vegetables branches, have copied the city distribution concept in their logistic chains. For these branches, the concept has proved to be financial attractive. These advantages only exist for time critical truckloads, which have to be separated in a high number of individual orders.

A city distribution concept for all branches should be accompanied by flanking measures to force companies to use this concept. The most effective flanking measure would be a truck ban in the problem areas with narrow infrastructure.

4.2.2 Underground Logistic System

The Underground Logistic System consist of an underground network of infrastructure, especially designed for the distribution of goods from the edge of the city to the inner city. The edge of the city is provided with one or more transfer centres where the goods are transferred from the trucks to the underground system. Relative small-automated vehicles will deliver the goods at their destination.

The application of such a system secures fluent goods flow through the city. This system is in an experimental phase.

The Underground Logistic System can be regarded a high-tech and very high-costs solution and not regarded feasible for developing countries.

4.2.3 Urban development – decentralisation

From the viewpoint of zoning, three basic zoning concepts can be considered:

- No segregation, integration of functions
- Segregation in commercial, residential and industrial areas in one city
- Segregation and decentralisation of the individual commercial, residential and industrial areas in more centres.

The first concept looks like the situation in developing countries. Working and living are strongly connected.

The second concept with the segregated industrial, commercial and residential areas looks like Rotterdam. The segregation has several advantages. Industrial zones are better accessible, consolidated transport can take place and the clustering of activities will reduce the transport distances between the several activities. From the viewpoint of goods transport, urban transport is minimised. Commuter traffic will increase in comparison with the first concept, as people do not live near their work. However, due to the clustering of the functions in the city, public transportation structures are easy to realise.

Disadvantage of this zoning concept is the fact that the clustered areas can result in congested areas; an example is the concentration of commercial activities in the old town in Dhaka. To prevent high densities in specific areas, the concept of decentralisation could be applied. The concept is relatively simple; the functions that cause congestion are split in two or more parts. A part can stay in the specific area and the other parts are relocated in such way that the intensities are spread over a larger area.

The decentralisation concept has proved to be ineffective as functions are related to each other and the decentralisation can result in unforeseen developments. For that reason, functions should always be regarded in context with the surrounding functions. A more integral approach to decentralisation is the development of self-supporting districts as indicated in 4.2.4.

4.2.4 Urban development - self supporting districts

The urban development strategy in Holland is based on the creation of main cities and residential/working cities/towns. Rotterdam is a relative small city, but if the whole area is regarded, including the region, the city has a total population of 2.000.000 residents.

Within the region independent towns exist with their own facilities. These sub-cities include residential, commercial and working areas. The city and the towns in the region are connected by a fast, crossing free, highway systems and several centre-to-centre passenger rail links.

In comparison with the segregated single centre concept, the travel distance between working areas and residential areas will decrease. The distribution of goods in the city is easier as the district has a limited size. The optimal size of the individual districts is a compromise between goods-related traffic, commuter traffic and the layout of the city. Due to the enormous size of the third world cities, it is expected that the realisation of self-supporting districts is a condition to secure a manageable structure of the city.

4.3 Flanking measures

Flanking measures can also have an impact on the goods-related transport flows in the city. This chapter describes the Dutch flanking measures.

4.3.1 Prevention of road congestion by flanking measures

Prevention of commuter traffic

Road-congestion in Holland is mainly caused by transport of persons, the commuter traffic. Holland has a strong policy to make people live near their work and use public transportation as an alternative for transport by car.

Transport by car is getting more expensive by high taxes on gas, (future) pay lanes and 'rekeningrijden', a system similar to toll roads. Further, the government policy limits the number of parking places within the city, what results in a shortage of parking space, forcing people to use public transportation.

On the other hand, the government invests in public transportation, such as regional high-speed train connections and bus, tram and metro-connections in the city itself.

Although this strategy does not involve goods-transport, the overall road-intensity will decrease as the commuter traffic is partly eliminated. Result is that more road-capacity is available for goods related traffic flows. This policy prevents that the congestion will form a hampering factor in the economic development. Flanking measures are used to force people to other means of transportation, creating additional capacity for goods-related transport.

Prevention of congestion by decreasing goods related road traffic

In addition to the prevention of commuter traffic, flanking measures exist to improve the goods-related transport. The public policy aims to reduce the road freight transport kilometres through greater efficiency of road transport, kilometre reductive vehicle technology and substitution of road transport by multi modal transport. This public policy is not linked with a commercial goal, but is linked with the goal to save

on road transport, to save the environment, to secure the accessibility of the urban areas and improve the quality of life.

Two basic programmes can be distinguished. The first programme aims to develop new technologies to save transport kilometres. An example is the development of a 3 or 4 TEU truck. The second programme aims to change the behaviour of companies. An example is the modal shift project. Companies get subsidies to investigate the possibilities to apply other means of transport instead of road transport.

Although the primary goal of the public policy is not commercial, companies will not change their approach if the measures conflict with their commercial interests. A modal shift project will only succeed if commercial advantages can be found.

If no commercial advantages can be found, the chance of success is very limited. In such a case, international pressure is required to force companies to develop alternative and better products. This can be illustrated by the automobile industry, which develops cleaner and economical engines to meet the international pressure to improve this technology.

4.3.2 Vehicle-free areas and off-peak distribution

Some of the older city centres in Holland have a very narrow infrastructure, which is difficult to access. These parts are often visited by a large amount of pedestrians. The interaction of traffic and persons resulted in dangerous situations, especially in combination with heavy traffic. The heavy trucks can cause enormous congestion in narrow zones as they can block the way for the remaining traffic during loading/unloading.

Some of the Dutch cities introduced truck-free inner cities. This measure is an additional measure to force companies into the use the city distribution concept.

Other cities have introduced complete vehicle free zones, especially where high pedestrian concentrations occur. These measures are applied to improve the safety of pedestrians and improve the quality of life in the inner city. To supply the several shops, service roads are available, which can only be accessed during certain off-peak hours or time frames. Although the areas cannot be accessed by car, the area is good accessible by public transportation and parking facilities at the edge of these zones.

Off-peak distribution can be secured by flanking measures. However, if the congestion is big enough, companies will consider off-peak distribution without any governmental policies.

5 Analyses

The objective of the analyses is to project Dutch/Western concepts to third world cities and to determine the feasibility, the impact on the health of the city economy and the impact on the quality of life. This section describes this analyses based on a confrontation of Rotterdam with Dhaka and Nairobi and an evaluation of the western logistic concepts.

Market-related questions, economic questions, industrial questions, social questions and technological questions as described in the Terms of Reference have been summarised in Annex 1.

5.1 Confrontation of Rotterdam with Dhaka/Nairobi

This paragraph will compare Rotterdam with Dhaka/Nairobi in the fields of urban development and infrastructure.

Urban development

When the city of Rotterdam is compared to Dhaka and Nairobi, one aspect is very evident. In Rotterdam, goods related industrial and logistic activities are mainly located at the edge and outside the city. In Dhaka and Nairobi this is only the case for professional activities. The more traditional activities, which are very important in developing countries and which contribute the most the total employment, are mainly located within the urban areas. As a result, the contribution of the goods flows to the urban transport is less in Rotterdam than in third world cities.

In the past, Rotterdam had a similar structure as Dhaka and Nairobi. Beside the larger companies, a lot of small activities existed, which were mainly concentrated in the city itself. Due to the increasing labour costs in Holland, companies were forced to improve the efficiency to maintain their position in relation to the competition. Especially goods related-companies could improve the transport costs by consolidation of loads and improvement of the logistic system. Scale effects were important to minimise logistic costs. This development resulted in bigger companies. Some of these companies survived by specialising, but most of them could not keep up and vanished. The present companies in the inner city are mainly service and knowledge related.

Another aspect was to prevent delays. The inner city was getting more congested, resulting in delays and additional transport costs. Companies became aware of this and established mainly at locations which were good accessible. Further to this, the larger companies expanded their markets and became national or even international oriented. This resulted in a shift of activities from the heart of the city to the peripheral zones of the city. At the edge of the city, national/international connections could be achieved with direct access to the city and its surroundings.

Now that the peripheral zones of the city start to be congested as well, the interest of more intensive logistic companies to establish at the industrial areas round the city has been reduced. These companies prefer to establish at less congested zones, for instance in the port area. This development has resulted in a concentration of residential areas and non-goods related working areas (business areas) in the city and transfer of goods-related activities to areas around the city and within the port.

In Dhaka and Nairobi, labour is very cheap. As a consequence, there is not a real drive to optimise logistics, scale-up activities and locate companies at optimised (distant) locations. In fact, a lot of people don't have the possibility to travel long distances due to their financial circumstances. Within the urban areas, working and living functions are strongly connected. This has resulted in a very high number of urban transports with relatively small loads, which are often transported by non-motorised vehicles.

It seems likely that these cities will develop in a similar way as Rotterdam, but with an increased speed. This increased speed is noticeable in the business districts of Dhaka and Nairobi and the development of dedicated industrial zones with professional activities. The business districts and the dedicated industrial zones resemble the business district/industrial zones of Rotterdam very much. However, less developed areas are still concentrations of small goods-related activities.

In the comparison between western and developing cities, one aspect is very important. Dhaka and Nairobi expand in a very fast rate. As long as the quantity of potential employees grows faster than the employability, labour will stay very cheap, even when the economic situation improves. The fast expansion of the population could slow down the predicted development or could, more probable, result in a dichotomy between developed and undeveloped areas within the city.

Road infrastructure

When the road infrastructure of Rotterdam is compared with the road infrastructure of Dhaka or Nairobi, one difference is very obvious. Rotterdam is provided with a highway around the city, giving quick access to the several areas. Dhaka and Nairobi are not provided with such a road. On the scale of the local roads, the internal (secondary) infrastructure in Rotterdam, Dhaka and Nairobi looks alike.

Ring roads around the city

The ring road around the city of the city of Rotterdam has a major impact on the internal goods flows. The advantages of the ring road are:

- Traffic with a destination outside the city can pass the city without entering it.
- Traffic with a destination in the city will enter the city nearby its destination.

With the ring road around the city, less traffic will enter the city and the transport distances within the city will decrease. Further to this, the highway stimulates the development of industrial zones in areas near the highway. Companies are attracted

to the peripheral zones to secure a good accessibility. These developments reduce the goods related traffic flows to the centre of the city considerably.

In developing countries, export related activities are very rare. Most activities are related to the city and a ring road will not result in a big shift of activities from the city centre to the peripheral zones. The majority of the goods flows will still originate or/and destine in the city. The direction of the traffic flows is mainly from and to the city centre. A ring road, perpendicular to the main traffic flows, would only result in a very meagre improvement of the internal persons and goods-flows.

A maximum effect can only be expected on the long term in combination with the following developments:

- The development from small companies to big professional and export oriented companies;
- The relocation of companies from city to the edge of the city.

These two effects are considered to be an autonomous development, which are mainly influenced by the economic situation of the country. On the short term, a ring road around the city should not be considered as a solution to improve the congestion problems within third world cities. On the long term, a ring road or a partial ring road around the city could have an important function in the urban goods transport by connecting the city with the peripheral zones and the rest of the region.

A major point of attention is the growth of third world cities. Due to the explosive expansion of these cities, a ring road around the city is likely to be integrated within the city limits as the city grows. This aspect can also be recognised within European cities. Some of these cities are provided with several highways (Milan), a new one around the city and old ones making a loop within the city. However, all ring roads contribute to the accessibility of the city and have a reducing effect on traffic congestion.

Ring roads within the city

Ring roads or partial ring roads within the city could be very helpful to pass congested problem areas without entering them. For that reason, projects for ring roads within the city could be useful to improve the accessibility of the city on short term. New projects can be implemented to solve actual bottlenecks. An example is the plan for a partial ring road around the old Dhaka city to reduce the congestion in this area. It is recommended to develop an overall infrastructure strategy, in which the probable developments (ring roads, relocation of activities) should be incorporated. New projects to solve actual problems should fit in this strategy to prevent unnecessary investments.

In general, it is expected that new infrastructure generates new (person related) traffic. From the viewpoint of goods related traffic, a new infrastructure is required to support the shift from traditional oriented activities in the city to professional activities at the peripheral zones. The goods related traffic flows will decrease as a result of the new infrastructure. The new infrastructure can be regarded as an economic condition for further development.

Road capacity

Another difference between Rotterdam and the cities of Dhaka and Nairobi is traffic control and traffic management. Rotterdam has modern traffic systems, which improve the road capacity by preventing gridlocks. The systems improve the maximum utilization of the infrastructure. Apart from the conventional traffic lights, systems are being implemented to gear the traffic systems of individual crossings to one another. This system results in an additional improvement of the integral road capacity.

Especially the last group of management systems are extremely expensive and it is not recommended to apply such systems in developing countries at this moment. However, traffic lights and maybe even cheaper, traffic policemen, could be helpful to provide short-term solutions for important bottlenecks in the infrastructure in Nairobi and Dhaka. It is expected that such measures will improve the maximum capacity of busy, uncontrolled, crossings considerably.

Considerable E-commerce activities, which are developing in western countries, are not expected to develop on short term in third world countries. E-commerce is attractive when a large amount of the population owns a computer. This is not the case in developing countries and is not likely that large scaled e-commerce activities (shopping over the internet) will develop over the next decade. The e-commerce related problems as indicated in paragraph 3.1 are not likely to develop in third world countries.

Rail infrastructure

Dhaka and Nairobi are provided with rail to road and road to rail handling facilities within the city. In Rotterdam, these facilities have been closed over the years. This last development is mainly a result of the transfer of goods-related activities to the edges of the city and the port. In Dhaka, these activities are mainly concentrated in town, what results in a demand for in-town rail handling facilities. Nairobi is provided with one major rail station at the border of the industrial and residential/commercial areas.

In Dhaka and Nairobi, two types of industry can be distinguished. The more professional industries are located at the edge of the city and often clustered in one or more dedicated areas. It is very likely that these areas will develop in a fast rate over the next years. The accessibility by road is very meagre as all traffic flows are forced through the city. Rail transport is a very good and congestion free alternative and could grow to a major modality to service these industries. However, the rail infrastructure in developing countries is often in a bad shape. This decreases the reliability of rail transport and a lot of companies prefer to transport their goods by truck. Improvement of the infrastructure is required to improve this situation.

For the second type of industry, the small activities within the city, rail transport is not the major modality. It is very likely that Dhaka and Nairobi will develop as

European cities, what ultimately will result in a shift of activities from small traditional companies to large professional companies and from in-town companies to out of town companies. This way, it is very likely that the in-town rail facilities in Dhaka will vanish over the next decades.

Water infrastructure

Rotterdam is a port city; hence, the water infrastructure is of major importance. However, the water infrastructure is mainly used to receive sea ships and send barges to the hinterland. Most of this transport is not related to the urban areas.

The port facilities are growing from the city to the direction of the sea. The basins are becoming bigger and bigger and the old basins in the city itself are less suited for modern ships. As space becomes scarce within the city limits, more and more basins are being filled, creating new land. Transport over water for the supply of in-town destinations is not a frequently used modality, except for off-size equipment and bulky materials such as sand.

Nairobi does not have suitable waterways. For that reason the water infrastructure is not considered.

Dhaka does have water infrastructure, which is very important for local goods-flows. Barges for industrial goods are not really considered, as extensive dredging is frequently required. This will hamper the short-term development of this modality. However, if the conditions were better, transport over water could develop into the major modality for the transport of goods and materials from and to the large industrial zones.

For the small and traditional activities, transport by water is still a major modality at this moment. However, it is likely that these companies will transform to large professional companies, which will leave the centre of the city and establish at the edges of the city. Due to the limited accessibility of the river for large barges, it is expected that the modality water will grow to be less important for Dhaka on the long term.

Conclusion

Based on the evaluation in this paragraph, it is likely that third world countries will develop in a similar way as western countries. The following developments are likely to occur as the economic situation improves:

- Activities will scale-up and getting more professional;
- Companies will expand their markets from town-orientated to national/international orientated;
- Activities will move from the city to the edge of the city;
- The road infrastructure will develop with ring roads;
- Water and rail transport will develop to be less important in the inner city and will mainly cluster at the industrial zones at the edge off the city.

How and where these developments will occur cannot be predicted. Fostering developments, for instance by creating additional infrastructure, has proved to be inefficient. Developments often occur at locations where they are not expected.

However, the knowledge how the city will develop opens possibilities to 'guide' and 'steer' new developments. It is advised to make a new urban planning strategy based on dedicated zoning (residential, industrial, commercial, and so on). New projects can be reflected to the new urban planning strategy to determine the future benefit of the project. For instance, a project for a rail service centre in the centre of the city will then get a low priority, as it is likely that these centres will vanish on the long term.

Short-term solutions to solve gridlocks could possibly be found in a better traffic management.

5.2 Logistic concepts

The high impact on goods related traffic flows within the third world cities is basically caused by the small traditional activities within the city. These activities cause high transport frequencies with relatively small loads. Consolidation of goods, by combining several loads in one transport would minimise the transport frequencies and would minimise the impact on the goods-related traffic flows. This reduced intensity would improve the safety on the streets, reduce congestion and improve the quality of life within the city. However, question is how to foster new concepts without damage to social, human and other relevant aspects.

This chapter will describe the relation between logistics and the economical situation, the process related logistic concepts, the urban distribution concepts and flanking measures.

It is very important to realise that goods related urban transport in western countries is not considered a problem. Congestion is mainly caused by the transport of persons. Goods-related transport has a minor contribution to urban congestion problems. In western cities, it is preferred to find the solution by minimising the commuter traffic. Measures related to goods-related urban transport could have an impact on the economic position of the related companies and are dealt with with great care.

For developing countries, the congestion is also mainly caused by the transport of persons. Nevertheless, most goods-related activities are located within the city limits, what introduces additional goods related traffic. This makes the contribution of goods-related transport to the congestion in third world cities larger than in western countries.

Transportation can be considered at several scale levels, namely at urban scale, regional scale, national scale and international scale. Logistic concepts are related to

the complete logistic chain, often nationally or internationally oriented. This study involves urban transport or the transport within the city itself. Regional, national and international links will be considered but will not be evaluated in detail. The traditional activities are mainly responsible for the urban goods flows. The goods flows initiated by the professional activities are mainly related to the national and international scales and will be evaluated in less extent.

5.2.1 The relation between the economical situation and logistics

The economic aspects are of major importance to the feasibility of logistic concepts and the establishment conditions of companies.

In third world countries, most activities involve the basic necessities of life, such as food and buildings. Value Added activities are minimal and most people earn their money from each other. The economic structure is related to the city and there is no additional cash flow, which could be used for further development. Without this cash flow, there is no real spin-off to the city economy. The city economy is very internally oriented. This is illustrated in table 5.1, which indicates the overall import/export flows in Bangladesh, Kenya and the Netherlands. It shows that the import/export flows in developing countries are very low. The import flows in developing countries involve mainly machinery, transport equipment, food, fuel and some consumer goods. The export products involve mainly natural resources, such as agricultural products or oil products. These flows are not urban related, except some garment related flows.

	GDP [US\$]	Import [US\$]	Export [US\$]	Import/export [%]
Bangladesh	175.5 billion	7.1 billion	4.4 billion	15.2 %
Kenya	43.9 billion	3.0 billion	2.0 billion	11.4 %
Netherlands	348.6 billion	142 billion	160 billion	86.6 %

Table 4.1: Import/export flows in developing countries and Holland

[Source: world fact book www.odci.gov/cia/publications/factbook]

In western countries, most activities are Value Added activities and most companies have national and international markets. The companies don't have a strong relation with the city. Due to the national/international relations, there is an incoming cash flow, which is used for the welfare of employees and further development of the company and the city. Labour is expensive, what results in the requirement to improve the efficiency. Mechanisation and efficient logistic concepts are very important.

The labour in third world countries is very cheap. Mechanisation is often not considered, because it is cheaper to invest in people. This situation is basically different than in Europe and will also result in different logistic concepts. Companies use logistic concepts to minimise costs and maximise the quality of their products. Due to the direct relation with the labour costs, it can be expected that logistic concepts for western and developing countries are not similar. The logistics concepts

in developing countries seem very inefficient and old fashioned in western eyes, but are in most cases optimal from logistic point of view (cost efficient solutions). For that reason, labour intensive working methods are in most cases the cheapest and most effective working methods for developing countries.

This statement can be illustrated with the following example:

The port of Poti, Georgia, is an important cotton port. The cotton arrives in break bulk, which is delivered by trains. In the port of Poti, the break bulk is loaded in containers. This is a condition of the western clients, because the transport in containers is considered more efficient. If the cotton would be loaded in containers in the first place, the handling from the cotton fields to the port of Poti would be more efficient. Nevertheless, this efficient strategy is not implemented. The main reason is the required investment in container handling equipment. Due to the low labour costs, it is more economic to invest in labour instead of equipment. Therefore, the transshipment of break bulk into containers is realised in the Port itself. As the labour costs increases (better economic situation), the efficient concept will be more attractive.

Another very important aspect is employment. Changing logistics and improving labour efficiency will result in fewer jobs for the same amount of work. This cannot be a goal for developing countries, where the improvement of the employability is one of the main priorities. Alternatives should be found for these employees. This will require the development of new value added, national/international oriented, activities in third world cities.

It is important to create alternative jobs from within the country itself. Jobs created by western companies will have fewer spin-offs to the city economy, as profits will not be used for development of the country. Probably a mixture of western and local activities could result in a maximum effect.

The immense number of unemployed people has resulted in a very poor labour efficiency in the logistic chains. Everybody wants to earn his/her money with the same activities. This can be illustrated with the number of rickshaws in the city of Dhaka. In relation to the required transport capacity, there is an enormous surplus of capacity. This results in a very low utilisation of the rickshaws. Balancing offers and demands, for instance by reducing the number of rickshaws by licensing, would improve the goods related traffic flows considerably, but would also result in additional unemployment. Weighing both factors, such a logistical improvement can hardly be justified.

Looking at Dhaka, Nairobi and Rotterdam, Rotterdam can be considered as an western city, Nairobi can be regarded as an city in development and Dhaka can be considered as the less developed of the three cities. The development of Nairobi is probably caused by the cash flow caused by the tourist industry. This cash flow improved the economic situation and opened the possibilities for a further development of the city. The industrial zone in Nairobi has a more western structure and is concentrated at a multi-modal location at the edge of the city.

An important thread for developing countries is the growth of the population. It is expected that the economic situation cannot keep up with the population growth. As a result, it is very likely that a further dichotomy will be developed between developed (educated) and undeveloped areas within the city.

5.2.2 Process related logistic concepts

The activities in third world countries can be divided in professional and traditional activities. The professional companies are often owned or financed by western companies and are especially established for export. Traditional activities have the biggest contribution to goods-related urban transport. For that reason, the traditional activities will be evaluated in more extent.

Just in Time (JIT)

The Just in Time concept is especially suited for high value goods. Starting point of this concept is to minimise stock. This concept will minimise the space requirements for storage areas and minimise interest costs for internal stocks. As stocks are kept very low, raw materials and end products will be transported with high transport frequencies and relatively low amounts. For high value materials, the increased transport costs will be compensated by the reduced space requirements and the reduced interest costs.

Looking at the present structures in Dhaka and Nairobi, the logistic chain looks a lot like the JIT concept. Especially in the food chain, the markets stalls are delivered each day with the amount of goods they require (=Just in Time). This Just in Time concept is not really a chosen strategy to minimise the interest costs, but is caused by:

- The fact that food is perishable
- The fact that the merchants are financially too weak to keep stocks
- The fact that companies don't have cash flows to invest in storage facilities

Further, some western companies have chosen to apply distant warehouses in third world countries that deliver their clients in Europe/America Just in Time. This approach is attractive, because the costs to invest and operate a warehouse are much less in third world countries than in western countries. These reduced costs, by not making a warehouse in Europe/America, even compensate the increased transport costs. This distant warehouse has a very large stock. Production and transport are still realised in a traditional way. The warehouse is located at the border between the third world and the western market. As the concept is initiated by the western philosophy, this type of JIT deliveries is considered to be a part of the western side of the logistic chain. Due to the national/international link of these warehouses, they should be located outside the urban cores.

The main disadvantage that is related to JIT is the high transport frequency. The main objective of this study is to improve the health of the city, which could be

improved by reducing the congestion problems. In this framework, JIT and zero-stock production is not considered a good concept for third world cities.

Order based production

Order based production is frequently applied in developing countries. This is caused by the fact that companies don't have the financial position to invest in raw materials. The client will be asked to make a deposit of which the company can purchase the required raw materials.

An example can be found in the garment industry. This industry is order based. Raw materials will be purchased when an order arrives (financed by the client) and the production starts after arrival of the raw materials. Finished products are shipped as soon as possible. Although the stocks are kept relatively low, the concept cannot be regarded to be a JIT concept, as it cannot guarantee the delivery date (quality aspect).

The order based production system is a very important concept for developing countries. The financially weak companies are able to produce without excessive investments in materials and stocks. The order-based production is not only applied for specialised goods, but also for relative standard products.

The production often involves relatively large amounts, so consolidated transport is possible and often applied (containers). The companies make use of the services of forwarders and shipping agents for the transport of the goods to the foreign clients. The forwarders and shipping agents are able to consolidate shipments to reduce the total shipping costs.

Logistic services do exist. However, because of the limited import and export activities, the scale of these services is very limited. In Dhaka and a lot of other third world cities, these facilities are located at strategic locations within the city.

Consolidation

Consolidation is a concept where loads of several clients are combined in one transport. Such a concept will decrease transport frequencies and relieve the infrastructure. Consolidation can be considered at several scales: inner city, regional, national and international.

On first hand, consolidation seems to be the solution to reduce the impact on the traffic flows within third world cities. It will reduce the goods related traffic considerably. At the urban scale, consolidation can be realised by community goods systems, franchising or other strategies, but this approach would have a major impact on social, human and other relevant aspects. As indicated in the introduction, it is very hard to apply efficient logistic structures without creation of additional unemployment and higher cost levels.

Consolidation is possible when companies start to grow and turn to more sophisticated logistic concepts, such as franchising. However, as indicated in 5.2.1,

the fostering of these concepts can only be justified in combination with an improved economical situation, with sufficient alternative jobs to cope with the people that become available to the labour market. Priority is to foster the economical situation and to provide sufficient alternative jobs. The consolidation concept at urban scale is likely to develop automatically when the economic situation improves and labour is getting scarce.

A similar line of thought applies for the regional scale. The present logistic chains are very labour-intensive and the consolidation concept will leave people without work. Also at regional scale, the fostering of the consolidation concept is not recommended.

At national and international scale, goods related transport is relatively small. Improving the link between western countries and developing countries could result in better export conditions. Consolidation is an important means to create an efficient link between the countries. Consolidated transport can be provided by specialised logistic services, which could be clustered in a distripark. The distriparks are generally located at good accessible locations, often in the peripheral areas of the city. These distriparks will hardly influence the urban goods flows and won't have a positive effect on the health of the city.

Logistic services are available in Dhaka and Nairobi. Specialised forwarders and shipping agents do provide consolidated transport at an international scale in developing countries. These services can be in town (Dhaka) or are clustered in the industrial area (Nairobi). However, as (traditional) export flows are very small, these centres are mainly used to distribute imported materials or as a logistic centre for western professional companies. This also indicates that fostering new distriparks will not automatically result in a structural improvement of the city economy. It will improve the establishment conditions for professional western companies. Export oriented local activities can only be expected when programmes are started to help the local inhabitants to develop these activities. Western professional companies can improve the employability, but will have a meagre contribution to the structural development of the city economy, as profits will flow abroad.

Door to door service

The door-to-door service is a logistic service in western countries to organise the transport from origin to destination for specific clients. This service is often based on the consolidation of loads of several clients. The services in Western countries are internationally oriented. The economic situation in developing countries is very internally oriented and the demand for such internationally oriented activities is very low.

However, the availability of logistic services is a main condition to improve the export flows. These logistic services do not only include door to door services, but also haulage, forwarding, consolidation, storage and so on.

The few third party brokers, consolidators, shipper agents, haulage agents and forwarders operate effectively in developing countries, especially in the chain between port and warehouses. They offer their services mainly for import and export activities and have a very limited role when the urban transport is involved. Brokers seem to have a very important role, as it can be difficult to hire transports without the help of a broker. The increasing demand for logistic services should be incorporated in the city plan to make sure that these activities will be located at the right locations.

Franchising and chains

Franchising and chains are other concepts to improve labour efficiency. As indicated in previous sections, improving the labour efficiency should not be a goal in third world countries, as it will leave people without work. Franchise constructions and chains should not be fostered, but if developments occur, these developments should not be prevented as well.

5.2.3 Urban distribution

There are two concepts that can be regarded for third world cities, city distribution and the development of self-supporting sub-districts.

City distribution

The concept of city distribution is not primary a result of congestions problems caused by goods-related transport, but is caused by the limited possibilities of existing infrastructure. Especially Dutch inner cities have very narrow streets, which are not suited for truck transport.

The same problems occur in Dhaka and in less extent in Nairobi. Especially in Dhaka, large trucks, even when parked, can block the through going traffic in the inner city. The truck bans in Dhaka during rush hours are just partly effective as the parked trucks still block the through going traffic. The city distribution concept could be an attractive alternative to keep the trucks outside the narrow parts of the city [Source: Working Paper 25: Commercial goods movement, bullet 23].

The concept includes several road/rickshaw transfer points at the edge of the old town. To prevent trucks from entering the old city, flanking measures are required. Based on experience, the truck ban should not be secured by prohibitions, but by physical barriers.

The city distribution concept will not minimise the number of goods-related transports within the city. The load of the truck will be transferred to smaller vehicles for further transport to its destination. The transport intensities will increase, but the interference of trucks and rickshaws can be avoided. It is very dependent of the situation, but it is expected that this concept would have a very positive effect for the city of Dhaka.

The effect of city distribution could be intensified if other means of transportation are used, for instance boats instead of rickshaws. This would result in a further reduction of the traffic intensities in the inner city.

City distribution is more expensive due to double handling, however, due to the low labour costs and poor labour efficiency in third world countries, the feasibility of the concept seems to be higher for developing countries than for western countries. The investment in secondary transport equipment (vans, boats) can be kept low when existing vehicles are better utilised.

Due to the double handling of materials, the concept does not affect the employability. In fact, the concept creates new jobs. The health of the city will improve as the trucks are kept out of the narrow areas, what improves the surveyability of the traffic and what reduces possible traffic accidents.

The feasibility of the concept depends on the situation in the city, the intensities, the modalities and the type of infrastructure. City distribution is not a general solution for cities in the third world, but could be a helpful strategy for problem areas in third world cities.

Decentralisation

As indicated in paragraph 5.1, it is very likely that third world companies will scale up and will change their establishment conditions to secure their accessibility and to serve a bigger market. Due to this development, the third world cities will change shape from an integrated city to a more segregated city. Some segregation can already be recognised in the city plans of Nairobi and Dhaka.

Segregation can result in new problems. The centre of Dhaka, old Dhaka, is a cluster of commercial activities. These activities introduce a lot of transport, which can result in heavily congested areas. Decentralisation of the activities could help to relieve the congested problem areas.

The market could be split in two or more sections, so that the markets are located in the centres of the several city-districts. This would relieve the heavily congested centre and would even improve the traffic intensities as the distance between market and client is reduced.

Relocation of functions could improve the goods-related situation, but will have to be considered in combination with the surroundings. New markets will attract new residential areas, warehouses and so on. The old market will be less crowded, resulting in people leaving the area. This development will create area for new functions.

Decentralisation or urban restructuring is considered to be a good concept. Urban traffic flows (goods or persons) can be influenced by urban development strategies. This also emphasise the need to create urban city plans as noted in section 5.1.

Self-supporting districts

Dhaka and Nairobi are very big cities. Especially Dhaka has a very large population.

If the 'Rotterdam' zoning concept would be copied to Dhaka, the distance between the centre and the ring road would be very large. The distance between the residential zones and the industrial zones would be very large, introducing more commuter traffic and heavily used infrastructure within the city. The size of the city could grow to be the hampering factor to secure the accessibility of the city.

This problem can be solved by the creation of self-supporting districts. The concept involves the creation of 'individual cities' within the city with their own residential, industrial and commercial zones. Most people can work and live in one area, reducing the traffic intensities. The individual districts can be connected by fast, crossing free, highway systems and several centre-to-centre passenger rail links.

The necessity of self-supporting districts in Nairobi will be less than in Dhaka. Nairobi is with a population of 1.500.000 inhabitants relatively small.

The creation of self-supporting districts could be helpful to prevent the development massive city structures. Growth in the region could be absorbed by new sub-cities. These cities should be provided with residential, commercial and industrial areas, so that people still live in areas 'where the action is'. The limited size of the self-supporting districts and the free area between the districts would be an improvement of the quality of life in the city.

The concept of self-supporting districts is more related to urban development than logistics. The development of self-supporting districts could be regarded as a special form of decentralisation.

5.2.4 Flanking measures

Looking at the congestion problems in western cities, urban goods transport is not considered as the main problem. The problem is mainly caused by commuter traffic. This means that goods-related traffic has a priority above commuter traffic and most measures involve the commuter traffic. Further, measures that affect goods-transport are treated with care as these measures could affect the economic position of the private enterprises.

Prevention of commuter traffic

Road congestion can be improved by flanking measures, such as:

- Additional taxes on fuels
- Toll roads
- Car pool lanes
- Minimizing parking lots

These flanking measures make it unattractive to drive by car (expenses) and/or promote consolidation of transport of persons. Public means of transportation will be more attractive, what also results in a more consolidated form of the transport of persons. The total intensity of the road will decrease, what result in less congestion. Goods related transport would experience less congestion, what decreases transport costs and what improves the position of goods-related companies.

Prevention of person-related urban transport is not part of this study and is not further evaluated.

Prevention of congestion caused by related transport

Flanking measures for goods related urban transport could be divided in two categories:

- Prohibitions
- Stimulation

An example of a prohibition is the truck ban or forced off-peak distribution. The effects of such measures should be studied in detail, because prohibitions could be harmful for the private enterprises and city economy. Off peak distribution and truck bans will result in transports during off-peak hours (night). Off peak personal is more expensive and will increase the costs for the companies. This could result in a bad economic climate for the city. Flanking measures based on prohibitions could also deter new companies who are attracted to the city.

Further, there is a possibility that people refuse to comply with the flanking measures. Dhaka has a licensing system for rickshaws. In practice, only 30% of the rickshaws are officially licensed. The licensing system is not effective.

Flanking measures based on prohibitions don't seem very effective in western countries and should only be regarded for small areas. If these measures are applied, it has to be secured that people comply with them. This can be realised by physical measures (for instance barricades to secure a truck ban) or very strict police control.

Another possibility is to stimulate companies to follow a different approach. Subsidies and so on could help to foster these switches. An example can be found in multi modal transport. Dutch companies get subsidies to investigate the possibilities to introduce multi-modal transport. If such a study proves that multi modal transport can bring environmental as well as commercial advantages, the companies at least consider the alternatives. The Dutch government considers this strategy as a way of to achieve structural development. The average result of such a subsidy programmes is very poor. Based on the costs/ benefits ratio, such policies should not be given a high priority in third world countries.

Other programmes exist to develop new techniques that could improve the transport efficiency and decrease the amount of driven kilometres. These new techniques always have a double goal, not only improvement of transport, but also improvement of efficiency and costs. As indicated in this report, such techniques

could result in additional unemployment and are not recommended for in developing countries.

5.2.5 Conclusions from logistic point of view

It can be concluded that economic spin-off is a very important issue for developing countries. Most of the actual activities involve food and building materials and almost the complete labour force is involved with these activities. Everybody wants to have a share in these logistic chains to earn a living. The excessive available labour force resulted in very low labour costs. This aspect limits the feasibility of western logistic concepts, which are basically improving the labour efficiency to reduce costs. Application of western concepts in third world countries will improve the labour efficiency without new employment. For that reason, it seems more important to foster new activities. This will give a spin-off to the economics and improve the situation of individuals (higher labour costs). As labour costs increases, companies will automatically search for better logistic concepts to improve the efficiency. Based on this evaluation, it is not advised to foster any logistical concepts that are related to the processes of a specific company.

Economic spin-off is possible by improving the export flows and by fostering new activities. The present export flows are minimal. Main condition to improve the export flows is the availability of national/international links. These links can be provided by good infrastructure and the availability of logistic companies, which could take care of international transport. Depending on the wishes of the clients, goods can be shipped cheaply by consolidation or Just in Time. The logistic activities could be clustered in so called distriparks. These distriparks will offer an easy link to the national and international markets. The distriparks should not be confused with the existing traditional warehouses. The traditional warehouses are related to the local markets.

The logistics centres can be used for import and export flows. The export flows are very important to improve the economic situation. However, it is also very important to facilitate the import flows; the integration in the global production will also result in additional import flows of raw materials and machinery. The logistic facilities can facilitate the flows in both directions. In addition to this, the imported flows often include consolidated containers. These containers require deconsolidation at a distribution park. In this way, the distribution park can also play an important role for consumer goods and other imported materials.

The recommendation to develop these logistic services seems to be in conflict with the recommendation not to foster western logistic concepts, but it is not. The warehouses and services must be regarded as facilities and the logistic concepts are related to the control of the goods flows in and between these facilities. This implies that the facilities can operate with, in western eyes, less efficient and labour intensive working methods.

The present export flows are very low and the availability of a national/international oriented transport link is not sufficient to give spin-off to the export activities. Economic spin-off can only be expected by the attraction of western companies or by the stimulation of new local (export oriented) activities. Western companies will introduce new employment, but the profits will not contribute much to the city economy. New local activities will create less employment, but will have a bigger contribution to the city economy, as profits will be used for further development in the city itself. Programmes for new distriparks should always be accompanied by new programmes to attract western companies AND programmes to develop new local activities.

Question is where to locate the new logistic services. The professional companies are likely to develop in the peripheral zones, but the traditional activities are located throughout the city. The interests of the traditional and professional companies are conflicting. Professional companies need the facilities in the peripheral zones; traditional companies would like the facilities in the town. Considering the probable future developments, a location at the peripheral zones is preferred.

The existing traditional export oriented activities are relatively rare. When a programme is started to foster traditional export oriented activities, this programme should stimulate the traditional companies to move to the peripheral zones. However, for the existing traditional companies, some logistic services are required in the city itself.

From the urban point of view, congested problem areas could be improved by city distribution, decentralization (self supporting districts) and/or flanking measures. The feasibility of such concepts is related to the local circumstances and it is impossible to give a general effective advice. Urban planning/zoning is very important to make sure that new projects fit in the expected developments. Due to the fast expansion rate of the cities, these city plans cannot be made in high detail. However, the insight in probable developments, translated in a conceptual zoning plan could prevent unwished developments. Such planning seems to have a high priority.

An example could prove the necessity of these urban plans:
If a distripark is provided at the edge of the city (because this is the best accessible location), it is very likely that it will attract new commercial activities. These activities and the distripark provide new employment, what will attract employed, but also unemployed inhabitants of the city. Without zoning, the new industrial zone will grow to be a new centre, with residential areas all around it. Ultimately, the new industrial zone could be fully integrated in the city. As a result, the accessibility of the industrial zone will decrease considerably. Such developments can be seen in Dhaka where the Northern industrial zone is going to be surrounded by residential areas.

The example illustrates that new developments can result in other unforeseen and unwanted developments. A zoning plan could secure that the residential areas will

develop at one side of the industrial zone, preventing this area to be integrated in the city structure.

The zoning plan should take the local circumstances into account. For that reason, it is very important that the local/national authorities prepare the plans. The World Bank could assist by educational programmes. In western countries, zoning and infrastructure plans have to fit into the national and regional plans. This should also be the case in developing countries. However, these plans are non-existing or have a very limited detail level. In addition to this, the relation of the third world cities with the immediate surroundings is very limited, the cities are relative autonomous. To prevent long procedures that could delay the development of the plans, it is recommended to have the plans prepared by local (city) authorities.

6 Conclusions and recommendations

Objective of the study is to investigate in which way the Dutch urban goods transport concepts could help to improve the quality of life and the health of the city economy. The main conclusions and recommendations in this report are summarised in the next paragraphs.

6.1 Conclusions

Based on the analyses in this report, the following conclusions can be made:

- The way third world cities develop resembles the way that western cities have developed. In this way, we can learn a lot from the historic development of western cities. Probable developments are:
 - Activities will scale-up and getting more professional;
 - Companies will expand their markets from town-orientated to national/international orientated;
 - Activities will move from the city to the edge of the city;
 - The road infrastructure will develop with ring roads;
 - Water and rail transport will develop to be less important in the inner city and will mainly cluster at the industrial zones at the peripheral zones.
- Order based production is and will be one of the main logistic concepts in developing countries.
- The fostering of company-related western logistic concepts should not be considered. Western concepts will improve labour and transport efficiency, but will have a negative effect on employment. Further to this, most of the actual logistic concepts in third world countries are optimal for economies with low labour costs. For that reason, it is recommended to foster the development of new activities rather than fostering logistic concepts. Developing countries should focus on labour intensive working methods.
- Economical spin-off is very important for developing countries. Improving the export possibilities could be a fast strategy to achieve this. To attract export-oriented companies, the city should have a good connection with the rest of the world. This connection can be provided by logistic companies, (clustered in distriparks), which can provide efficient services for (inter)national transport. Distriparks do not affect the goods related urban good flows in the short term. If the new export oriented activities can actually be attracted to the city, these logistic services will have a major contribution to the city economy.
- Logistic concepts related to urban planning (city distribution, decentralization, self supporting districts and flanking measures) can, but don't have to, contribute to the urban goods transport. The feasibility of such concepts is related to the city structure and characteristics and should be investigated for each city individually.

- Traffic management could be implemented in third world countries to improve the utilisation of the infrastructure. This can be realised with modern traffic systems (traffic lights, and so on), but also by traditional traffic policemen.

6.2 Recommendations

Based on the analyses in this report, the following recommendations can be made:

- It is recommended that each city will develop a city, or zoning plan. The plan cannot be very detailed as the growth rate is very high and actual developments cannot be foreseen. However, the historical development of western cities gives an insight in probable developments. This information can be incorporated in new strategies. New projects should fit in these strategies to make sure that investments have a long-term effect. Zoning plans should be made by the local authorities; however, the World Bank could assist by educational programmes in this field.
- Improvement of the economic situation is very important. Distribution parks could provide an efficient and cheap link to the foreign countries. Fostering distribution parks would provide the required facilities to promote export flows. This way, they will contribute to the city economy. It is recommended to foster distriparks under the condition that simultaneous programmes will start to actually develop new export oriented activities and, if necessary, programmes to improve the infrastructure.
- New export-oriented activities can be initiated by attracting western companies or to stimulate new local activities. It is recommended to foster both possibilities. Western companies can provide new employability in a relative short period. Profits will flow abroad, resulting in a limited contribution to further development of the city. The local activities will not result in a big contribution to the employability, but the profits will be used for further development of the city. This will have a long-term structural effect.
- It is not recommended to interfere with the present company-related processes and the present logistic structures in the food, building and transportation sector.

Annex 1 Terms of Reference

This annex gives an answer to the specific questions in the Terms of Reference of the World Bank Urban Strategy Review: 'Review of experience with respect to urban freight, the development of logistic services and the planning and development of urban transshipment centres'.

5. *There are usually very inadequate data on which to base good urban transport strategies in developing country cities. The Consultant will, by reference to some selected cities in developing countries, describe the following:*
- *The quantity, types and movement of freight vehicles used;*
 - *The quantity and types of commodity flows*
 - *The location of clustered physical goods storage, transfer and transport activities.*

As indicated in our proposal, the collection of such data is not possible within the budget and the time frame of this project. Qualitative data has been integrated in the report in the form of 'typical city' models. Data that was available and that was relevant to the objectives of the study have been integrated in the report.

6. *Further than that there is even less understanding of the decision processes which determine these flows. The Consultant will attempt to obtain data for selected developing countries on:*
- *Choice of locations by firms*

As indicated in this report, the activities in developing countries can be divided in large professional companies with a regional, national and/or international market and the small traditional companies with the city or a part of the city as a market. A company will, by definition, establish in the heart of its market. Such establishment strategy will minimise logistic costs.

As indicated in the typical city models, the large professional industries will establish at the edge of the city near the access roads, port and/or train stations to assure a good accessibility. Smaller traditional companies are located near their market within the city. Especially the last group have a major impact on the urban transport flows.

Western countries are mainly provided with large companies with international markets, located at the edges of the cities. The developing countries are mainly provided with traditional activities, which are located in the city itself. It looks like that there is a big difference in the establishment strategy in western and developing countries. However, this difference is not

initiated by the establishment strategy, but by the type, size and market of the individual companies.

- *Mode choice decisions by logistic managers, route and time choice decisions by drivers and location decisions by firms.*

The choice of the best modality depends on the required distance. In western countries, distances are relatively long as the individual companies have a very large market area. For efficient transport, consolidated transport by (multi modal) motorised equipment is absolutely required. In developing countries, (traditional) companies are located near their markets. Transport distances are relatively small, what can be considered as a different situation.

The best modality to organise the short distance transport depends on:

- The labour costs;
- The available infrastructure.

The total transport costs are determined by labour costs and the depreciation and operational costs of the vehicle used. In developing countries, labour is very cheap and the transport costs mainly determined by depreciation and operational costs. This makes non-motorised transport very attractive for developing countries. It requires a minimum investment and maintenance/operational costs are very low. The labour efficiency is very low, but this is not important, as the costs for labour are very low as well.

Another aspect that influences the type of modality is the infrastructure. The bazaar in Dhaka has very narrow streets, what makes the use of large vehicles impossible. The modality choice is firstly determined by the possibilities of the available infrastructure and secondly by cost aspects. The low labour costs in developing countries makes the use of non-motorised transport, especially for relative small distances, very attractive.

The cities that have been studied in this report are Rotterdam (western, fully developed), Nairobi (developing) and Dhaka (less developed). It was noticed that non-motorised vehicles (pushcarts, rickshaws and boats) are very important in Dhaka and that non-motorised vehicles are vanishing from the street scene in Nairobi. In Rotterdam, non-motorised vehicles are very rare for goods transport.

Route and time choice decisions mainly depend on the traffic-situation. Basically the shortest route is taken, unless congestion occurs. In case of congestion, people will choose the fastest route. The time of transportation is very dependent on the situation. Most transports in developing countries involve the transport of food and merchandise. Especially these transports will occur just before and after the market times.

7. *In view of the integral part which transport plays in the logistic structures of firms and industries and the increasingly global nature of economy activity, the consultant will review experience and comment on the following issues:*

- *To what extent is zero stock production taking hold in developing regions?*
- *What impact might it have on urban spatial structure and freight volumes*

Zero stock production or 'Just in Time production' is a concept to minimise the interest costs of stocks and minimise the space requirements of the factory/warehouse. Processes are linked together in such a way that products are delivered at their destination at the required time with a reliability of almost 100%. Such a concept is especially suited for plants/warehouses specialised in high value goods, which are located at high-value locations.

Although JIT is not a concept for third world countries, the traditional activities in the inner city resemble the JIT concept a lot. Especially at the food markets, deliveries take place 'Just in Time'. This results in high transport frequencies with low freight volumes. As most transport is realised with non-motorised equipment, this situation can result in major congestion. For that reason, JIT is not a concept to foster.

The main logistic concept in developing countries is order-based production. After receipt of the contract, the order-based companies will order the raw materials, manufacture the products and deliver them as soon as they are finished. The stocks are also minimal. This strategy is enforced by the poor financial situation of the companies and is not a strategy to optimise the process and reduce interest costs. Often the client has to pre-finance the required stock of raw materials for that order. The reliability of the date of completion is very uncertain in this concept. As a consequence, order-based production is basically different than the JIT concept. The order-based concept is very important for developing countries, as it is a good concept to deal with the poor financial situation of the companies.

The order-based concept is also characterised by relative frequent transports in non-consolidated form.

- *Has a market mechanism developed where buy/sell/deliver transactions can be completed with minimum distribution costs near storage transfer facilities?*

A separation has to be made between professional activities and the smaller traditional activities. Professional companies are often export-oriented companies, which are located at multi-modal nodes with a good accessibility. The clustered configuration of production/transfer points is one of the establishment conditions for professional international oriented companies.

For the local traditional activities, logistical services (warehouses, and so on) are mainly located near market areas. Although the distribution is very inefficient, the structure is very cost-effective under the local circumstances. The present logistical structures are cost driven and an indirect consequence of a market mechanism.

Import/export oriented logistic services are available in the city; they are located at strategic locations near their clients. These services operate effectively. The capacity of these services is very limited as the demand is very low.

- *What policies affect the location of major freight generating clusters in developing countries.*

The main freight generating clusters can be divided in traditional freight generating clusters and professional freight generating clusters. The traditional clusters are mainly located near the traditional markets. These markets have been traditionally grown and there is no special policy that has affected their location. The professional goods-generating clusters are mainly located at multi-modal nodes with a good access to port and airport. As a result, their location is directly determined by the location of access roads, railroads, ports and airports. The location of the goods-generating clusters can be influenced by urban zoning plans.

8. *On the basis of the evidence reviewed, the consultant should also comment on the relevant aspects of industry policy, including:*
- *Should zero stock production be encouraged in developing regions and if so how?*

As mentioned in bullet 7, it is not recommended to encourage zero stock production, as it will worsen the goods-related traffic intensities and it will increase production and distribution costs. At this moment JIT deliveries from third world countries to western countries occur, but these JIT deliveries are initiated by the western part of the logistic chain. The production process and the transport within the country are mainly order-based and are not related to the JIT concept.

New western process related logistic concepts are found to be ineffective for developing countries. These concepts will improve the labour efficiency,

resulting in additional unemployment. As labour costs are very low, there is not really an economical drive to apply new concepts. Beside this, unemployment can be regarded as an undesired side effect.

- *Are there any opportunities to use the newly emerging global production processes to help foster urban and regional change in a beneficial way?*

As concluded in our study, it is very important to improve the economic situation, for instance by expanding the export activities.

The emerging global production is certainly a chance to improve the weak economies of developing countries. Developing countries are very attractive to western companies as a result of the low labour costs.

The city could contribute to the emerging global production by the attraction of western companies. The western companies will offer a lot of jobs and will give an education to the local staff. This will improve the quality of labour and will help to fight unemployment. However, profits will flow abroad and the contribution to the city economy is limited. The activities related to the emerging global production are often large-scaled. Large scaled professional companies with international markets aim to establish at good accessible locations and will avoid the city centre. This would result in a development from city-oriented companies to companies that establish at the edge of the city. This would speed-up the development to a modern city, improving the city economy and improving the quality of life.

On the other hand, a contribution can also be realised by fostering local activities. On the short term, this approach would generate less jobs, however, profits will stay in the city and will contribute fully to the city economy. Probably a mixture of western companies and local activities would give the best results. Traditional activities are normally located in the city itself. However, to optimise the use of logistic services, which preferably should be located in the peripheral zones, these export oriented traditional companies should be stimulated to establish in the peripheral areas of the city.

- *What should be the public or private sector roles in activity restructuring*

Activity restructuring could be an important help to relief congested problem areas and prevent traffic concentrations. Restructuring requires a vision of the future situation and a thorough knowledge of the local culture and traditions. For that reason, restructuring should be preceded by the development of a general city plan. This city plan should be prepared by the local authorities. The city plan should have a very low detail level as the city develops with a very fast rate and actual developments are hard to predict.

The public sector could improve the establishment conditions for export oriented (western) companies by creating multi-modal nodes at strategic (edge of the city) locations. However, this is not sufficient. As companies establish, the region will attract new people, creating a new centre. An urban plan should be introduced to prevent undesired developments, such as an industrial zone completely surrounded by new residential areas.

The role of the local private sector is supposed to be marginal. Due to the poor financial position, the local private sector is hardly able to obtain a position in this process. Foreign companies could have a role in the restructuring. However, starting point is to attract these foreign companies to the city. This can be done by creating the correct establishment conditions, but can also be realised by economic programmes. The Dutch government has several subsidised programmes to develop new local activities. Starting point is that these programmes have (financial) advantages to the western as well as the local companies. As the programme is successful, it is likely that the western companies will start to invest to expand their activities in the specific region.

- *Is it desirable to re-develop and/or relocate distribution activities outside the urban core?*

The relocation of distribution activities outside the urban core is desired to improve the goods-related urban transport, but will result in negative side effects, such as unemployment and higher distribution costs. From logistic point of view, the present traditional logistic chain in Nairobi and Dhaka seems to be optimal for their situation. Restructuring of the actual logistic chains can only be considered when the traditional companies scale-up and turn into large professional companies.

This study concludes that it is very important to improve the economic situation, for instance by expanding the export activities. Due to the poor financial situation of the traditional companies, order-based production will be an important logistic concept for producing companies. Just like the JIT concept, the order-based production can result in a high transport frequency with relatively small loads. Especially small companies with relatively small orders will have a big contribution to urban transport. Logistic centres are required to consolidate goods and ship the goods to their destination.

There are two possibilities for these centres, in town or out of town. If located in the city, the export-oriented companies will stay in the city, what will have a big impact on the urban transport. This strategy is not efficient from logistical point of view and does not fit in the most probable developments (a shift from in-town facilities to out of town facilities). If located out of town, the short-term effects will be negative. The distance between warehouses and traditional manufacturers is too large. Nevertheless, traditional export oriented activities are very rare and because of that, it is possible to attract new traditional export related companies to the peripheral zones of the city. The existing companies can make use of the existing services in the city. This strategy would result in a shift of activities from the centre of the city to the edges of the city, improving the urban transport situation.

From our point of view, this strategy is not a strategy of relocating, but a strategy of adding. The present warehouses in the city are mainly related to the local market. This indicates that the demand for the existing warehouses will not decrease when new (export oriented) warehouses are developed at the edges of the city.

- *Is it possible to rationalise physical distribution within the core?*
- *Is a shift in retailing from central to peripheral areas desirable? If not, what can be done about it?*

The physical distribution in the core is related to local activities. As most people earn their money from these logistic chains, it is very hard to restructure these activities to the peripheral areas. A shift from retailing from urban core to peripheral areas is desired, but can hardly be realised, as people will have to live near their work. Most cannot pay for public transportation. Relocating the activities, which can be regarded as the main activities within the city, would result in a shift of residential areas to the peripheral areas, resulting in a new city centre.

However, as indicated in this report, decentralisation or urban restructuring could be a means to relieve very congested problem areas. Restructuring/decentralisation should be considered with its surroundings. Decentralisation by creating individual sub cities or self supporting districts could be a form of decentralisation/restructuring to prevent the city from growing to a mega city.

9. *For the situations reviewed, the consultant should comment on the suitability of transport systems in developing countries to meet the demands of modern logistics, with particular reference to the following:*

- *Does modal mix and service integration assure lowest cost/maximum service coverage transport within the urban area?*

As indicated in this report, efficient distribution is not a starting point to optimise transport costs in third world countries. Costs are initiated by investments and due to the very low labour costs; it is rather preferred to invest in (less efficient) people instead of transport equipment. Modal mix does assure lowest costs, but it is not the modal mix, as we know it in the western countries. The modal mix in developing countries does also include all kinds of non-motorised transport.

Export oriented companies connect to the distribution networks of western companies. This implicates that this western network will enforce certain conditions. These conditions could involve consolidated transport, delivery within a certain time frame, transport in containers and so on. To meet these requirements, effective logistic services are required. These requirements are not cost driven, but are demand driven.

In addition to this, the export flows are not likely to influence the urban areas. Export oriented plants, logistic services and so on will be located at the edges of the city, not influencing the city centre.

- *What is the evidence on effectiveness of urban rail lines, highway access to seaports, bus access to rail terminals, etc.*

The condition of the rail infrastructure is rather low in developing countries, what results in a poor reliability of rail transport. However, rail transport could grow to be one of the main modalities for goods transport. However, the effectiveness of railroads within the urban core is decreasing as companies grow and start moving to the edges of the city. For that reason, future (goods-related) rail projects should aim to connect to the clustered industrial zones at the edge of the city.

In the present situation, transport by truck is preferred above any other modality. It is considered more reliable and trucks are more flexible as they prevent double handling. In western countries, rail transport is relatively cheap as it saves on labour. However, for developing countries, this advantage is less important. The difference in costs levels of rail- and truck transport is relatively low. For that reason, it is expected that road transport will remain to be the main modality in the coming decade.

- *How effective are third party brokers, consolidators, shipper agents, haulage agents, forwarders and so on in developing countries.*

Third party brokers, consolidators, shipper agents, haulage agents and forwarders seems to be very effective in developing countries, especially in the chain between port and warehouses. They offer their services mainly for import and export activities and have a very limited role when the urban transport is involved. Brokers seem to have a very important role, as it can

be difficult to hire transports without the help of a broker. Most third party logistic services involve high valuable goods.

The market for these logistic services partly depends on the import/export flows. The market for these logistic services is relatively small.

- *How can a competitive market for urban freight be fostered?*

The urban freight market is very competitive in third world countries, especially when related to the traditional activities. Most people earn their money from trade, building activities or transportation. In fact, there are too many people who want to make a living in transportation. Consequence is inefficient transport, a lot of competition and underused transport equipment. From our point of view, further competition should not be a goal.

The present market for the logistic services as recommended in our report is non-existing. Condition is the attraction of new export-oriented activities. As a consequence, it is very hard to attract new companies that will invest in these facilities. The Dutch government has several subsidised programmes to develop logistic centres in third world countries. Such programmes could be means to develop the initial facilities.

- *What constraints or limitations inhibit development of through intermodal pricing and/or dock to door multimode transport?*

Multi modal transport, as we know it in western countries should be a long-term goal for developing countries. In the short term, multi-modal transport is limited by the poor condition of infrastructure (waterways, roads and railroads), labour costs (making inefficient transport attractive) and the fact that most transports are local or regional.

Multi-modal transport is especially attractive for long distance transport. Import and export flows are very small in most developing countries. For that reason, the market for multimodal transport is only able to grow when the export and import flows increase.

- *In congested cities, where freight transport is a serious contributor to that congestion, is there any case for rationing supply through licensing, restricted areas, service franchising, and so on?*

Improving the transport efficiency of traditional transport activities seems to be very dangerous. This can be illustrated by an example.

Most transport vehicles in Dhaka are only used for a couple of hours per day. This situation can be improved by licensing. This will result in fewer vehicles and a better use of the vehicles. Licensing would improve the transport efficiency considerably.

The result of such a measure is additional unemployment. Dhaka introduced a system of licensing, however due to the enormous unemployment, people don't comply and try to earn their living with transportation anyway.

Measures should be considered with great care. Some flanking measures (restricted areas) could be helpful to improve the situation. However, the authorities should be certain that people will actually comply with the measures. Otherwise measures will have no or even a negative effect.

10. *Finally there are some technical questions to be answered, including:*
- *What is the role of advanced information systems in improving urban freight movement in developing countries?*

Advanced information systems can be very helpful to improve urban freight movement, but again there is the danger of unemployment. Labour efficiency should not be a goal in third world countries. From our point of view, it is very important to develop new activities for export or the internal market. These activities will give a spin-off to the city economy and will ultimately result in better logistic structures. Internet and other modern means of communication could be very helpful for the development of these export activities.

Advanced information systems are also very important to the professional logistic services. These services are less related to urban transport, but are related to the regional/national and international scale.

Telecommunications are a main condition for companies to scale up and service a regional, national or international market.

- *What opportunities exist to improve load matching, forwarding load appointment making, load tracking, cargo interchange, and so on through the use of community cargo systems?*

Community cargo systems will consolidate freight flows at the urban level. This will reduce traffic intensities and optimise transport (and labour)

efficiency. It would have a very positive impact on the goods-related urban transport.

Community cargo systems can be regarded as 'short-term' solutions as it is expected that activities will move to the peripheral zones in the long term. The community cargo systems will substitute a lot of alternative transport modes, leaving a lot of people without work. From this perspective, such approach cannot be justified.