CHAPTER 7: INTERMODAL TRANSPORT

7.1 EXISTING ISSUES, OPPORTUNITIES AND CONSTRAINTS

7.1.1 Introduction

Both passenger and cargo transport are believed to benefit from Intermodal transport. But an important question that should be asked is whether this assumption is really true and if yes, when, how and in what segments of transport Intermodal transport can be effectively introduced in the Greater Cairo Area.

Intermodal transport is a complex transport system. Even definitions of Intermodal transport vary and sometimes contradict. Intermodal transport is not only given a range of different names, but also a wide variety of descriptions are in use, making the debate / discussion on the subject difficult and confusing[1]. To avoid entering in the details of this discussion, the JICA Study Team therefore adopts the Intermodal transport definition of Prof. Dr. Gerhard Muller that reads: "***the concept of transporting passengers and freight on two or more different transport modes in such a way that all parts of the transportation process, including the exchange of information, are efficiently connected and coordinated***"[2]

Many hurdles will have to be overcome to achieve Intermodal cargo transport in the future, but Intermodality will be a key-success factor for the future public transport system in Cairo.

7.1.2 Intermodal Cargo Transport

(1) Issues

There are very ***distinctive cargo traffic patterns in Egypt***. Cargo is transported predominantly between a limited number of cities / regions and the Greater Cairo Region (GCR) is the major attraction pole for truck traffic.

1 Technical Report 3, Chapter 6 provides a detailed review of the ongoing discussion and describes various elements of Intermodal transport in relation to those discussions.
2 Prof. Dr.Gerhardt Muller: "Intermodal Freight Transportation - 4^{th} Edition"; ENO Transport Foundation; 1999.

Also in the longer term, Cairo will remain the most important center for freight traffic. While the connection Cairo - Alexandria will stay a dominant corridor for freight transport, the importance of the Ismalia corridor will expand taking into account the planned development of the Sinai and the increased importance of the port for export and import towards Europe.

The majority of cargo is transported over the road, and given the present condition of alternative transport modes (river and rail), the modal split will not undergo substantial changes in the near future.

The present ***structure of the transport sector*** also contributes cargo to be transported by road rather than via river and rail. Large transport companies concentrate on high-volume contracts with large industries and agricultural corporations. The transport sector predominantly owns heavy trucks, in particular >3 axle trucks, but also has a large share of small pick up trucks and 2 axle trucks, this to respond to the specific needs of smaller industries. Manufacturers remain in many cases responsible for the transport of their manufactured products, using in large majority 3 axle trucks, which is perfect for transporting their manufactured products to the final consumer.

Given the control of the manufacturing sector over its transport and the emphasis of the transport sector on large contracts, transport specialization is rare in Egypt. For that reason, the large majority of trucks used are multi-purpose flat trucks and covered trucks. These vehicles can be used for transporting a wide variety of products, but are inefficient as regards the handling of the cargo. Transportation costs and transport time from origin to destination are therefore high, having a direct effect on the competitiveness of the transport sector and of the industry as a whole. The latter is caused by the cost of transport which is reflected in the consumer price.

(2) Constraints

Truck traffic is essential for the economic welfare of the Greater Cairo region. Its structure and pattern is a consequence of many factors, among which the most important are the truck ban within the Ring Road and the location of industries in the region. Although industries in the GCR are re-locating towards the satellite cities, several areas within the Ring Road area remain important industrial and production centers. At present, the industrial re-location towards the satellite cities is not supported by an efficient *road* ***transport infrastructure***. Large volumes of truck traffic therefore need to converge on the Ring Road before they can travel towards the satellite cities, adding to the already existing problems on the Ring Road.

The ***present impact of truck movements*** on GCR traffic can be summarized as follows:

- Truck traffic is dense on all inter-city roads. In particular Alexandria Agricultural Road and Ismalia Desert Road have high concentrations of trucks (both small and large trucks) while in Suez Desert Road, the share of large trucks is particularly high;

- The Ring Road section between the Alexandria Agricultural Road and the Suez Desert Road is the most congested area for truck traffic. All types of trucks are driving on this road, from small pickups and 2 axle trucks to large 3 axle and articulated trucks.

- Inside the Ring Road area, truck traffic on the extensions of the major inter-city roads is very dense because it accommodates large quantities of small trucks (pickups and two axle trucks). However, the share of heavy trucks is not negligible and trucks apparently penetrate precincts located inside of the Ring Road, even though a truck ban is in place;

- Truck traffic with the satellite cities is particularly dense. Influx of trucks from the industrial center of 10th of Ramadan and small trucks moving to and from Obour Wholesale Market cause many traffic problems on Ismalia Desert Road. 6th of October city, with its wholesale market and industrial concentration, also attracts pronounced volumes of trucks from Cairo and the Upper Egypt Desert Road and Upper Egypt Agricultural Road. A large share of truck traffic also travels between 6th of October City and Alexandria via the Western Ring Road.

Access to Cairo and to the satellite cities for alternative modes (rail, river) is very poor if not inexistent and forces the industry to use road transport, contributing therewith to the existing traffic problems. Although truck traffic is not directly responsible for most traffic problems, it frequently contributes to making the situation problematic.

Even if the infrastructure would be in place to move cargo via rail and river, the transport sector is not adapted to develop efficient *integrated* transport systems that optimize cargo flows. In addition to the necessary basic hardware (infrastructure) there is an urgent need for improved humanware (expertise building) and software (modern equipment and information exchange systems).

(3) Opportunities

Translating the existing constraints into positive action means that the transport sector should:

- Increase competitiveness and responsiveness to market forces;
- Integrate modern logistics in their offer;
- Innovate cargo handling processes as a catalyst to specialization;
- Increase transport integration and in time also develop Intermodal transport.

Governmental action should support this process and:

- Continue the process of liberalization / privatization of the transport sector;
- Stimulate sector reforms towards specialization in transport services;
- Stimulate industrial reform where transport is *outsourced* to the transport sector;
- Stimulate industrial re-location according to sector-specific needs;

- Increase transport infrastructure improvement/development, in particular in waterways and transport to enable efficient Intermodal transport;
- Increase and improve regulatory control on transport to stimulate fair competition.

7.1.3 Intermodal Public Transport

(1) Issues

The key-points of attention in developing the future public transport system in the GCR are:

- Integrated use of different transport modes;
- Efficient connections;
- Improved coordination;
- Available information.

In developing Intermodal Public Transport in Cairo, one of the major problems that Intermodal passenger transport is presently facing will have to be addressed, namely the *integrated approach*.

The European Commission, in its most recent White Paper, summarized the problem(s) as follows[3]: "*In passenger transport, there is considerable scope for improvements to make travelling conditions easier and facilitate modal transfers, which are still highly problematic. Far too often passengers are put off using different modes of transport for a single journey. They have problems obtaining information and ordering tickets when the journey involves several transport companies or different means of transport, and transferring from one mode to another can be complicated by inadequate infrastructure*".

The above comment could easily be made on the basis of the Intermodal capability of the public transport network in Cairo, which suffers from a lack of convenient facilities, the absence of integration between modes and, with exception of the metro and ENR services, a complete lack of information dissemination.

(2) Constraints

From an efficiency perspective, the GCR public transport modes (including privately operated ones) should be considered (and operated) as parts of a single public transport network.

Integration of public transport is at present absent because:

[3] White Paper: "European Transport Policy for 2010: Time to Decide", COM(2001) 370, 12/09/2001, p 80

- Outdated and inefficient / unattractive transport equipment;

- Counterproductive competition between the different modes (and in particular shared taxi, bus and metro);

- A fare policy that is not integrated across public transport modes, and does not reflect economic and business realities.

- The lack of efficient Intermodal terminal facilities.

Developing an Intermodal public transport system requires the efficient integration and interconnection of the different public transport systems. Terminals play an important if not critical role in the efficiency of the system and determine for a large part the level of direct and indirect impact on the total traffic system. The results of the CREATS Intermodal survey[4] clearly demonstrated that at present, there exists no ***intended*** Intermodal public transport system and that only transport links are provided, without the necessary facilities to make these links efficient and effective. From the perspective of the integrated transport system, it could even be suggested that ***the way public transport terminals in Cairo provide public transport does not solve any of the traffic problems but does actually add to the level of congestion***.

For Intermodal efficiency, public transport terminals need to provide infrastructure facilities for the connecting transport modes. These facilities are, e.g.,

- Private parking space;
- Separate access lane;
- Dedicated stop.

On average, public transport terminals are not designed from an Intermodal service perspective and have poorly structured "Intermodal" transport or no "Intermodal system" at all. The "system" predominantly consists of shared taxis (microbuses) and public buses (or minibuses) stopping in the neighborhood of these terminals to load and unload passengers.

(3) Opportunities

The re-organization objectives of public authorities in developing an Intermodal public transport are to:

- Create an integrated system with co-ordination and optimization of the interconnectivity of transport modes;

- Extend the use of existing fixed transport (metro, rail, tram) by creating efficient feeder services to these lines. Speed and regularity of the feeder service will be a critical success-factor;

[4] See progress report 2 Chapter 7 section 8

- Introduce the hierarchy-principle into the public transport system where low-capacity services provide support to the high-capacity public transport system;
- Restructure the shared taxi network in such a way that the effectively operate as end-line service providers and do not compete with long-haul public transport services;
- Improve the service level of public transport, both on the lines as at the interconnecting points;
- Optimize the cost effectiveness of public transport by avoiding redundant services and optimizing the fare structures.

7.2 WHY INTERMODAL TRANSPORT?

Transport of goods and passengers is a critical component of every economy. In Europe for example, total transport expenditure runs to some 1.000 billion euros per year, which is more than 10% of the European gross domestic product. The sector employs more than ten million people over the whole of Europe. At the same time, passenger and cargo transport in all its aspects are imposing an ever increasing burden upon society. At present, the costs of road traffic congestion amount to 0.5% of Community GDP and by 2010, these costs will increase by 142% to reach 80 billion euros a year or approximately 1% of Community GDP[5].

Consequently, public policy makers all over Europe are appealing for the development of Intermodal transport and rail and river transport as alternatives for road transport. For policy makers road transport should focus on moving goods and passengers between the points of origin and destination and the nearest transit point. But markets are not impressed by words and theories and assess the feasibility of Intermodal transport solely by its bottom-line costs and profits. Public policy makers should not be surprised about the lack of success. Intermodal transport has higher costs, longer time frames, inferior quality, higher risks of damage to goods, restrictions as to the types of goods that can be transported, and more complex administrative procedures.

These friction costs lead to a loss of efficiency and an increase in total transport costs. Under these circumstances, private companies are reluctant to shift to Intermodal transport as alternative to road transport.

So is Intermodal public and cargo transport a priority objective for Egypt?

[5] *White Paper on Transport: "European transport policy for 2010: time to decide", European Commission, Brussels, 12/09/2001, COM(2001) 370*

7.3 INTERMODAL PUBLIC TRANSPORT IN THE GCR

7.3.1 Introduction

Of the trips recorded during the Public Transport Passenger Survey[6], 49% of the trips involved the use of 2 modes, 13 % of 3 modes and 1 % of 4 modes while only 37% of the trips used one mode. ***This result shows that Intermodal public transport in the GCR is not a theoretical concept but a daily practice***. It should, however, be mentioned that this high percentage is partly due to the large size of the CREATS study area and that undoubtedly, lower values can be found inside the GCR. The detailed analyses of the public transport system in Cairo[7] demonstrated that the present offer of public transport is provided by a formal urban public transport service provided by the public sector and an informal sector that consists of privately owned licensed shared taxis that offer route specific transport. But in many parts of Cairo, transport is also provided by non-licensed vehicles that offer uncontrolled transport under highly dangerous conditions.

The shared taxis are responsible for 25% of total daily mechanized linked person trips and public busses 21%[8]. Both modes combined are responsible for nearly 50% of total person linked mechanized trips and directly respond to public demand

In several cases of infrastructure works for - and structural reorganization of public transport, Intermodality was not an issue and mistakes were made in providing interconnectivity between the different modes, frequently leaving passengers with the feeling that the situation deteriorated.

7.3.2 Key issues for Intermodal Public Transport

(4) Important remark

In next paragraphs, a number of representative public terminals are discussed. In addition to a detailed description of the identified problems, Intermodal solutions are proposed. ***It is clear that the proposed solutions as given in the sketches and lay outs of intersections, squares etc… are CONCEPTUAL and cannot be taken as final designs. Any final solution will require in-depth traffic studies and accurate mapping and details of the sites and the bus- and car flows. Furthermore, any final solution can only be obtained in consultation with the concerned local authorities.***

(5) Intermodal terminals for public transport

The next Figure 7.3.1 visualizes the proposed public transport network. As can be seen, the network is rail-based, interconnecting the WINGS with the metro and supported by the LRT supertram of high quality and speed.

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6 *Refer Volume II, Chapter 6 of this report for further detail regarding the PTPS.*
7 *See Chapter 4 of the Phase I Final Report.*
8 *Progress Report 2, Chapter 5*

The figure includes important interconnecting points on the network and categorizes these Intermodal connections into four types. The categorization is based upon their functional role in the network.

To complete the Intermodal public transport network of Cairo, road based public transport, in particular CTA busses, ensure the interconnectivity to the network via major inner-city bus corridors while the role of shared taxis is to feeder the network according to a zonal system[9].

From an Intermodal perspective, all interconnections are important and should be considered individually to guarantee that their Intermodal quality is optimized. This can only be done in the context of a full and comprehensive *Intermodal public transport network study*.

In CREATS, four different types of interconnecting points are identified. The four terminal types were defined either on the basis of their importance in the network or because they have a particular function in the network.

Four terminals, representing each the first three types of interconnecting points are taken as example on how the interconnecting points should be rehabilitated or developed. For the forth type, no example is given but the concept of Park and Ride is discussed in more detail. The example terminals are represented in Figure 7.3.2.

[9] *See for a detailed description of the approach Progress Report 2, Chapter 7.8 and Phase I Final Report Chapter 4.*

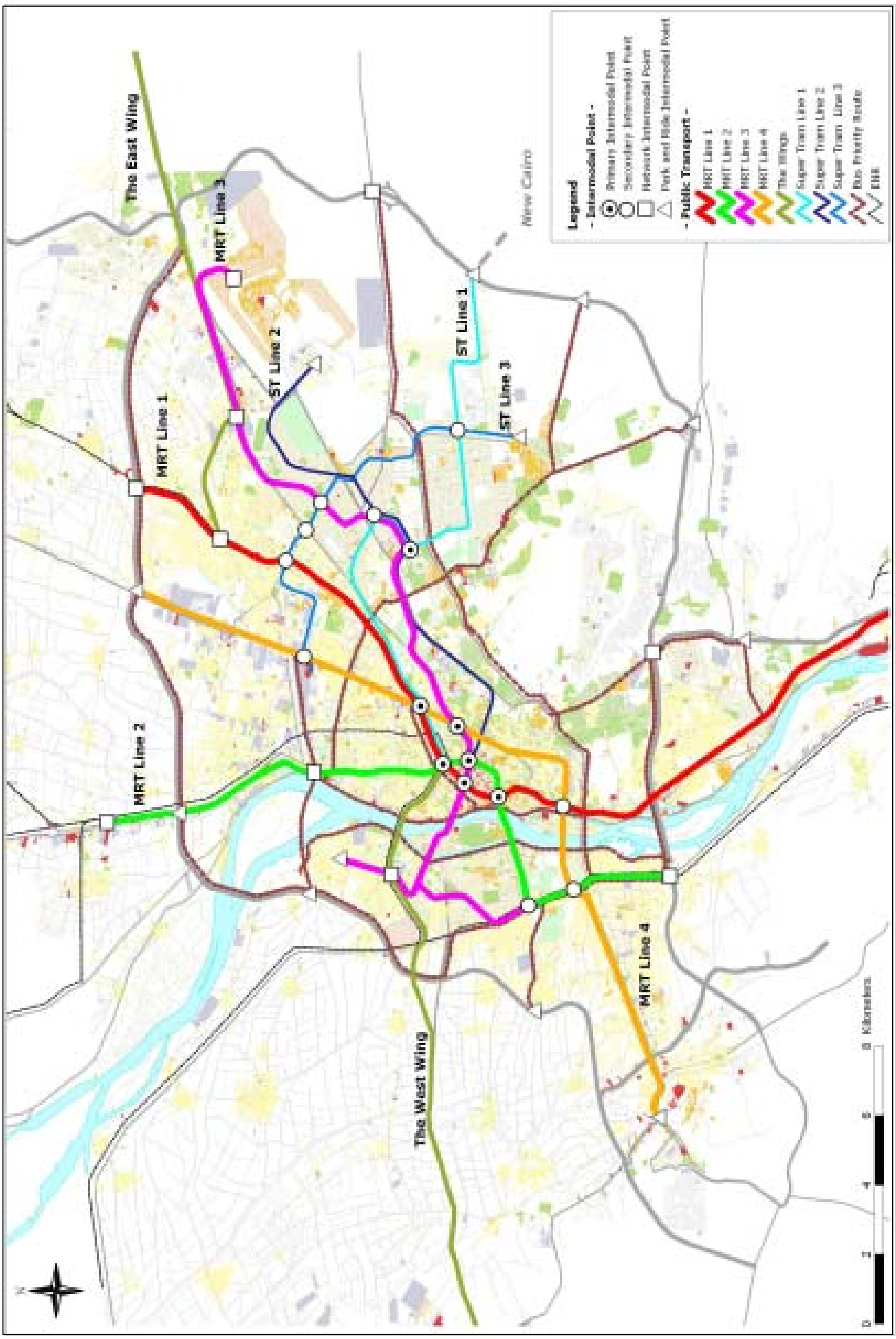


Figure 7.3.1 Public Transport Network Terminals

Source: JICA Study Team

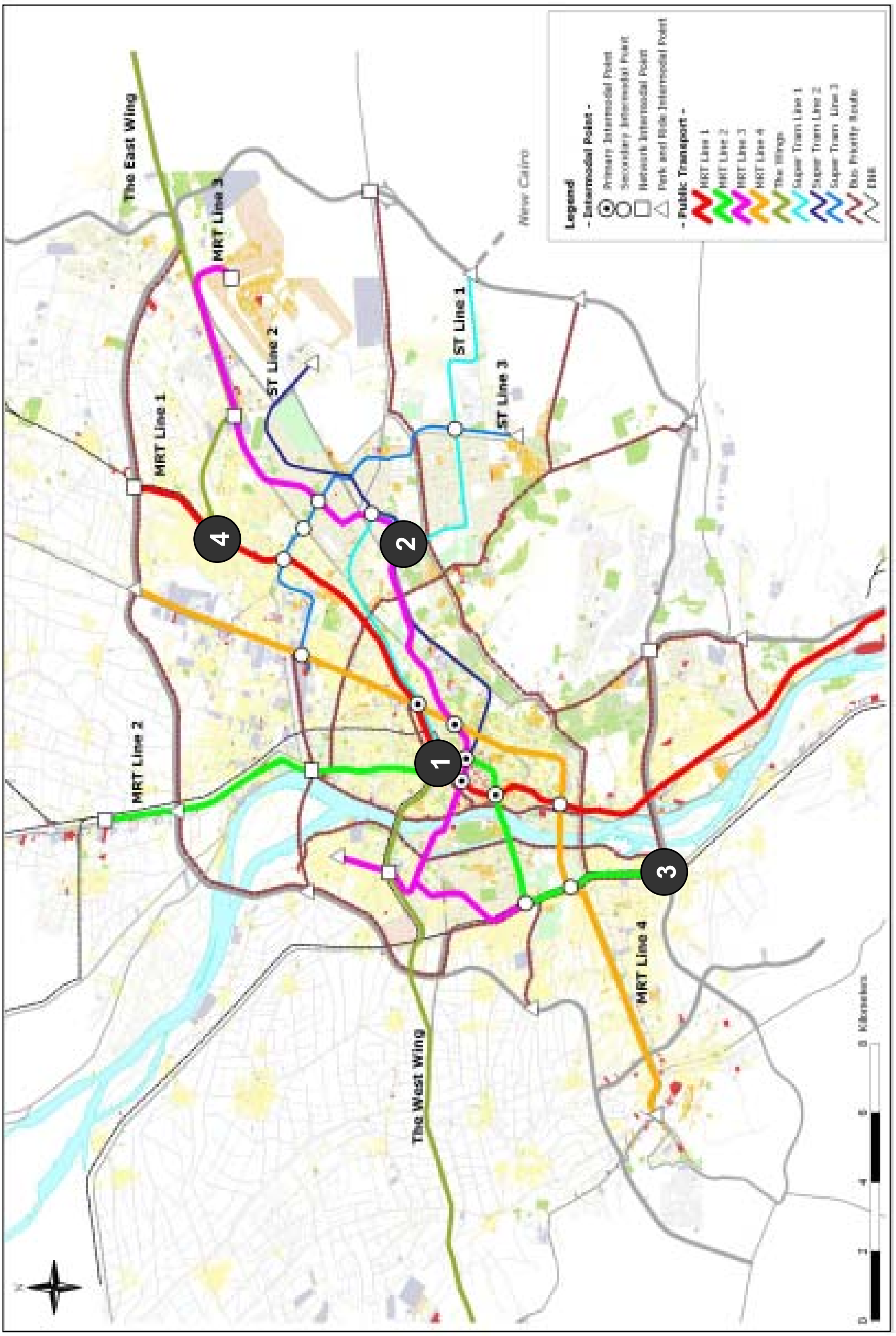


Figure 7.3.2 Public Transport Network and Example Terminals

Source: JICA Study Team

Four different types of interconnecting points can be identified inside the public transport Intermodal network:

1. Primary Interconnecting Points
2. Secondary Interconnecting Points
3. Network Interconnecting Points
4. Park and Ride Interconnecting Points.

Primary Interconnecting Points are locations where all public transport modes converge and high numbers of passengers transit from one mode to another and access or enter the public transport network. These terminals are centrally located in the network. Ramses is a good example of a Primary Interconnecting Point.

Secondary Interconnecting Points are situated on the intersection of two different types of public transport, e.g., Metro Line and supertram. Their functionality is similar to the Primary Interconnecting Points but the number of modes converging in the terminal and the number of passengers per day using that terminal is less. Stadium Station will in the future become an interesting Secondary Interconnecting Point and because the infrastructure still needs to be build offers a good opportunity to optimize Intermodality.

Network Interconnecting Points are located at the boundaries of the network and link the public transport network with inter-city public transport. Moneeb inter-city bus terminal is taken as an example on how these terminals function. The level of Intermodal complexity is low in these types of terminals because linking with buses is less complex than linking with fixed railway lines. Ain Shams Terminal is discussed as a second example of a railway based Network Interconnecting Point where existing facilities and construction constraints make its rehabilitation more complex.

The Park and Ride Interconnecting Point provides dedicated parking services for private cars and connects with the public transport network. Park and Ride is discussed in a separate section in this Chapter.

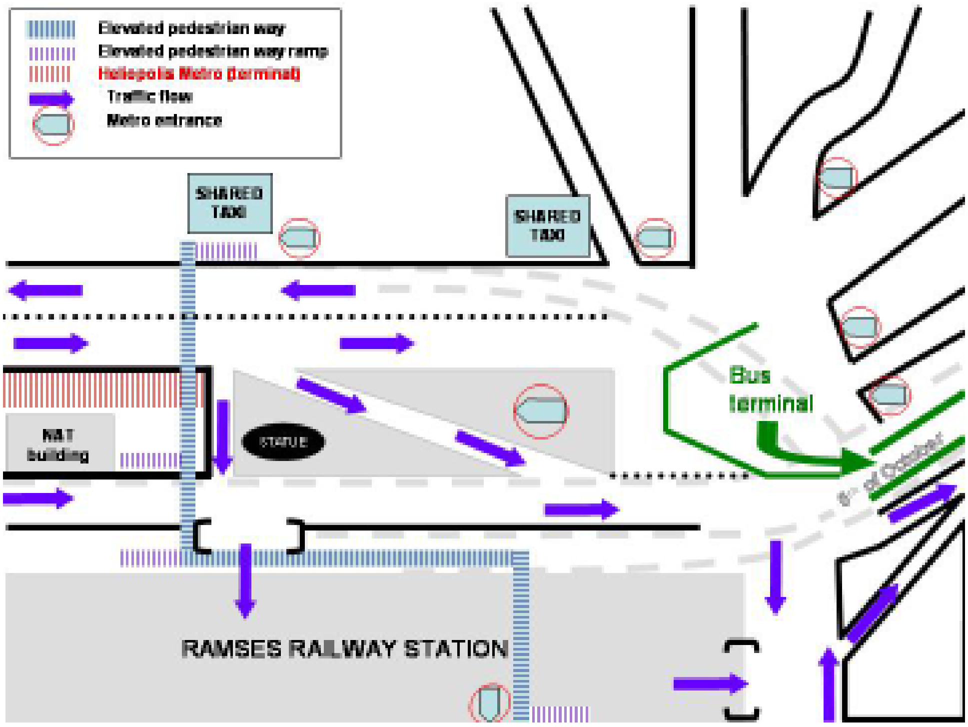
The four terminals that will be discussed in detail are:

1. RAMSES RAILWAY AND METRO STATION (Primary Interconnecting Point)
2. STADIUM STATION (Secondary Interconnecting Point)
3. MONEEB STATION (Network Interconnecting Point)
4. AIN SHAMS STATION (Network Interconnecting Point)

Ramses Railway and Metro Station (*short: Ramses station*)

Ramses station is undoubtedly one of the most important public transport stations in Cairo. It is the terminus of the ENR railway and is directly linked to the CTA bus terminal, the metro lines 1 and 2 and the terminus of Heliopolis metro (the future LRT 1). Mini busses and shared taxis further crowd the streets and the terminal to transport the people to and from this area. This concentration of traffic and persons generates huge congestion and the problem is further aggravated by the traffic and pedestrian behavior and by the illegal merchants selling their products in the middle of traffic.

The present situation is visualized in the next two figures. The first figure represents major traffic flows and a schematic of the road infrastructure. The second figure visualizes in detail the railway terminal.



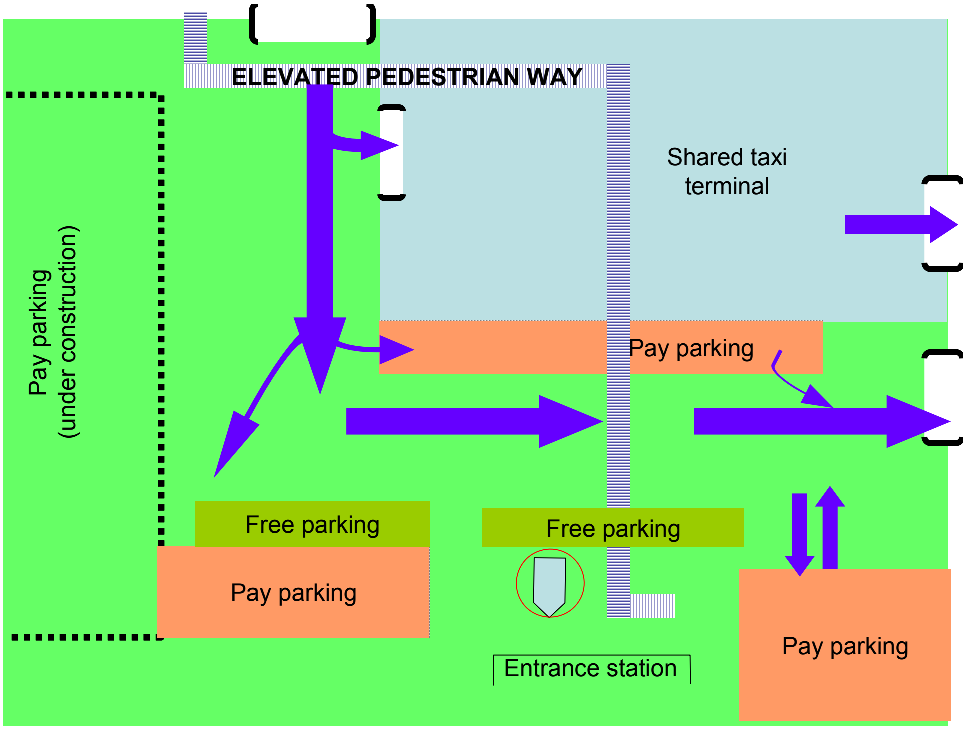
Source: JICA Study Team

Figure 7.3.3 Ramses Railway and Metro Station

In principle, Ramses station has the necessary infrastructure and structure to operate as an Intermodal terminal. Railway, metro, tramway, bus and shared taxis are linked via the elevated pedestrian way and via the metro passage. However, major traffic problems occur near the terminal and even further on Ramses Road next to the tramway terminus, traffic problems arise as a consequence of the problems near the station (*triggerneck congestion*). Ramses railway terminal has huge problems at the entrance and exit points.

Traffic wanting to reach the terminal needs to cross the access ramp toward 6^{th} of October and gets blocked at the entrance hindering other traffic on the street. Arriving traffic via the small street in front of the NAT building (mini-buses and shared taxi) gets stuck and starts unloading its passengers at that point or at any free space around the statue. In particular shared taxis use the road in front of the railway terminal to avoid entering the terminal. This chaotic situation negatively affects traffic on all access points and hinders trough-traffic. Many shared taxis also stop at the exit of the railway terminal, obstructing traffic that wants to leave the terminal and blocking the road for all others.

In between this chaos merchants display their merchandise on the streets, in particular along the terminal fence and on the road between the statue and the entrance of the metro. This of course adds to the problem and reduces the capacity of these already narrow and congested streets. At the same time, people wanting to change from one mode to another need to “search” their next shared taxi or mini bus ride because a large number of the shared taxis do not use the designated terminal, adding to the already problematic situation outside the terminal.



Source: JICA Study Team

Figure 7.3.4 Ramses Railway Terminal - Detail

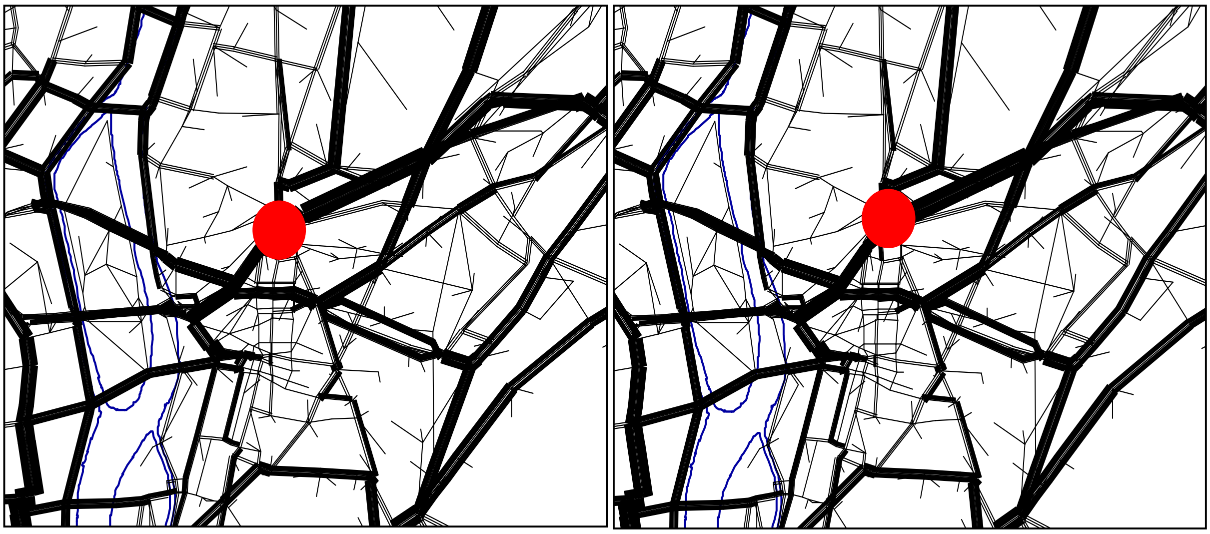
Both the entrance and the exit of Ramses terminal are fully congested, making traffic inside the terminal difficult if not impossible. The problems are not only a consequence of the situation outside the terminal, but are even more so caused by the chaotic behavior of taxis and private vehicles that load and unload passengers in the terminal area.

Although the original design of the terminal was highly efficient, the effectiveness of the different sections in the terminal has disappeared over time to be al but useless at present. The shared taxi terminal is too small to accommodate the present volumes, the parking space for private cars (paid and free) is over-crowed and in particular the free parking area is used by taxis while the entire road section in front of the terminal is used by taxis and private cars as loading and unloading zone. Even the new paid terminal presently under construction will not solve the problem as long as its development is not part of a comprehensive restructuring of the terminal.

Any solution to the problem needs to address the terminal and the access to the terminal simultaneously. On the one hand, the design of the terminal has to be adapted to Intermodal needs, while traffic flows to and from the terminal need to be redirected to guarantee a better more fluent throughput.

Managing public transport traffic flows on Ramses Square is particularly important, given the high density of buses and shared taxis that converge at the interconnecting point, predominantly via Ramses Street and parallel streets, see next figure.

Ramses public transport flows

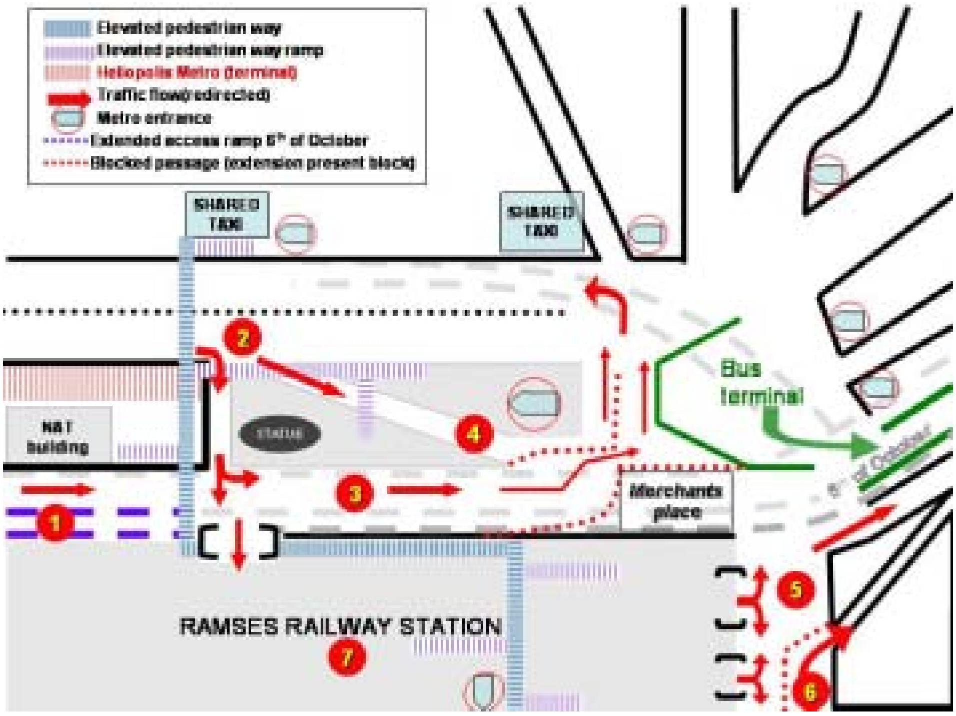


Bus flows **Shared taxi flows**

Source: JICA Study Team

Figure 7.3.5 Ramses Station - Concentration of Buses and Shared Taxis

A possible solution is provided in next 2 figures. The objective of the proposed improvements is to guarantee a better flow of traffic and to avoid as much as possible that traffic needs to cross or bypass.



Source: JICA Study Team

Figure 7.3.6 Access roads to Ramses Railway Terminal - Improved Situation

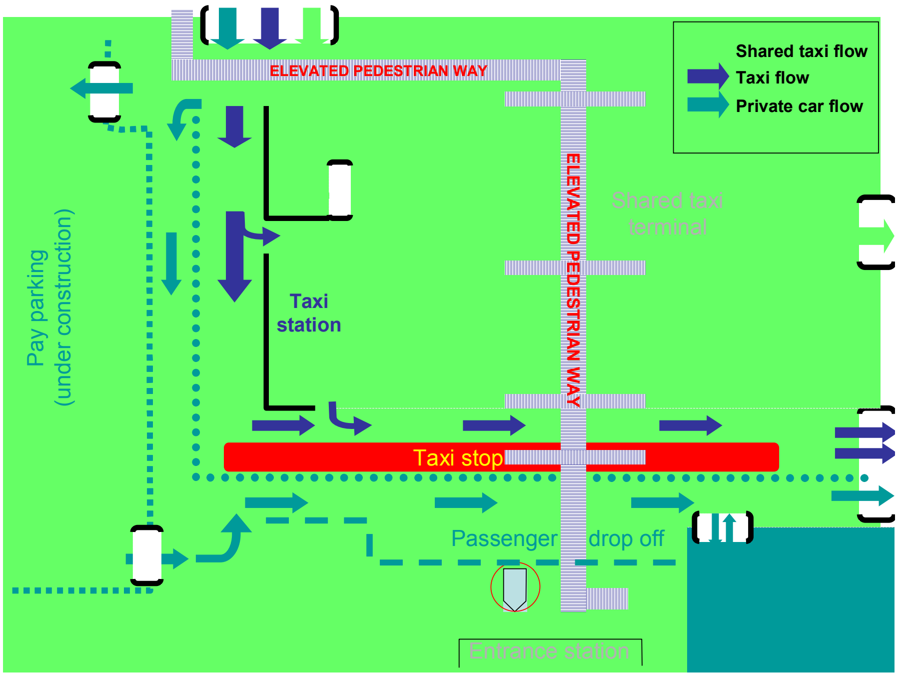
A first and critical improvement is at the access ramp to the 6th of October expressway. The ramp should be extended to prevent traffic entering the terminal to mix with traffic accessing 6th of October. This extension will avoid that traffic coming from the small street between the statue and the NAT building to block. However, implementing this solution will require a detailed traffic flow study in the area to find solutions for the existing one-way streets.

A second improvement is that traffic coming from Ramses has to be separated in traffic that wants to enter the terminal and traffic that wants to load and unload passengers. The former can take the street in front of the NAT building and proceed towards the terminal while the latter needs to be guided / forced towards the street between both small squares. All vehicles should be prohibited to stop in front of the NAT building in order not to block the flow of vehicles towards the terminal. This second improvement will generate two effects. The first is that because of a more efficient flow of traffic, the street running parallel to the terminal can be used as stop for the shared taxis that come from Ramses and from the small street in front of NAT. The second is that the street in between the two small squares can be used as a mini bus terminal, therewith limiting the number of mini buses that stops on Ramses Street.

But the infrastructure improvements need flanking measures. The first is that traffic has to be guided as shown with the red dotted lines on the figure. These dotted lines represent fences that prevent traffic from passing. The second is that the merchants have to be removed from the street and pedestrian ways and confined to a designated area where they do not interfere with traffic. The third measure is to install barriers in such a way that pedestrians will only use the metro passage or the elevated pedestrian way to reach their destination and crossing the street randomly is avoided.

Near the exit of the railway terminal, congestion is also high as a consequence of much traffic that converges at that point. The street is also used by mini buses and shared taxis (and taxis) as stop for the terminal, making traffic almost impossible. Redirecting and separating traffic will alleviate this narrow street from the massive congestion that it knows at present. The discussed measures will generate a direct impact on traffic at the exit of the terminal. Because traffic coming from Ramses is no longer able to make a turn at the corner of the terminal, this portion of traffic that blocks at present the exit of the terminal will disappear. The number of cars that approaches the exit of the terminal from Shobra (via the extension of El Tera Street and El Sablia Street) should be steered into the street opposing the exit of the terminal. In that narrow street, parking or even stopping vehicles should be prohibited to maximize the capacity of this small street. All traffic that leaves the terminal can than easily go left or right without being blocked by other traffic. *The proposed restructuring of traffic is only evaluated at the conceptual level. A detailed traffic study will be necessary to assess the feasibility of each of the proposed changes and to analyze the impact on traffic in the surrounding streets.*

Transformations inside the terminal area are also urgently needed. The proposed improvements are visualized in next figure. The basic concept of the terminal is maintained in the proposal, but the different types of vehicles are separated. Given that the measures to restructure traffic outside the terminal will in theory increase traffic throughput inside the terminal, it is imperative to ensure that this throughput traffic remains fluid also in practice. Separating traffic can achieve this, given the different functionalities of passenger vehicles, taxis and shared taxis.



Source: JICA Study Team

Figure 7.3.6 Ramses Railway Terminal - Improved Terminal Lay Out

First, private vehicles are separated into a dedicated lane where they have the possibility to park for a longer time in the two pay parking areas. They have the possibility to (un)load passengers at a designated space in front of the terminal entrance. Also taxis are forced to use their proper lane, and can only load and unload passengers along the taxi stop sidewalk. Taxis will no longer be allowed to park inside the terminal (as they now do) except in a small designated area where a license system should ensure that this facility is properly used. The two lanes are physically separated with a fence, forcing pedestrians to cross the terminal via the elevated pedestrian walk via which they can access both the taxi stop and the shared taxi terminal. If they want to leave the terminal to reach shared taxi or bus terminals outside, they can use the metro passage.

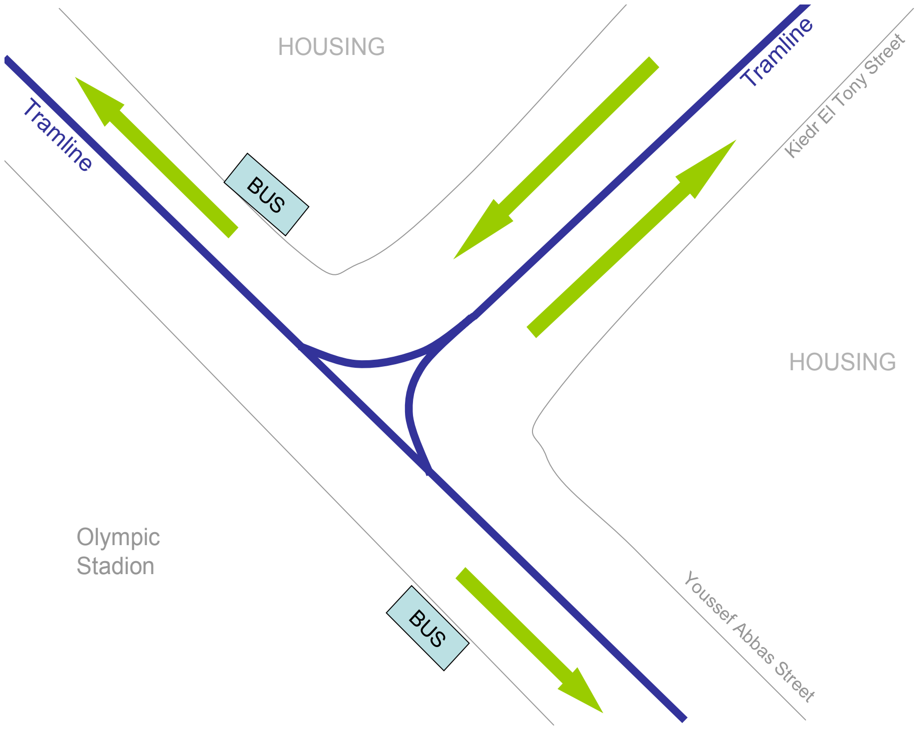
The shared taxi terminal is expanded to efficiently accommodate the increased volume. Restructuring traffic flows of shared taxis outside the terminal area will contribute to better structure the parking. It would also allow informing the users correctly and accurately about the destinations of the different shared taxis so that they no longer have to search the street to find the shared taxi they need. In other words, a real shared taxi terminal could be developed. Access to the terminal should also here only be possible via the elevated pedestrian way to avoid interference between pedestrians and vehicles.

By making it difficult for pedestrians to cross the terminal except via the elevated or metro passage, access to the areas outside the terminal will be more difficult and the use of the metro passage and elevated pedestrian way will increase. This in turn will have a positive impact on traffic flows just outside the terminals that will be less hindered by pedestrians directly interfering in traffic. A critical success-factor is the **enforcement** of the imposed measures. Vehicles and pedestrians have to be forced inside their designated areas both inside and outside the terminal area by means of a permanent police presence and an immediate penalization of all persons that do not obey the rules. The proposed barriers at strategic locations will help, and if not, police enforcement will ensure that people follow the rules properly. Attention should also be directed towards the merchants who have to stay into their designated areas and completely banned from the streets.

Stadium station

Stadium station will in future link the rapid LRT line with the proposed Metro 3 line. Also bus and shared taxi will be present at this terminal. It differs from Ramses station because this terminal will be designed simultaneously with the development of Metro 3. This offers interesting opportunities to optimize terminal design and minimize construction costs.

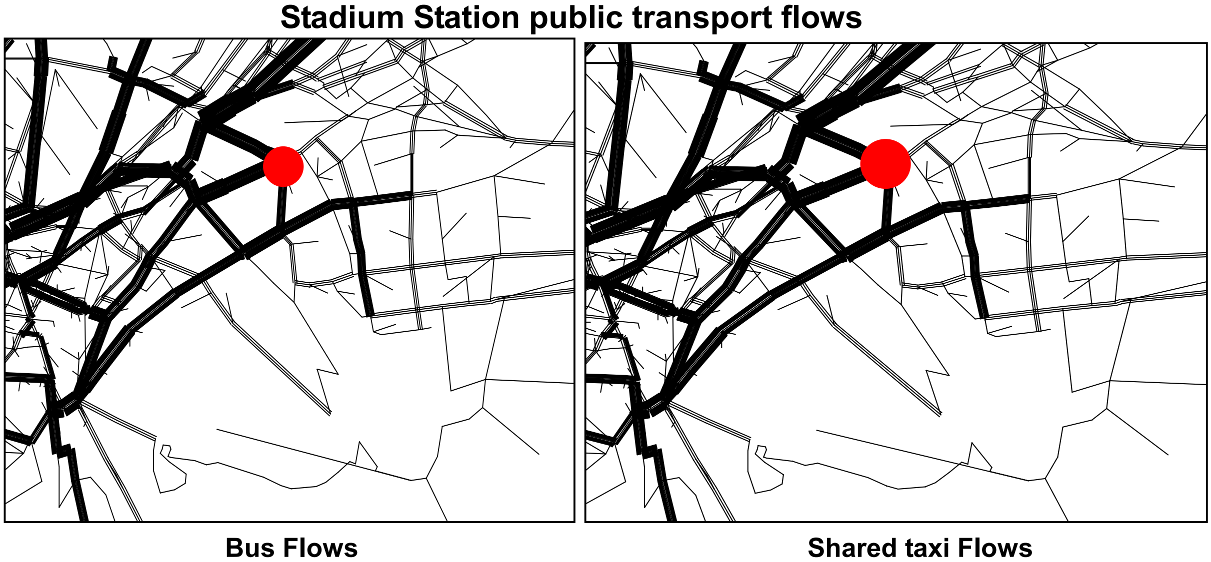
At present, the terminal is of low Intermodal interest. Just one small problem could be the interference between tram and road traffic at the intersection. This sometimes creates minor problems for the tram, but the effects are minimal, given the low speed and frequency of the tramway. The present situation is visualized in next figure.



Source: JICA Study Team

Figure 7.3.7 Stadium Station - Present Situation

Once Metro Line 3 and the proposed LRT are implemented, the importance of Stadium Station will increase and passenger volumes and traffic will sour.



Source: JICA Study Team

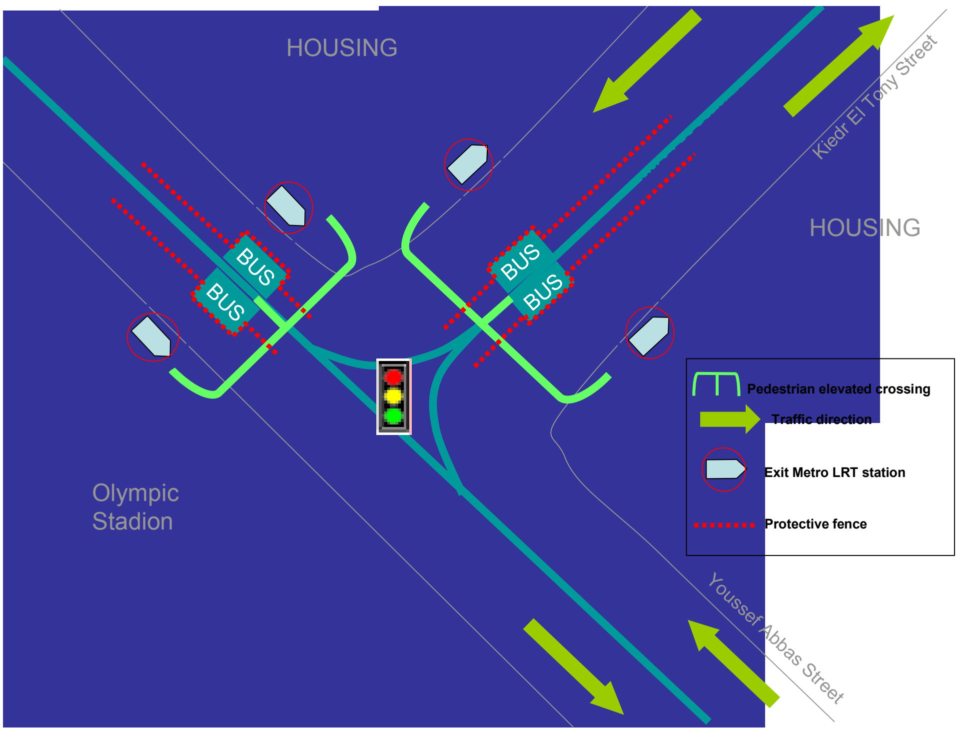
Figure 7.3.8 Stadium Station - Concentration of Buses and Shared Taxis

Stadium station is located parallel to the Metro Line 1 corridor which at present attracts high levels of buses and shared taxis. The volume of Stadium station is much lower now but once the new metro line and supertram are developed, traffic in Stadium station will substantially increase and attract new passenger flows.

The introduction of the metro and supertram at that location will also generate important volumes of supporting traffic (bus, taxi and shared taxi) upgrading this interconnection to the level of a Secondary Interconnecting Point.

The design of the new Intermodal terminal should avoid that the expected increase in traffic generates congestion and must ensure that accessibility to all public transport modes is optimized. The future Intermodal concept is proposed in next figure.

The optimal solution is to bring the LRT underground to improve interconnectivity with the metro and to avoid traffic problems as a consequence of the high frequency of supertrams on the line that will disrupt normal traffic. A combined underground terminal for metro and LRT would complete the design. Construction costs of the LRT terminal could be minimized / optimized if combined with the construction of the metro line.



Source: JICA Study Team

Figure 7.3.9 Stadium Station - Future Situation

The full underground option has several advantages:

1. Reduced investments because the construction of the LRT line and station is combined with the construction of the metro line and station;
2. Increased revenues at the terminal can be generated because the commercial space is doubled;

3. Positive environmental effects (in particular noise and vision) because the LRT would run underground in this densely populated area;

4. Free space for a priority bus lane. Priority of the buses at the intersection would be guaranteed via traffic lights and access to the bus terminal is possible via elevated pedestrian crossing;

5. No impact from private cars on the LRT movement, therewith eliminating possible congestion and disruptions of schedules when the metro and LRT line are operational.

A second option is the elevated LRT line. This option could be selected if the development of the LRT line is decided / started prior to the construction of the metro line. In that case, the elevated LRT could be a temporary solution until the construction of Metro Line 3 begins (and option 1 is implemented).

In case the elevated LRT is selected as a permanent solution, some positive and negative consequences can be identified:

1. Positive consequences;

    a. Construction costs are lower than the underground option. However, a detailed study should indicate what the differences are between option 1 and option 2;

    b. The LRT line would remain separated from normal traffic to ensure the efficiency of the proposed service (LRT every 2 minutes);

    c. The possibility remains to have a priority bus lane under the elevated LRT. The priority of the busses at the intersection would be regulated via traffic signals;

2. Negative consequences;

    a. If the elevated option is temporary, the investments are high as compared to option 1;

    b. The negative effect on the environment increases for noise and vision impacts;

    c. The financial benefits generated by the stores in the underground LRT terminal disappear.

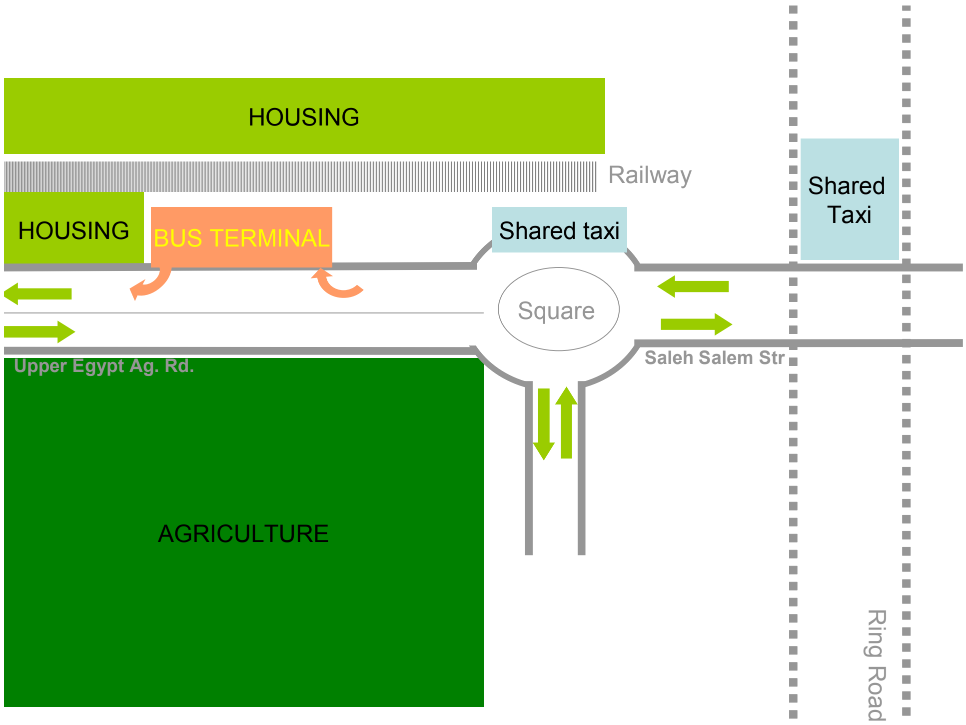
A theoretical option is to have the LRT run in a separated corridor at street level. But the high frequency of the LRT line (a car every two minutes), makes it impossible and would generate unacceptable traffic problems at the intersection.

An important element is the protective fence at the bus stop near the metro exits. Independent of the selected option, this fence is necessary to control pedestrian movements at the intersection. Without the fence, people will cross randomly the street or want to reach the bus stop without using the elevated pedestrian way.

Given that shared taxis, taxis and other traffic will increase in the future, this will have a negative impact on the efficiency of traffic throughput in the area. A fence that forces people to cross the street via the elevated pedestrian way will not only be efficient for traffic, but will also be much safer for the pedestrians. In a later phase, an underground Park and Ride parking could be considered, possibly in combination with a shared taxi terminal, further improving throughput of traffic at the intersection, thanks to the elimination of random stopping of shared taxis at the terminal entrances. It is also much safer for the people waiting at the bus stop.

Moneeb station

Moneeb station is a typical Network Interconnection Point and is the third terminal for which a conceptual Intermodal approach is provided. Moneeb station is at present a relatively small inter-city bus terminal. The planned extension of Metro Line 2 will make this an important Intermodal terminal connecting the city network to the inter-city public transport network. The present situation at the terminal is visualized in next figure.



Source: JICA Study Team

Figure 7.3.10 Moneeb Station - Present Situation

The bus terminal is located on Upper Egypt Agricultural Road, on the right side of the road. Shared taxis service the area at two locations, on the square where they stop randomly and at the shared taxi station located under the Ring Road on Salah Salem Street. Illegal stops at the shared taxi terminal frequently block traffic in both directions on Salah Salem. The intercity terminal in itself causes constant traffic congestion on the road to Upper Egypt, consequence of its design and location. The terminal capacity cannot accommodate the number of buses so many stop on the road, blocking all other vehicles. Buses coming from Upper Egypt have no terminal at all and have to stop on the road. Because the roadside there is frequently loaded with parked vehicles the buses stop in the middle of traffic sometimes blocking all lanes at the same time. This congestion could be avoided of the proper facilities were available.

Except for that congestion, the level of public traffic is small and if the terminal would be better organized, traffic problems would only occasionally occur. Most shared taxi and bus flows converge at present at the terminus of Metro Line 2 (Moneeb), where also the ENR station is located. One can clearly observe in next picture that the largest share of this traffic is oriented towards Cairo.

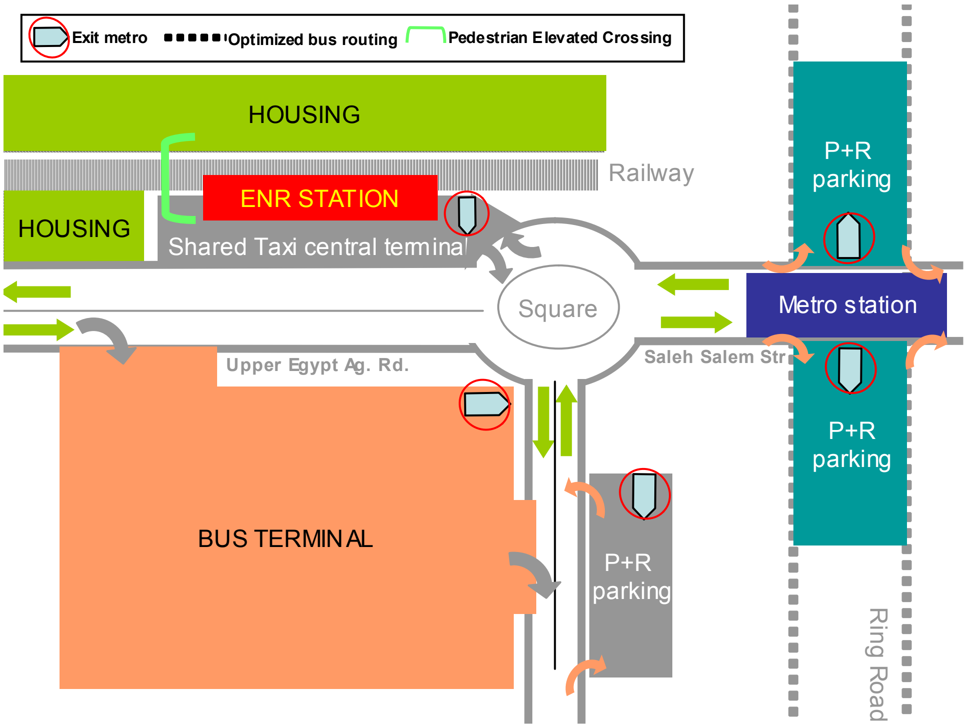
Moneeb Station

Bus flows **Shared taxi flows**

Source: JICA Study Team

Figure 7.3.11 Moneeb Station - Concentration of Buses and Shared Taxis

Extending Metro Line 2 and opening a new ENR station will attract a portion of buses and shared taxis presently operating north on Salah Salem Street (metro terminus). The future design of the Network Interconnecting Point must provide the necessary facilities to control and structure increased traffic flows. A possible solution is proposed in next figure. The concept takes into account the extension of Metro Line 2, but can be easily implemented prior to the construction of the metro.



Source: JICA Study Team

Figure 7.3.12 Moneeb Station - Future Situation

The future terminal will efficiently link inter-city traffic via rail and bus with inner-city traffic via metro and share taxi (and private car and taxi).

Important is to ensure that the inter-city bus terminal is sufficiently large to accommodate all buses, which is not the case for the present terminal. Given that there is no room to expand the present terminal, the agricultural area at the opposite side of Upper Egypt Road is the most logical solution to locate the new terminal. The present terminal can then be replaced by a shared taxi terminal where all shared taxis can be accommodated. The existing shared taxi terminal under the Ring Road bridge can be into a P+R parking, if necessary supported by other similar parking facilities if demand requires so.

A new railway station will complete the Intermodal Point. At present, the railway station is located at Moneeb metro station, further down Salah Salem that together with the access streets is heavily congested with shared taxis and buses. Re-locating the new terminal and extended metro line will alleviate this congested terminal and reduce traffic congestion in at the present Moneeb station.

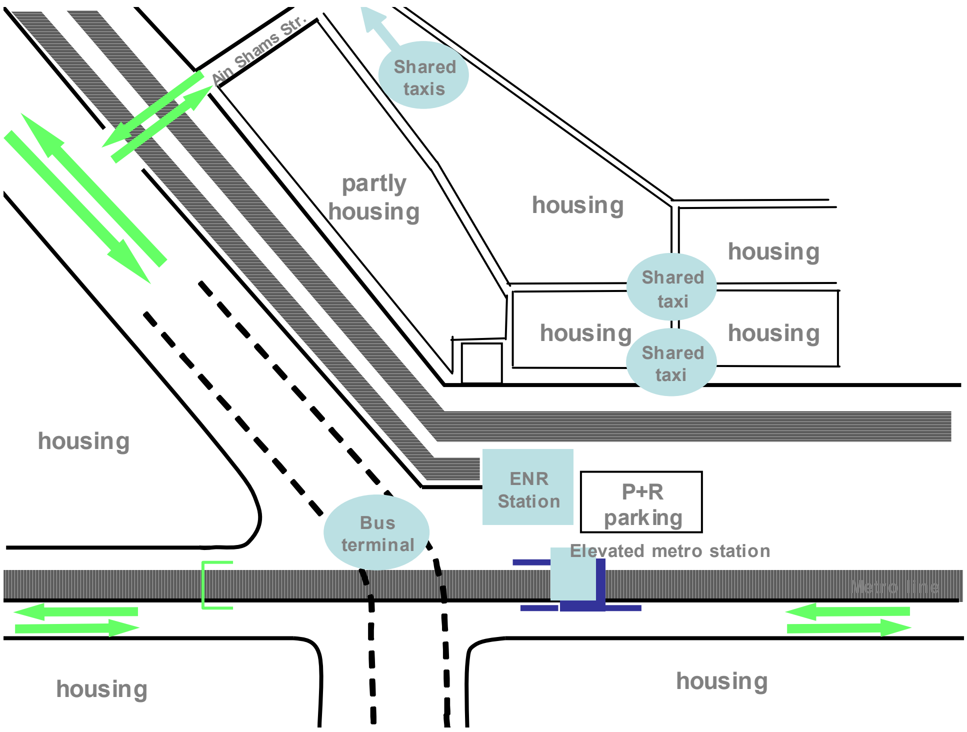
An important supplementary infrastructure is the **Park and Ride parking** for private As Network Interconnecting Point this parking this parking also needs to accommodate private cars for persons wishing to access Cairo using public transport. P+R facilities are particularly important at the outer ends of the public transport network.

Pedestrians should be redirected in such a way that they do not interfere with traffic. Two particular measures are therefore necessary. The first is to foresee a fence in the middle of Upper Egypt and Salah Salem roads to prevent pedestrians from crossing the street between the various terminals and forcing them to use the underground passages of the metro. The second measure is to build "closed terminals" where access is only possible via the entrance gates and via the metro passages.

The square will play an important role in managing traffic flows in the future because traffic accessing and leaving the different terminals will all rotate around that square. It could therefore be considered, and this at the time when the metro terminal will be constructed, to build a much wider roundabout with a dedicated lane for the buses.

Ain Shams Station

The last terminal is Ain Shams Station. Although also a Network Interconnecting Point the difference with Moneeb Station is that transforming this terminal into an Intermodal terminal is much more complex, given a number of constraints. The public transport services in this station will not change in the future but will only upgrade with the WING railway line (linking 10th of Ramadan City).

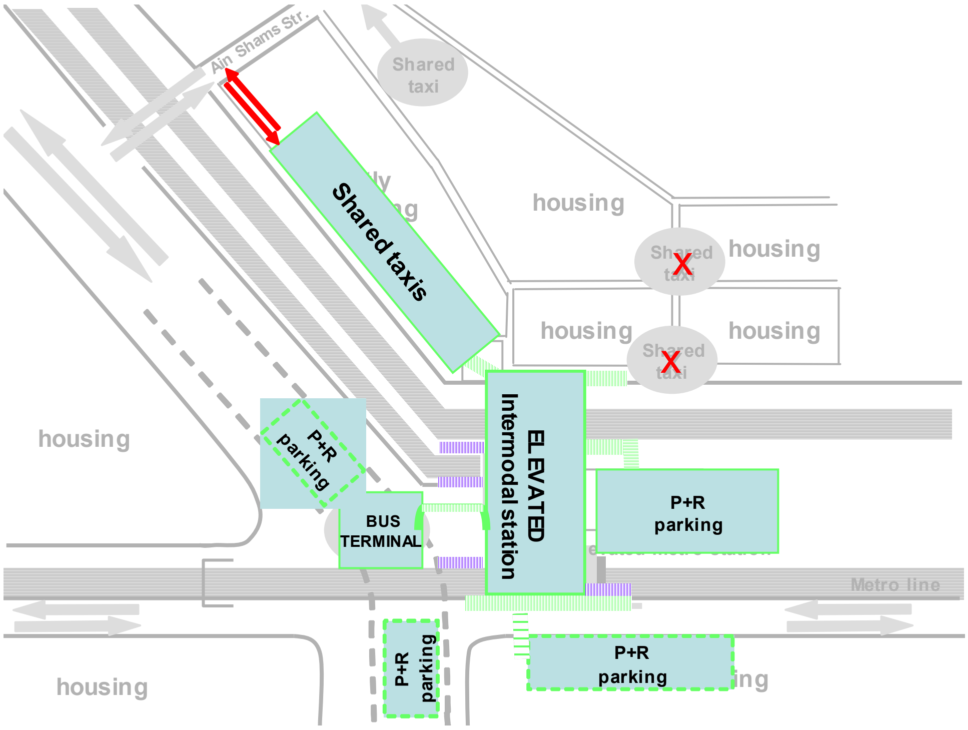


Source: JICA Study Team

Figure 7.3.13 Ain Shams Station - Present Situation

Ain Shams network terminal links Cairo via Metro Line 1 with the inter-city railway network. The facility also includes a small bus terminal (bus line to Ramses), an elevated metro station for Metro Line 1 and a railway station with ENR railway lines to Oboor City and to Suez. Shared taxi services are limited to illegally operating taxis operating in the small streets behind the railway line. Many of these taxis are not registered and are in a very poor condition. Many drivers have no license and in more than one instance, it was noted that these vehicles were operated by children. The speed by which these taxis drive through the small and crowded streets is unacceptably high and dangerous[10]. Finally, a badly organized and small P+R parking is located between the railway and metro station. The parking is difficult to access and many park their cars in the surrounding narrow streets.

The site can be transformed into an efficient and functional Intermodal terminal as is demonstrated in the concept design in next figure.



Source: JICA Study Team

Figure 7.3.14 Ain Shams Station - Future Situation

The existing elevated metro station is in the new design extended to the railway station that is demolished to provide the necessary space. The terminal will be accessible from both sides so that the illegal crossing of the railway tracks is prevented in the future. To increase the functionality of the terminal (and to create value added) a second level can be build where small shops are located. Both the metro platform and the railway platform will be accessible via the terminal as well as the bus station and an upgraded P+R parking. The bus terminal, which at present is only a stopping place, will be upgraded with a quay and a bus shelter. These improvements are necessary to better accommodate passengers.

[10] *There is a public market just outside the (illegal) entrance to the terminal, attracting many people, in particular children, women and older people.*

Elevating the terminal will also improve access to and from the P+R parking and the free space in between the railway and metro line can be rehabilitated to develop an efficient park and ride terminal. If necessary and over time additional park and ride facilities can be developed under the bridge and opposite to the metro line where the old and abandoned building(s) could be removed.

A very important measure for the viability of the area around the terminal is the development of a large shared taxi terminal along the railway line. At present, there is a narrow street connecting the “market place” with Ain Shams Street. This street can be widened and a shared taxi terminal can be created near the elevated entrance to the Intermodal terminal. The constructions imply that some buildings have to be removed in particular the old abandoned building near the end of the street. Widening the access road to the terminal is possible because there is sufficient waste land between the housing and the street, frequently used by two axle trucks to park.

The various access roads (parallel to the railway, metro and under the bridge) are in very poor condition. A more detailed analysis should be made regarding the traffic flows on these streets in order to determine the number of P+R parking that will be necessary. This analysis should also identify the optimal routing for both the bus and the private cars that want to access respectively the bus terminal and the central P+R facility.

To ensure that pedestrian flows are controlled and do not reduce the efficiency of the terminal, the illegal access points should be closed off and sufficient fencing should be put in place to force pedestrians to use the designated paths. The first illegal access point is via the street at the end of the railway quay for the train to Oboor. The second illegal access point is at the market place in front of the metro and railway terminals. Given that there is no public access to the terminal from that side, a hole was made in the brick wall and people cross the railway tracks to enter one of both terminals. They also use this illegal crossing to travel from one side of the terminal to the other.

Given that this terminal is located at the border of the public transport network, P+R parking facilities are also foreseen to allow people to abandon their cars on a secure location and use public transport to enter Cairo. In the rehabilitation version, one integrated P+R parking is foreseen, and several locations are identified where the service could be installed based upon future demand.

7.3.3 Park and Ride Facilities: A Tool to Reduce Congestion?

The concept of Park & Ride (P+R) is becoming increasingly important in Intermodal public transport all over the world. It is seen by public authorities as a means tool to reduce car traffic, in particular inside city centers. Public transport service providers either private or public organizations, invest in offering efficient P+R facilities at end stations and at critical intersections on their network, allowing therewith private car users to abandon their vehicles in a secured manner and make use of public transport to reach their final destination.

Next picture presents some examples of different types of P+R facilities. As can be seen, the facilities vary from multi-story parking garages to open-air protected areas where P+R facilities and complementary services are provided (e.g., public toilets, telephone, etc…). One important element that all these different parking facilities have their regular public transport services, generally busses and / or metro.

Source: P+R Park & Ride GmbH, Munich

Figure 7.3.15 P+R Parking Facilities in Munich (Germany)

Park & Ride offers parking possibilities at transit stations, bus stops and highway ramps particularly at the urban boundaries. They facilitate transit to public transport and ridershare (car pooling) use.

Parking is generally free or significantly less expensive than in a regular car parking in urban centers. Park and ride facilities are used primarily by carpoolers and transit riders. Some facilities near railway stations are strictly for use by rail while others located along the highways and major intersections are used by carpoolers and link to bus and other public transport networks. Park and ride facilities are generally open 24 hours a day, seven days a week, every day of the year.

The supply of Park & Ride facilities has a major influence on the portion of downtown commute trips made by transit. But while P+R reduces urban traffic as a whole, it increases centralized vehicle traffic as motorists detour or make additional trips to reach P+R facilities[11]. A conscious development strategy should therefore be applied in areas where traffic is generally high.

Park and Ride facilities are common use in countries around the world and the concept has been integrated into the public transport offer. Three examples of regional Park and Ride facilities are given next and the way how they are integrated into the public transport system discussed.

Source: Southern California Association of Governments © Thomas Bros maps (For information purposes only)

Figure 7.3.16 P+R Parking in Southern California (general and detail)

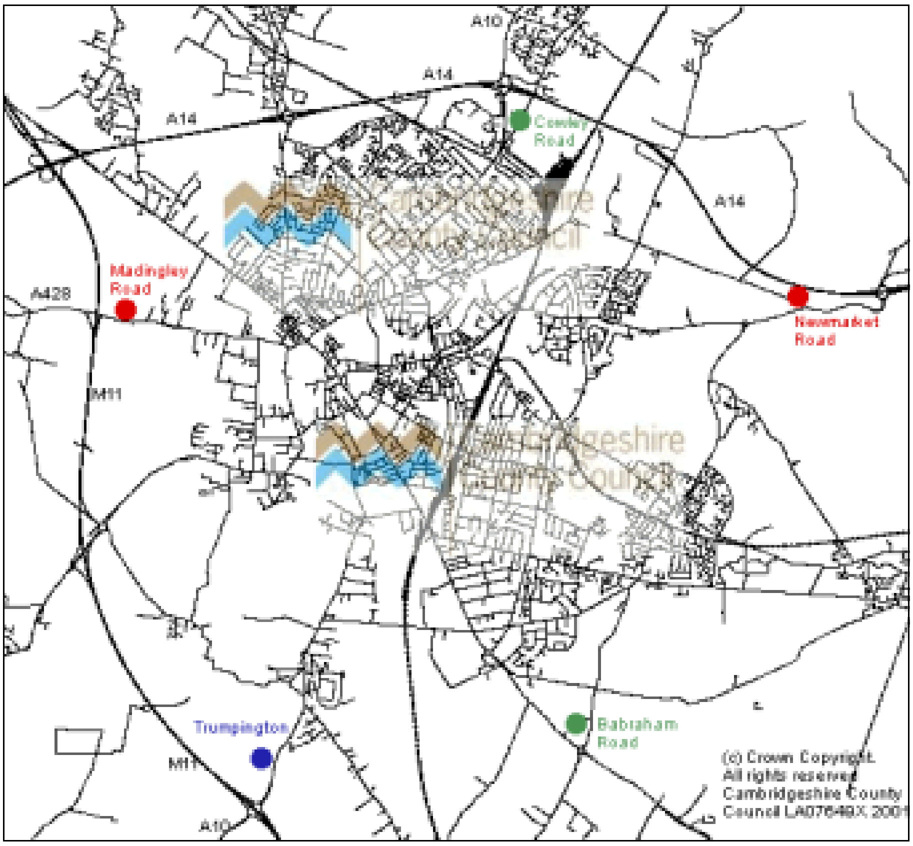
The first map is of the P+R and transit-only parking facilities for Southern California (USA). P+R parking facilities provide easy access to available public transport such as Metrolink, Metro Rail and major bus terminals within Los Angeles, Orange, Riverside, San Bernardino and Ventura Counties.

Information is available trough Internet and frequently updated information is available regards capacity, free space etc. Users can select the city by name or zip-code and retrieve (print) the related map on P+R and transit-only parking facilities. They

11 *See for a detailed description of the problem: "Building Healthier Neighborhoods with Metrorail: Rethinking Parking Policies"; November 2001; Lands Program/Chesapeake Bay Foundation; 6 Herndon Avenue, Annapolis, MD 21403; "'Park and ride - sustainable transport or expensive white elephant?"; Martin Lucas-Smith; BA Dissertation amended, non-presented version; King's College, Cambridge University Geographical Tripos; May 2000 ; John Morrall and Dan Bolger, "Park-and-Ride: Canada's Most Cost Effective TDM Strategy" Transportation Association of Canada Annual Conference (Charlottetown) 1996.; G. Parkhurst, "Influence of Bus-Based Park and Ride Facilities on Users' Car Traffic"; Transport Policy, Vol. 7, No. 2, April 2000, pp. 159-172.*

also can zoom in and out on the map to street level detail. The dots on the general map are parking facilities. Clicking on the dot provides detailed information about the parking and about connecting public transport. It also provides the optimal route to reach the facility. This is a sophisticated Internet-based technology, demonstrating both the high importance regional public authorities attach to P+R parking and the success of the P+R service in the congested Los Angeles area.

The second example is the P+R parking services around Cambridge (UK). As can be seen on next figure, the focus is also here on high quality parking facilities outside the city center and immediate access to the public transport services into the city center. Specific locations that attract a higher than average number of vehicles (hospitals, university, etc…) are serviced by dedicated bus lines from most P+R areas.

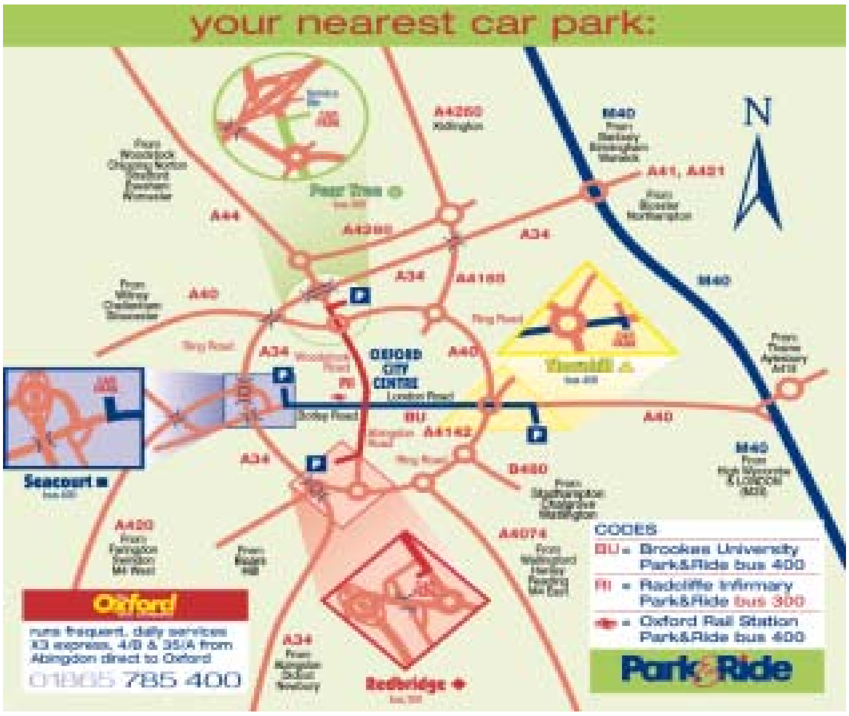


Source: Cambridge Country Council / © CROWN (For information purposes only)

Figure 7.3.17 P+R Parking in Cambridge

Information on P+R parking locations and related public transport services is accessible on the Internet site of the Cambridge County Council.

The third example is in Oxford (UK) where Park and Ride services are offered by and integrated into the Oxford Bus Company operations. They also have linked the parking sites to their bus routes, as is visualized in next figure.



Source: Oxford Bus Company

Figure 7.3.18 P+R Parking in Oxford

Information on P+R parking facilities and services in above example cities is also here available on the Internet and via brochures and road-side information boards.

The provided Internet services vary from basic information and location maps to highly sophisticated routing programs that allow users to locate their P+R facility and find the best way to reach it from their location. Internet based P+R information services are common in the USA and are rapidly expanding in Europe, in particular in the UK and Germany.

With the expansion of services, the debate about the use and impact of P+R facilities on road transport and inner-city congestion is also increasing, in particular about the negative effects of these facilities on land prices, road congestion and the prioritization of private car use (exactly the opposite of what P+R tries to achieve).

The effects of P+R are summarized in next table.

Table 7.3.1 General effects of P+R facilities

Objective	Rating	Comments
Reduces total traffic.	1	Reduces a portion of car trips.
Reduces peak period traffic.	2	Tends to reduce trips during peak periods.
Shifts peak to off-peak periods.	0	
Shifts automobile travel to alternative modes.	3	Supports transit and ridesharing.
Improves access, reduces the need for travel.	0	
Increased ridesharing.	3	Supports ridesharing.
Increased public transit.	3	Supports transit use.
Increased cycling.	1	Supports cycling when bike parking is provided.
Increased walking.	0	
Increased Telework.	0	
Reduced freight traffic.	0	

Rating from 3 (very beneficial) to –3 (very harmful)."0" indicates no impact or mixed impacts.
Source: "Park & Ride Convenient Parking For Transit Users"; TDM Encyclopedia- Victoria Transport Policy Institute

Park & Ride facilities reduce urban traffic congestion outside the city center. The benefits could be significant since Park & Ride tends to be most effective where traffic congestion and parking problems are worst. But Park & Ride exclusively for cars provides only modest reductions in local road traffic, pollution, energy use and consumer costs, since automobile trips are still made to reach the facility[12].

An overview of the benefits, comparison between bicycle and cars, is provided in next table[13].

Table 7.3.2 Comparison of effects of P+R facilities

Objective	Auto	Bike	Comments
Congestion Reduction	3	3	Reduced peak-period vehicle travel.
Road & Parking Savings	1	3	Reduces road and parking costs in urban centers.
Consumer Savings	1	3	Reduces travel expenses.
Transport Choice	1	2	Improves transit as a travel choice.
Road Safety	1	2	Reduces automobile travel.
Environmental Protection	1	3	Reduces automobile travel.
Efficient Land Use	-1	2	May encourage urban expansion.
Community Livability	1	3	Reduces automobile travel.

Rating from 3 (very beneficial) to –3 (very harmful)."0" indicates no impact or mixed impacts.
Source: "Park & Ride Convenient Parking For Transit Users"; TDM Encyclopedia- Victoria Transport Policy Institute

As a general rule for implementing Park & Ride in Cairo, following perception could be maintained: ***P+R is most appropriate at the fringe of large urban areas. It tends to***

[12] *See for a detailed analysis of the effects of P+R: "Building Healthier Neighborhoods with Metrorail: Rethinking Parking Policies"; November 2001; Lands Program/Chesapeake Bay Foundation; 6 Herndon Avenue, Annapolis, MD 21403;*

[13] *Park and Ride facilities increasingly foresee facilities for cyclists (special protected storage) because the number of cyclists making use of these facilities spectacularly increased in recent years.*

be most effective as part of a comprehensive effort to encourage transit and rideshare commuting from outside to inside the city.

***Excessive Park & Ride facilities may be undesirable around high density transit stations to avoid concentration of private car traffic. P+R alone will not solve the traffic problems in Cairo but can be considered one of several necessary supporting measures*.**

7.3.4 Supporting Measures

1) Introduction

As was argued in the introduction, improving the infrastructure of terminals and introducing high quality buses and railcars is only one part of the solution. The other part is the software component that is required to integrate the individual public transport services into a single Intermodal public transport system.

The important link between public transport infrastructure and supporting measures was for example made explicit in the new European White Paper on transport[14]: "*We therefore need to make the alternatives to the car more attractive in terms of both infrastructure (metro lines – trams – cycle tracks – priority lanes for public transport) and service (quality of service, information given to users). Public transport needs to achieve levels of comfort, quality and speed that come up to people's expectations.*" (p. 88).

In this section, three supporting measures will be discussed that are critical success factors for the quality and the efficiency of the future Intermodal public transport system. These measures are:

- Integrated fare policy and single ticketing;
- Integrated timetables;
- Internal and external information and dissemination.

2) Integrated fare policy and single ticketing

The concept of an integrated fare policy and single ticketing for the different public transport modes is not a new concept for Cairo. A very detailed and clarifying study on that subject was conducted in the mid-nineties[15]. This study concluded that it is important for the future integrated public transport system to develop a "…unified ticket technology for all transit modes in GC…. New technologies may have to be introduced. Ticketing is an important area for much future changes, production,

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[14] *"White Paper: European transport policy for the future : a time to decide", Brussels, 12/09/2001, COM(2001)370*

[15] *"Greater Cairo Public Transport Fare Policy Study"; Transport Planning Authority in association with Development Research and Technological Planning Centre - Cairo University and Société Française d'Etudes et de Réalisations de Transports Urbains - Sofretu, Final Report: June 1995*

distribution, sales, cancellation and control. Other areas for possible future development that may necessitate complementary changes in transit fare policy exist. These are: revenue management, mode and service integration, new fare structure, simplifications of revenue sharing, new ideas for external financing and new measures for reducing unnecessary operating costs and deficits…. There will be a room for improving ticket technology in the future. Introducing magnetic tickets and relevant ticket cancellation machines … would be an important step… This can have an impressive impact on ticket management, revenue management and ticket control." (p. 136 - 139).

These conclusions still remain relevant and valid. The proposed Intermodal public transport system of the future includes 3 metro lines, supporting supertram connections and optimized bus lines to feed these primary public transport modes. An integrated and simplified fare policy, supported by single tickets is a critical condition to make it work.

Examples of single tickets can be found in most public transport systems in Europe, the USA and Asia. Some examples that demonstrate the many options that exist are given hereafter.

The first is the integration of air and railway public transport by Air France called *Avion/Train*. Air France and SNCF facilitate travel and propose a single tarif for the airway - railway journey. The single ticket can be purchased at all Air France ticketing agencies worldwide. For connections with the TGV (high speed railways in France), the *Train/Avion* ticket can be purchased at all railway ticketing services in France. To access the railway network, passengers have to show their single air/rail ticket and obtain a railway ticket for the journey to and / or from the Airport.

The second initiative is a joint effort between the Belgian public railway company (NMBS) and the city bus operators (De Lijn) to offer a single ticket for rail and bus. The service is operated jointly by NMBS and De Lijn in several Belgian cities. The offer includes different types of combined rail/bus passes, allowing passengers to use rail and bus with the same special pas. Next table provides prices and types of special passes for Brussels.

Table 7.3.3 Combined train/bus passes for Brussels

PRICE	1 WEEK	1 MONTH	3 MONTHS	12 MONTHS
RAIL- BUS PASS	9,40 EUR	31,50 EUR	88,00 EUR	313,00 EUR
SCHOOL RAIL BUS PASS	-	31,50 EUR	88,00 EUR	313,00 EUR

Source: NMBS

As was requested in the Greater Cairo Public Transport Fare Policy Study in 1995, a more detailed study will be necessary to identify the conditions on how to introduce and operate the single ticket system in Cairo. The study should provide answers as regards the exact price of such tickets and on the investment costs related to equip the vehicles with modern technologies to validate and control the single ticket system.

3) Integrated timetables

Given the close link between the different rail-based public transport systems, timetables should be updated in such a way that interconnectivity is optimized. This means that time intervals between arrival of one mode and departure of the connecting link should be minimized but simultaneously take into account the necessary transit time needed for passengers to pass from one mode to another. In principle, this should not pose important problems given that the frequency of the metro lines. When developing the supertram, the high service frequency will ensure efficient interconnectivity with a minimal burden to passengers. Integrating and improving the time tables of the public bus services and transforming mini buses and shared taxis into a feeder service will be much more difficult to realize.

A more problematic issue will be to improve the timetables of CTA buses that will feeder the main Intermodal terminals in the future public transport system. A detailed study will be necessary for the main feeder lines to identify optimal frequency and time to achieve efficient integration. The issue of integrated timetables is closely related to the need for information. External information relates to passengers who need to organize their trip. Internal exchange of information is between operators to consolidate and integrate their mode-specific timetables and to control traffic flows.

4) Information exchange and dissemination

A final important component of the Intermodal Public Transport System of the future is the dissemination and information exchange. Dissemination is the external dimension, where the public is informed about the various public transport services and timetables. Information exchange is the internal dimension and involves constant and structured contact between the different operators to compare timetables, prices and services offered to the public.

At present, and with the exception of the CMO, there exists practically no information regarding formal public transport services. There is a pressing need to prepare such information for CTA/GCBC services. It is suggested that initially the CTA focus on "the basics", that is, build a solid, functional information system upon which, at a later date, more sophisticated approaches may be built.

- Printed information. The initial priority should be the development of an area-wide route map for CTA/GCBC bus and mini bus services[16]. The map should be of sufficient detail to permit the user to trace each route by number designation. A CBD inset on the same map is desirable as is general information about using the transit system. The CBD inset should clarify which routes use which terminal.

- The second priority should be development of pocket-size route pamphlets, one route per pamphlet. Information presented should include routing superimposed on major travel streets and cross-streets, schedule (if appropriate) at intermediate and termini check points, as well as major items of interest along the route.

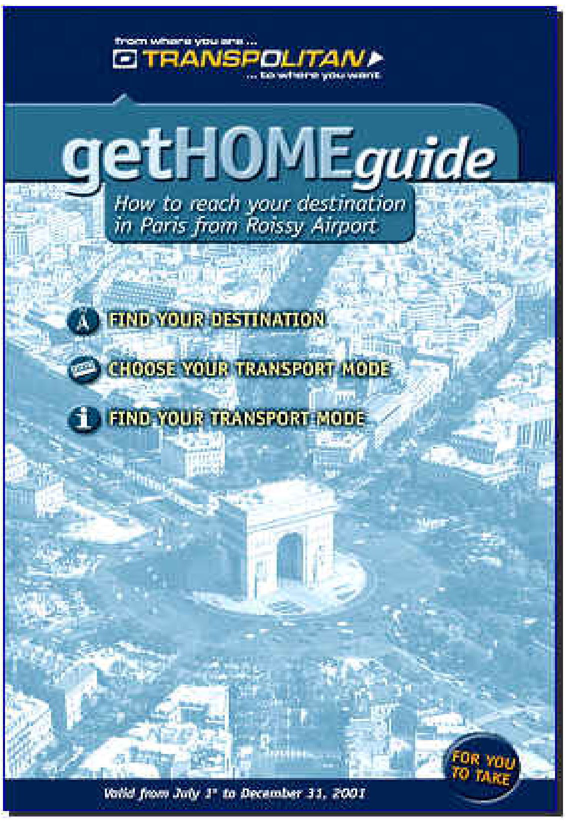
[16] *It is understood that several years ago such a map existed, but was discontinued.*

- Signage. It is, as indicated earlier, highly desirable to implement a signage program at bus stops and, in cooperation with other operators, at terminals. This plan should be viewed as an expansion of the CTA program which currently provides upgraded bus stops. The key information which should be conveyed is which route stops here, where is it going and a time element (schedule and/or begin/end of service). Signage at terminals should be more comprehensive in terms of descriptive layout, multi-lingual content, operator designations and display of information.

- Public involvement. The role of public transport is to provide mobility for Cairenes. The scale and complexity of CTA/GCBC requires well-trained professionals to ensure appropriate execution of route planning and operation. The potential role of citizen inputs to these decision making processes should not be overlooked. The value of citizen input is already reflected in the development and evolution of shared taxi routes - which represent essentially a pact between vehicle owners and vehicle users. The CTA may well be able to harness such input to plan and/or assess route structures and operations via community/neighborhood meetings and on-board origin-destination surveys (refer previous section, Transport Action Plan).

An example of an Intermodal public transport information system is provided hereafter. The system is proposed in two versions, a paper-based version and an Internet-based version[17]. Only the paper-based application is at this stage relevant for Cairo and is visualized in next figure. The information service has recently been developed and will be commercialized in the near future by a private company.

[17] *More detailed information can be found on http://www.transpolitan.com*



Source: Transpolitan©

Figure 7.3.19 Intermodal Public Transport Information Pamphlet

The pamphlet provides information on the various Intermodal options available to travel from origin to destination. Once begin and end of the trip is defined, various options are available to go between the two points. The pamphlet identifies the transport modes with timetables and prices and the transit points where passengers have to change between modes. The pamphlet is simple to handle and counts on average 18 pages for a city like Paris (for which a demonstrator version exists).

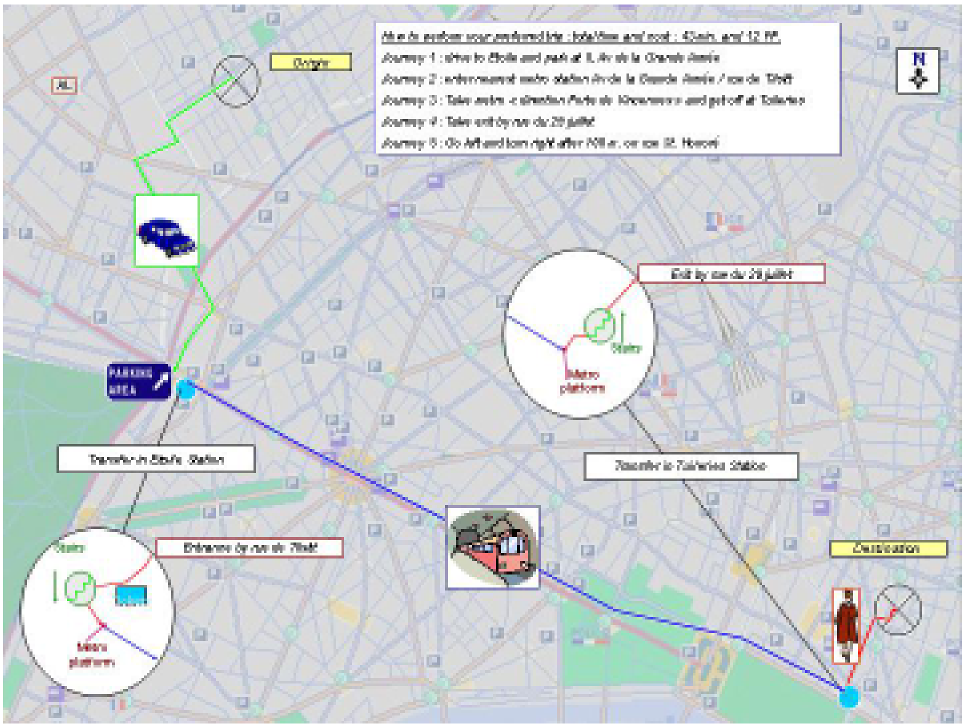
Passenger information services for public transport are common in most countries with a high quality public transport system. The information is put at the disposal of the passenger either via Internet, telephone, Teletext (information pages via television), brochures and books as well as in all major stations and stops via bulletin boards.

Introducing a similar approach in Cairo would substantially contribute in making public transport more transparent. It would also help passengers to travel faster and more efficient, therewith increasing the attractiveness of public transport as an alternative to the private car.

The concept can only work if and when the different operators join forces to develop fixed and stable services. There is still a long way to go before that stage is reached. The recommendations of the Master Plan to improve public transport provide a good start to transform public transport in Cairo from a mode-based segregated system into an integrated and Intermodal public transport system.

If that goal is achieved in the future, more advanced techniques become available such as sensor-based information systems where passengers, waiting at the terminal or stop are informed in actual time about the estimated time of arrival of the next bus, metro, train or supertram.

It will also pave the way to Internet-based information services to the public where the optimal route via public transport is determined on-line via computer, using different quality, cost and service level characteristics to identify the best way to travel. An example of such application is given in next figure[18].



Source: Transpolitan©

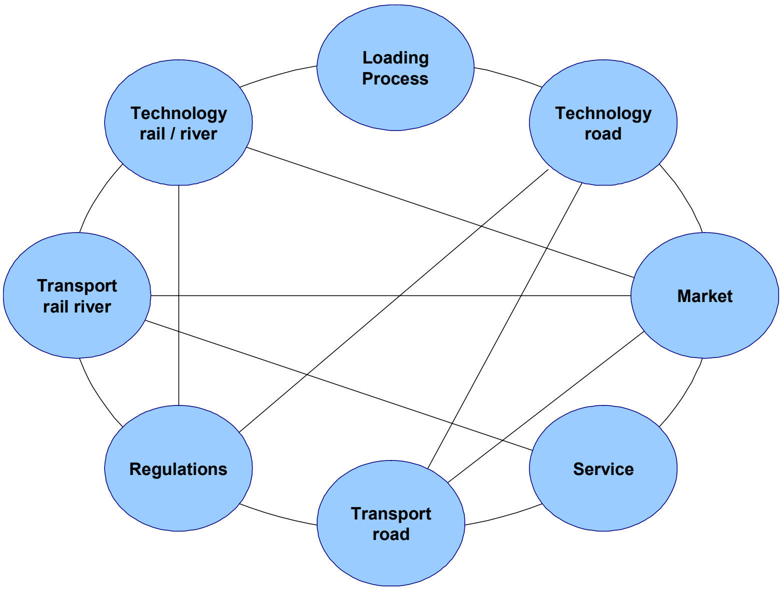
Figure 7.3.20 Intermodal Public Transport Route Planning (Internet Application)

[18] *The internet-based application of Transpolitan is already functional and negotiations with large hotel chains, airports and city councils are ongoing to formally introduce the service.*

7.4 INTERMODAL CARGO TRANSPORT IN THE GCR

7.4.1 Introduction

Intermodal transport is a complex system, consisting of a wide variety of inter-related components, as is demonstrated in next figure.



Source: SAIL- Semi Trailers for Advanced Logistics, EU -DG TREN, 2002

Figure 7.4.1 Intermodal Transportation Components

It is therefore important to review in the first place what Intermodal transport is and how it is implemented. This review will be done for Europe using a selection of EU studies on Intermodal transport and Intermodal terminal technology.

Next, the Egyptian transport sector is (briefly) reviewed and for the different transport sectors, its potential and capability of providing and / or integrating Intermodal transport[19] is assessed. The results of both reviews are integrated in a conclusion and a set of recommendations on how to develop Intermodal transport in the future.

[19] *Within the context of the CREATS study, only some superficial comments are possible. A detailed and extensive study will be required to truly estimate the level of and potential for Intermodal transport in Egypt.*

7.4.2 The reality of Intermodal Cargo Transport

1) Introduction

To make Intermodal transport work, there is first of all a need for *hardware* (dedicated transport units, specific unit loads and Intermodal terminals with specialized equipment). In addition and of the same importance, sophisticated information and control *software* should be in place to monitor the different phases of Intermodal transport and to efficiently process the accompanying information. Finally, Intermodal transport needs *humanware*, highly trained experts that organize, control and operate all phases of the Intermodal transport process.

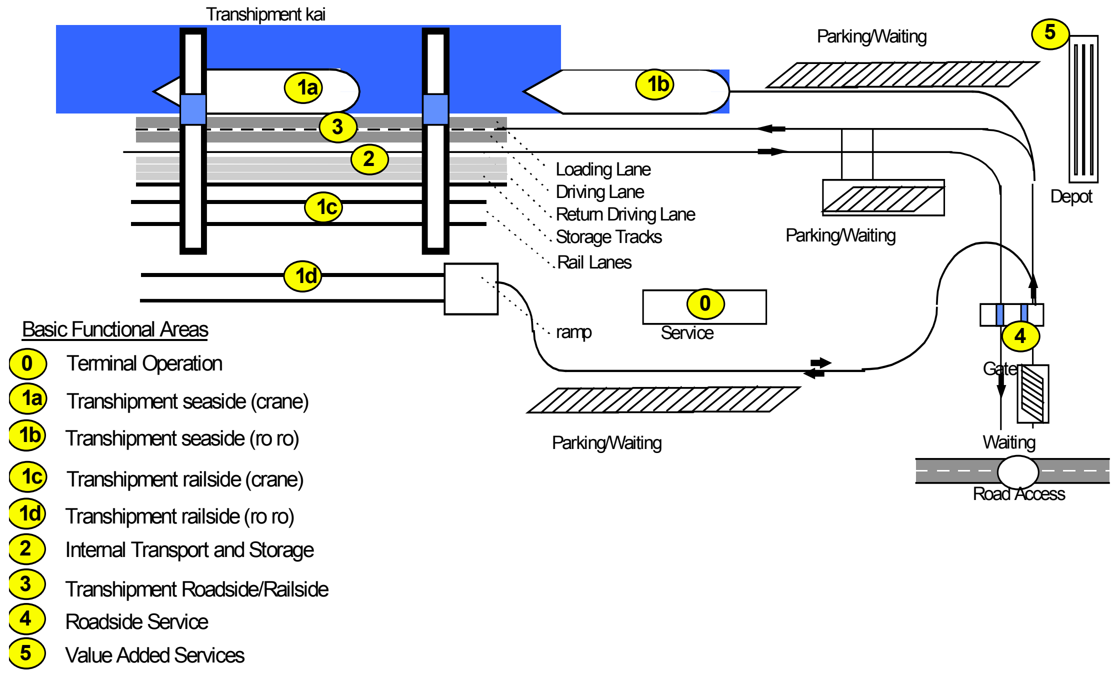
2) Intermodal hardware

Road, rail and river transport have unequal levels of performance and service quality. This is due partly to intrinsic differences and particularities of the transport mode, but also to the difference in infrastructure. The user perceives road haulage as the benchmark for freight transport and will not consider infrastructure limitations or terminal problems as an acceptable reason for shifting from road to an Intermodal alternative. Only if the other modes and Intermodal transport meet the standards of road transport.

Leaving congestion aside, the major infrastructure problem for the moment remains the cargo transit points. The fact that on most relevant cargo corridors, efficient Intermodal terminals operate successfully and innovations are introduced or new concepts proposed, Intermodality generally stops at the terminal entrance.

In the following example[20] of a terminal process, a tri-modal terminal that involves road, rail and river is considered. Generally, Intermodal terminal operations require different experts such as gate inspectors, dispatchers, groundsmen (place operators), crane drivers, information managers and others are working together. In addition, inspection of operations and equipment, maintenance and repair, supply and waste management, the fire brigade all must work efficiently together.

[20] *See for a more detailed analysis "Semitrailers in Advanced Intermodal Logistics - SAIL: Final Report", European Commission, Directorate General for Energy and Transport, 5th Framework R&D program, project contract n° 10277 AND "Innovative Technologies for Inter-Modal Transfer Points - Final Report - ITIP", EU Directorate General for Energy and Transport, 5th Framework R&D program, 2000; contract n° 2000-AM.1005*



Source: Semitrailer Advanced Intermodal Logistics - SAIL

Figure 7.4.2 Basic Terminal Layout (Rail/Road/River)

From an Intermodal perspective, the terminal is divided into various sectors of operation (modules), independent from technical solution for the various functions. Five basic sectors can be identified: railway operation at the interface main track - terminal (access), transshipment sail-side, internal transport and storage, transshipment roadside and road operation (access and traffic).

Intermodal terminals do not have standard designs. Most terminals are "tailor-made" based upon logistics requirements such as the load types handled, the daily volumes and the modes the terminal handles. Several "generalized" terminal concepts exist but as far as technology stands at present, none of the concepts has gained a strong position in the combined / Intermodal market.

The functionality of an Intermodal terminal highly depends upon the equipment used for transshipment. Hereafter, some modern transshipment technology is presented[21]. Some well known other technologies are the KRUPP Fast Handling System, COMMUTER, the TRANSMANN Handling Machine, NOELL Fast Transhipment Terminal (SUT), and many others[22 23].

21 _See for a more detailed analysis "Semitrailers in Advanced Intermodal Logistics - SAIL : Final Report", European Commission, Directorate General for Energy and Transport, 5th Framework R&D program, project contract n° 10277_

22 _It is irrelevant here to review the discussion at present going on because it is complex and the range of subjects is very broad. For example, the ITP study took 2 years and the final report was over 300 pages, the_

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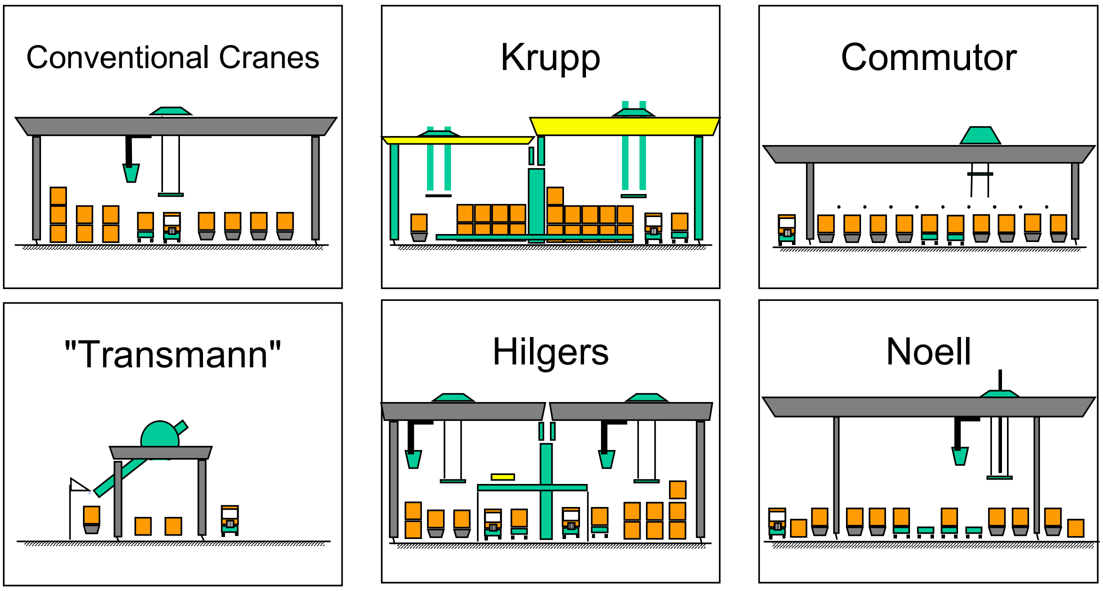


Source: Innovative Technologies for Inter-Modal Transfer Points - ITIP

Figure 7.4.3 Transshipment Technology

As becomes clear, Intermodal transshipment increasingly requires highly specialized and complicated equipment. But many smaller terminals make use of standard transshipment equipment such as the reach-stacker and portal crane. But their generalized design reduces their capability to handle the ever increasing number of different types of load units.

Reach-Stackers belong to the large mechanical conveying group of stackers and possess a wide range of use, as they are not bound to tracks. They are used for the transshipment of containers and semitrailers and cover capacity-peaks. Reach-Stacker equipment lifts 45 tons in the first line and 35 tons in the second one. As it is equipped with a swayable toplift-spreader, rotation up to the weigh of 280° is possible.

SAIL study continued during 18 months and the final report (without the results of the prototype's physical tests) was over 500 pages.

[23] *See also for a detailed description of the terminal technology : "Innovative Technologies for Inter-Modal Transfer Points - Final Report - ITIP", EU Directorate General for Energy and Transport, 5th Framework R&D program, 2000; contract n° 2000-AM.1005*

Source: Semitrailer Advanced Intermodal Logistics - SAIL

Figure 7.4.4 Conventional Reach Stacker for Trailers

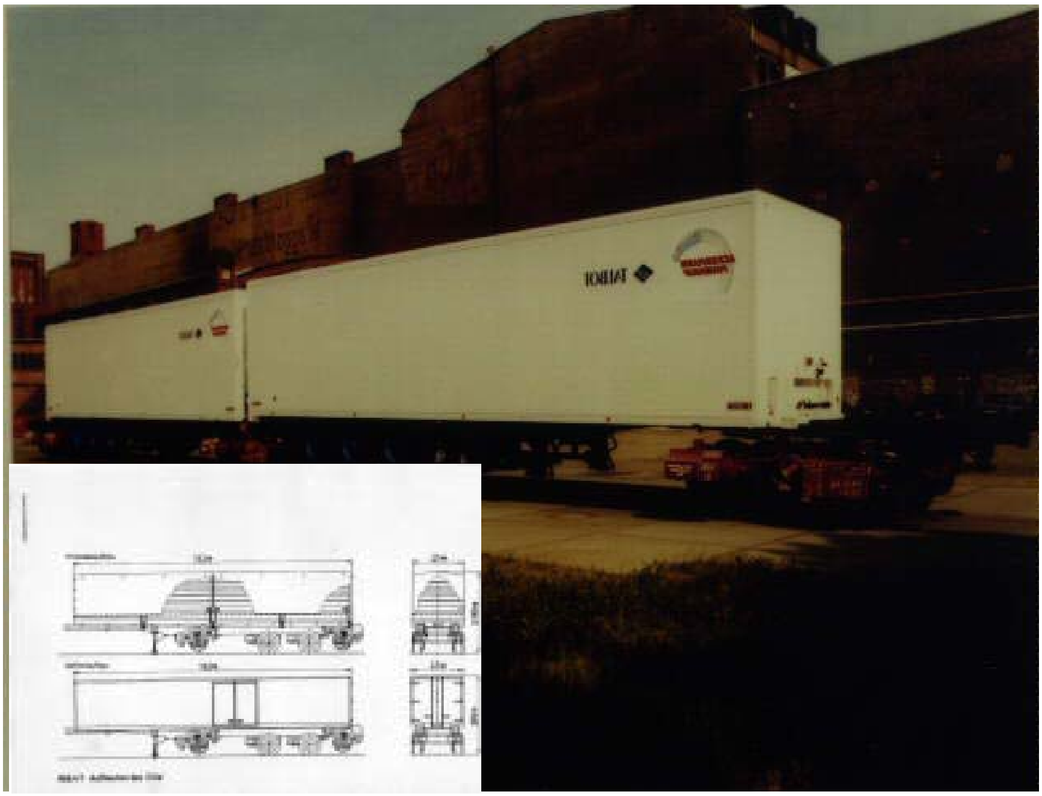
A second conventional terminal crane is the portal crane. There exist basically two kinds of portal cranes used in Intermodal transport. The portal crane with rubber tire is almost exclusively used in harbors for the transshipment of containers. It is more flexible in use than the track-bound variant but it requires a large level surface for operations which is only seldom available in Intermodal terminals, see next picture.

The track-bound variant of the portal crane is frequently used at larger Intermodal terminals. They have a transshipment rate of approximately 30 containers per hour. The purchase of a track-bound portal crane is 25% more expensive than the purchase of one with a rubber tire and it also requires the setting of rails and a base. Due to a shorter transshipment procedure and lower maintenance expenditure, considerable cost advantages are perceivable with the track-band version.

Source: Semitrailer Advanced Intermodal Logistics - SAIL / Innovative Technologies for Inter-Modal Transfer Points - ITIP

Figure 7.4.5 Rail and Rubber Tire Portal / Gantry Cranes

Given the costs and complexity of transshipment equipment, a number of new Intermodal concepts try to eliminate the use of transshipment equipment. The very high purchase / construction costs and the loss of pay-load due to the additional equipment to be carried attached to the load unit make these concepts unsuccessful in most cases. One of these technologies is the RoadRailer concept is demonstrated in next figure.



Source: Semitrailer Advanced Intermodal Logistics - SAIL

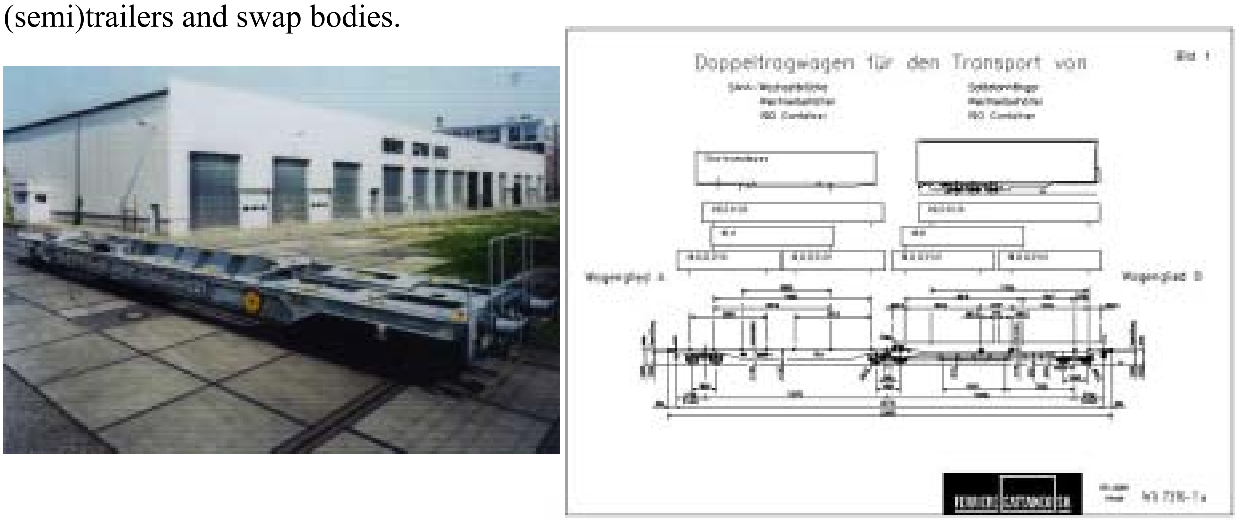
Figure 7.4.6 Road Railer Technology

Many pan-European Intermodal operators develop dedicated railcar / truck technologies, for example *Ambrogio Intermodal Italy* in Italy or *Ewals Cargo Care* in the Netherlands. Their dedicated technology is demonstrated in next two pictures. The technology is implemented on company-specific routes and developed and operated in cooperation (strategic alliance or company structure) with the terminal - and railcar operators.

Source: Semitrailer Advanced Intermodal Logistics - SAIL

Figure 7.4.7 Ambrogio Swap body DIN EN 452/ EN 12410 and ECC Mega Trailer

To transport the highly sophisticated load units by rail, specialized railcars have to be designed. Two examples of such railcars are presented in figure 7.4.5. The first is the Pocket Wagon T-2000 (an adapted version is the T-Mega Pocket Wagon that is specifically designed to transport high-volume trailers). The second is the SAIL semirailer railcar, allowing the transportation of a high variety of containers, (semi)trailers and swap bodies.



Source: Semitrailer Advanced Intermodal Logistics - SAIL

Figure 7.4.8 T-2000 Railcar and SAIL Railcar Design

Complexity of the systems and high investment costs are the reason why Intermodal transport is not more successful in Europe.

Containerization still continues to rise, they are predominantly used for sea-transport and hinterland road transport. Trailers, semitrailers, swap bodies and other technology is the dominant unit load for road transport in Europe[24]. But these load units make the

[24] *For example, the analysis during the SAIL project of the semitrailers registered within a selection of relevant European countries showed a dynamic growth between 1990 and 1998 (much faster than the growth of containers). In 1990 almost 692.000 semitrailers were registered in the relevant countries. Until 1998 this number increased to over 914.000 semitrailers in total. However, semitrailer use in Intermodal*

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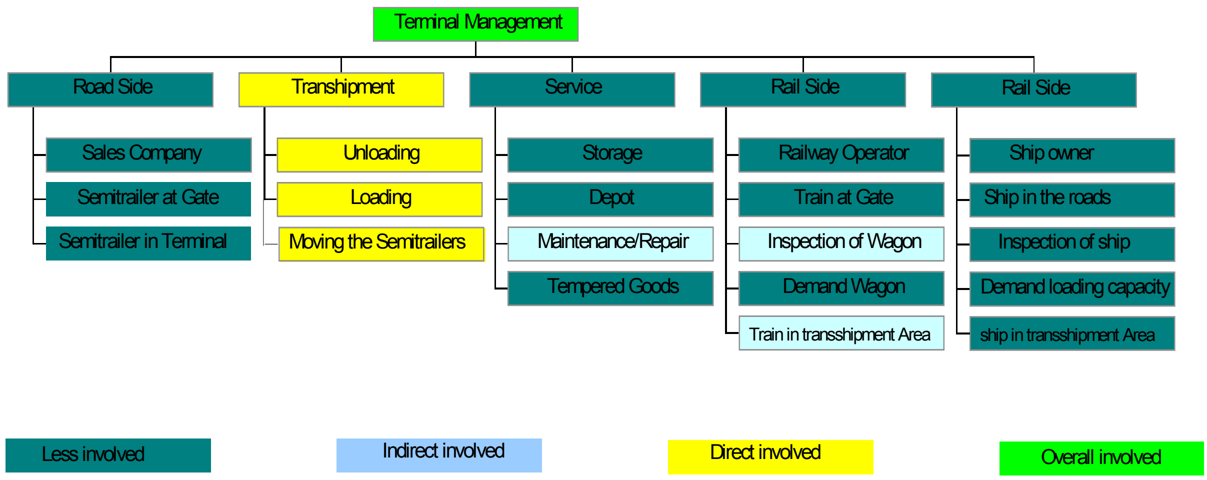
successful implementation of Intermodal and combined transport even more complex and more costly, therefore less attractive.

3) The Intermodal software

Managing the complex transshipment at terminals requires highly sophisticated computer technology, not only at the terminal itself, but increasingly also on the transport units to manage arrival and departure of the vehicles at the terminals. Some examples of this Intermodal software technology are discussed in this paragraph. The discussion does not even enter into the problem of information management, which in addition to the equipment handling software is a critical success factor for Intermodal transport. A typical terminal management brake-down is presented in next picture. Most of the components require computer technology to manage operations.



Source: Semitrailer Advanced Intermodal Logistics - SAIL

Figure 7.4.9 Terminal Organization Matrix

Intermodal cargo traffic management can be completed via AVI technology. AVI stands for Automatic Vehicle Identification, and, as the name describes, is applied to systems which can automatically capture data on the identification of rail rolling stock. Rolling stock is equipped with transponders (TAGs), on which specific data is installed (vehicle number, number of axles, tare weight, owner, etc). At neuralgic locations, such as transhipment terminals or rail stations, high frequency radio devices are installed that can read the data programmed on the tag, automatically, as the vehicle passes. The data is passed via a defined interface (e.g. RS 422) to a basic operating system.

transport systems remains limited and the share of Intermodal semitrailers has been declining since 1990. In 1999 only 9% of the Intermodal transport units were semitrailers in UIRR transport.

The main hardware elements of the system are TAGs (transponders) and Interrogators. TAGs contain variable and fixed information, such as the vehicle identification code. Interrogators generate, transmit and process the RF signal returned by the TAG. Once the interrogator receives the reflected signal from the TAG, it sends the TAG data to a host computer.

Photo J. Bebie Photo: AMTECH Corp.
Source: Intermodal Concepts and Management (ICM)

Figure 7.4.10 Tags and Interrogators

The use of identification, tracking and tracing technology is increasingly used in terminals. Information is collected electronically at the gate (see next pictures) and computers deduct / extract from the tag the necessary information to decided on the cargo handling processes, the storage location and all necessary administrative information.


Photo J. Bebie : UPR, Stockton CA, USA Photo J. Bebie : UPR, Marion Arkansas, USA
Source: Intermodal Concepts and Management (ICM)

Figure 7.4.11 Terminal Gate Control Technology

7.4.3 Cargo Transport in Egypt: The Sector View

1) Brief review of the Egyptian transport sector

Road transport[25] is the most important transport mode in Egypt to transport cargo from origin to destination. The road transport sector is still structured on the basis of the old state-controlled system, although the liberalization program is gradually changing it. Economic reforms eradicated existing monopolies, generating a network of "distributors" who directly negotiate with producers. Also the contact between producer and consumer narrowed and producers transported their products directly to the consumer by road or signed contracts with large road transport companies.

Following important elements can at present be noted:

- Cooperative Associations are important transporters of cargo. The cooperative associations' fleet size is evaluated at 30 % of the total transport fleet.
- Small truck owners with a limited number of trucks that are not members of any association but who work either through transport agents or independently make up for a quarter of the transport sector transport fleet. This group also includes small(er) factories that operate a transport fleet for the distribution of their products. The total force of this sector is about 25 % of the total transport fleet.
- The industrial sector still owns an important road transport fleet. It accounts for 37 % of the total transport fleet. This "industrial" fleet transports about 45 % of the raw materials and the products that enter and go out of the Egyptian factories.
- Larger road transport companies (only five companies in the beginning of the nineties) predominantly transport imports from the Egyptian ports to the Egyptian hinterland. Each company owns between 400 and 500 trucks and transport approximately 8.45 million ton (number for the years 1992 / 1993). These companies own 7 % of the transport fleet.

Commodities transported mainly by road are:

- General cargo imports and exports via the Egyptian ports (increasing part is transported in containers);
- Manufactured products (including wood and metal)
- Agricultural and food products;
- Cement and construction materials.

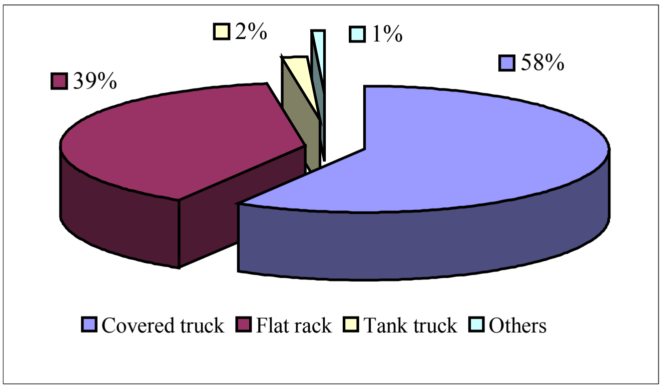
The study of Dr. Ali Abd el Salam el Meazawi and Dr. Abd el Kader Fathy Lasheen also depictured a future structure for road-based cargo transport in Egypt:

- Due to the disappearance of existing monopolies, the variety and spread of clients, the increase of the supply, the strengthening of the competition and the high expenses of operations demonstrate that there is no place for big companies in the sector. It is expected that the big companies of road freight transport will reduce till it reaches the size suitable to the market demand for transport.

[25] *See for a detailed analysis the report, prepared by Dr. Ali Abd el Salam el Meazawi and Dr. Abdel Kader Fathy Lasheen; May 1994*

- Development of the Cooperative Associations will continue, due to its apparent flexibility in dealing with the market and to its market position and ownership structure, offering a variety of trucks to transport cargo under their direct control.
- The activity of freight forwarders who deal with truck owners as intermediates between producers (shippers) and customers (final or intermediate) will increase.
- After market changes stabilize, the country could organize competition properly. But at present, the market is far from stable. One could even suggest that changes still have to begin. From the perspective of Intermodal integration, the above structure of the road transport sector is far from effective and will need substantial modernization at all levels (managerial and operational as well as technical and technological) before it can develop Intermodal transport.

At present, dedicated trucks are scarce and the half covered or fully closed truck is the most used type of truck to transport goods (58.69 % of the truck fleet), see next figure. The multi-functional flat rack is the second most important type of transport unit (38.91 %). At present, it is this flat rack that is predominantly used to transport containers.



Source: JICA Study Team

Figure 7.4.12 Transport Equipment Type

In general, the trucks are in poor operational condition, due to a lack of maintenance and the impact of traveling trough the desert along sometimes difficult roads. Some typical truck types are presented in the next figure.

Container truck transport exists in Egypt, but as can be seen in the picture above (picture top left), flat track trucks are generally used to transport containers.

Transport by road is by far the dominant transport mode in Egypt. As was demonstrated in several studies[26], Alexandria and Cairo are major attraction poles for cargo and generate between 25% and 80% of total cargo traffic movements. On average, over 60% of cargo entering or leaving the Egyptian ports is responsible for the mainly road-based cargo transport movements to and from the Greater Cairo Region.

[26] *See for example: Study on Master Plan and Rehabilitation Scheme of the Greater Alexandria Port in the Arab Republic of Egypt, JICA, 1999*

Source: JICA Study Team

Figure 7.4.13 Examples of Trucks in Egypt

According to the aforementioned studies, Road transport will continue to dominate the transport market with around 90% of total cargo transported. Railway transport and waterway transport will slightly increase except if public intervention or market changes drastically change the forecasts.

Railway transport infrastructure was designed and developed / expanded during the *etatism* regime of President Nasser (1952 - 1970), and was used / destined to transport bulk, low value cargo produced in the state-controlled factories. President Sadat reduced state-involvement in the economy and initiated with his *Open Door Policy - Infitah* - the evolution towards a free market economy and privatization, a policy that is continued and accelerated by the present President Mubarak. These evolutions shaped and altered both the economy and the industrial sector in Egypt and in particular in the Cairo region. Although large-scale infrastructure works were executed, the focus remained on road development while the railways did not underwent the necessary transformation to an efficient cargo transport mode that meets customer requirements.

The 1996 study of the railway sector[28] made a detailed analysis of the railway sector's infrastructure and operations and demonstrated that the focus on passenger transport is harming the development of freight transport. The largest part of the infrastructure is located along the Nile and in the Nile Delta, the most populated areas in Egypt, with links to the Egyptian ports. The structure of the network could be highly interesting for freight transport but this potential is at present not truly utilized. In its conclusions, the study team argued that "*As for freight transport, ENR currently uses railway's strength in large volume transport to transport iron ore and phosphates, but detailed study is necessary to decide what role ENR should play in general and containerized*

[27] *See for example: Study on Master Plan and Rehabilitation Scheme of the Greater Alexandria Port in the Arab Republic of Egypt, JICA, 1999*

[28] *"The Master Plan Study for Egyptian National Railways", JICA, December 1996*

freight. But one point which is certain is that ENR has many low volume freight stations in short distance and this fact greatly damages train operation efficiency and wastes the precious transport capacity of the track. ENR should close those small stations and try to shift cargoes handled there to adjacent larger improved railway stations as much as possible." (JICA, 1996, p 9-54).

With the expansion of container transport in Egypt, railways became important for transporting transit containers between the Mediterranean and Red Sea ports and between less the ports and Cairo. This role can be further expanded and more efficient Intermodal transport, using railway transport for the long haul, could be further developed in the Greater Cairo Region (see next paragraph).

Waterway transport is confronted with similar problems as the railway sector but its present operational status is worse. In spite of the existence of the Nile River, that passes the Greater Cairo Region and flows via its Delta to the major port areas, the infrastructure is hardly utilized for freight transport. Approximately 8 million tons only are transported over the Nile per year, which is substantially below its real potential.

The two major canals for freight transport are at present the

- Aswan - Cairo corridor (the Nile River)
- Cairo - Alexandria corridor (El Nubariya Canal)

Substantial efforts are made to upgrade Nile river traffic and to create new opportunities for cargo transport between Cairo and Damietta port through upgrading the existing Damietta branch of the Nile, works which are expected to be completed by 2003. At present, the River Transport Authority is also investigating the possibility to develop a water-based connection between Cairo and the port of Ismailya via the Ismailya Canal, enabling inland water transport to transport cargo between the Cairo region and the ports of Ismailya, Suez and Port Said. However, the project is subject to finding a solution for inland vessels navigating on the Suez Canal. This issue is at present a serious constraint because only deep-sea vessels are allowed to navigate on the Canal which will play an important role in developing river transport on these connections.

The inland vessels are a big problem. Inland vessels are badly maintained and much cargo is transported via the typical Nile vessel, which is hardly suited for efficient and modern transport. Furthermore the sector lacks efficient terminals and is not ready to compete with the road and railway sector for new cargo such as containers. This is not only caused by the lack of adequate infrastructure (e.g., terminals) but also by the lack of expertise in marketing and handling the new traffic flows.

In spite of the initially negative view on the potential of rail and river transport, the basic requirements are in place to increase the share of rail and river transport in cargo transport to and from the Greater Cairo Region. In addition to both planned Intermodal terminals, the railways and river transport sectors have terminal infrastructure in place inside the Greater Cairo Region. Although at present, their utilization is low and fragmented (unstructured), initiatives could be taken to increase the role of dedicated railway and river terminals in container transport.

Both the railway and waterway authorities are therefore engaged in a major restructuring program to prepare their sector for the new market. Both the railways and waterways are developing dry ports (railways) and inland freight ports (e.g., Ather el Nabi port) in the Greater Cairo region to handle containers and other modern cargo types.

The new services by these alternative modes are potentially successful given that the customers demonstrate a willingness to use these facilities, given a set of conditions and requirements.

1) Container traffic

Container movements were analyzed in detail in 1999[29]. Container traffic has emerged rather late in Egypt but has been increasing at double-digit rates, as shown in next table. Over the last 10 years, containerized imports through the Egyptian ports quadrupled from 345,000 tons to 1.5 million tons.

Table 7.4.1 Container Imports through Egyptian Ports

Port and	Number of Movements by Year									
Activity	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Alexandria	228,487	296,396	236,532	257,773	289,115	304,122	326,894	397,327	515,963	628,724
Exp& imp	190,790	213,310	229,253	247,143	284,427	301,841	325,129	389,378	493,307	586,015
Transit	37,497	83,086	7,279	10,630	4,688	2,281	1,765	7,949	22,656	42,709
Port Said	47,930	52,758	101,571	171,118	180,460	324,487	336,034	415,394	269,915	410,728
Exp& imp	31,869	37,742	45,795	61,739	61,958	78,703	95,391	104,014	127,869	144,292
Transit	16,061	15,016	55,776	109,379	118,502	245,784	240,643	311,380	142,046	266,436
Damietta	60,863	207,963	323,680	421,537	518,003	596,562	585,495	588,973	339,008	380,229
Exp& imp	-	-	2,745	11,729	29,218	45,759	49,094	64,825	91,508	5,763
Transit	60,863	207,963	320,935	409,808	488,785	550,803	536,401	524,148	247,500	374,466
Suez	7,970	3,275	5,210	3,664	7,651	9,352	17,144	12,521	36,909	48,742
Exp& imp	7,970	3,275	5,210	3,664	7,651	9,352	17,144	12,521	36,909	48,742
Transit	-	-	-	-	-	-	-	-	-	-
Total	**345,050**	**560,392**	**666,993**	**854,092**	**995,229**	**1,234,523**	**1,265,567**	**1,414,215**	**1,161,795**	**1,468,423**
Exp& imp	230,629	254,327	283,003	324,275	383,254	435,655	486,758	570,738	749,593	784,812
Transit	114,421	306,065	383,990	529,817	611,975	798,868	778,809	843,477	412,202	683,611

Source: Statistical Report For Sea Transportation Sector

The Cairo region is by far the most important destination for cargo entering the port of Alexandria. If the "local" hinterland is excluded from the table, over 95% of all containers imported via Alexandria port have their final destination in the Cairo area.

[29] *Study on Master Plan and Rehabilitation Scheme of the Greater Alexandria Port in the Arab Republic of Egypt, (JICA, 1999)*

Table 7.4.2 Container Hinterland Distribution from Alexandria Port

Hinterland of Container Cargoes Distribution	Percentage
Cairo	58.3%
10th of Ramadan City	4.2%
Giza	3.0%
6th of October City	2.1%
Sadat City	0.5%
Others	0.3%
The Cairo region Sub-total	**68.3%**
Alexandria	26.7%
Amerya Free Zone	0.6%
Borg El Arab City	0.5%
Others	0.5%
The Alexandria region Sub-total	**28.3%**
Tanta	0.5%
ZaGazig	0.1%
Middle Delta Sub-total	**0.6%**
Port Said	0.3%
Ismailia	0.3%
Suez	0.2%
Damietta	0.1%
Others	1.9%

Source: JICA Study 1999 (Alexandria Port Study)

Most containers are transported by road, but also the railways increasingly transport these containers into Cairo in addition to transporting transit containers between Mediterranean and Red Sea ports.

Damietta port is an equally important port of call for containers destined to the region (import and transit). The Cairo region accounts for 77%, Alexandria for 12.7% and Damietta hinterland accounts for 4.7% of import container volumes. Container traffic flows from Port Said is no different, with Cairo accounting for 38.7% of total volume while Ismailia and Alexandria both attract 6.6% of container traffic. Approximately 50% of total container import remains within the port of Port Said free zone prior to final distribution in Egypt (after stripping) or further shipment to foreign destinations.

These container flows offer concrete possibilities for rail and river to increase their market share in transporting of containers. A 1999 study of the Cairo Container Terminal at Ather el Nabi[30] made a forecast for future containerized transport through Alexandria and Damietta ports: see next table.

Table 7.4.3 Container Traffic Forecasts

	Import and Export of Containers				
Port	1998	2000	2005	2010	2015
Alexandria	503.000	570.000	810.000	1.170.000	1.690.000
Damietta	62.000	68.000	97.000	140.000	202.000

Source: RTA, SWECO, 1999

[30] *"Cairo Container Terminal - Review and Updating of Existing Feasibility Study", Sept. 1999, River Transport Authority; SWECO*

In the above table, transit containers were not included. According to the SWECO study, container development would demonstrate an expansion rate of 1.5 times the GNP increase. More important is the hinterland distribution expectations for these future container flows. Approximately 20 to 30% of total container import will be stripped in the port area and 70% of the FCL (fully loaded containers) will be shipped to the Cairo region. This prognosis was substantiated by the above mentioned JICA Study for Alexandria port.

The study on the potential of Ather el Nabi Port argued that container volumes could, after a start-up period of three years rise from 20,000 TEU in the first year to 50,000 TEU in year 2005 and 82,000 TEU in year 2015 (see next table). Afterwards, annual increase of containers handled at the site would stabilize at 3 percent growth.

Table 7.4.4 Container Traffic Forecasts at Ather el Nabi Port

Imports, Exports and Empty Loads (TEU)				
2002	2004	2005	2010	2015
20,000	38,000	50,000	68,000	82,000

Source: RTA, SWECO, 1999

The study calculated that in 2010 and 2015, 24% and 27% respectively of total container traffic from Alexandria port will be transported by barge to the Cairo region. For containers from Damietta port, the modal share was estimated at 20%. Undoubtedly a very optimistic and preliminary evaluation (terminal construction has not even begun in August 2002 and the number substantially differ from the estimates in the JICA study), but it makes clear that there is a potential market for transporting containers via river to Cairo, in addition to rail and road.

Also the railway sector is planning the development of what they call an Intermodal terminal. The planned Bashtil Dry Port consists of 45 Fedan of land that will be transferred to the private sector via a 25 year BOT contract. The land is at present being cleaned before terminal constructions can begin. This terminal undoubtedly offers interesting potential to handle container transport to and from Cairo.

It is expected[31] that the terminal will handle 16,000 TEU during its first year of operations. This estimate is more realistic than the SWECO forecasts and that railways are better positioned to rapidly increase their role in container transport to Cairo.

2) Intermodal container transport development in Egypt

Above overview of cargo flows and containerization allows formulating some preliminary conclusions regarding its Intermodal potential. It is stressed here that the conclusions are preliminary and need to be validated and substantiated by detailed

[31] *Information provided by ENR, unsubstantiated by independent data and / or studies.*

studies. It is stressed that these studies need to be integrated to develop a **realistic** picture of the Intermodal potential. Studies only based upon traffic flows and forecasts will undoubtedly give a distorted picture of the real potential, as it was the case for the study for Ather el Nabi Port.

The analysis of European Intermodal transport leads towards the (tentative) conclusion the Egyptian industry is at present not demanding sophisticated transport services and the transport sector itself is far from equipped and lacks the necessary expertise to deliver. For that reason, it is imperative that the relevant authorities as well as the transport sector itself concentrate in the short and medium-term future on the development of efficient and modern container transport by all transport modes (road, rail and river), in which multimodal and Intermodal concepts are integrated to the level that they are beneficial to its operational efficiency.

But container transport will continue to rise, as is demonstrated in next table.

Table 7.4.5 Evolution of Container Passage in the Ports 1995 - 2010

Scenario	*Optimistic*			*Pessimistic*		
	Index	*TEU (000.000)*	*% increase*	*index*	*TEU (000.000)*	*% increase*
1995	100	142	-	100	142	-
2000	156	222	56	156	222	56
2005	236	235	51	215	306	38
2010	327	465	39	275	391	28

Source: Ocean Shipping Consultants, the World Container Port Market to 2010, Chertsey, 1996

As was argued in Chapter 6 (Cargo Transport), cargo transport will not evolve to become a major problem in the Greater Cairo Region. Containerization can contribute to further alleviate the roads in Cairo if a share of the road-based container transport is shifted towards rail and river.

The potential is there and the necessary investments will remain relatively low. Several river and rail terminals are located inside the GCR and even inside the Ring Road area. Transforming some of these "general cargo and bulk terminals" into "container terminals" could be a first step to achieve the modal shift[32]. The necessary terminal equipment will remain relatively limited and traditional container reach stackers could be sufficient to handle the daily container volumes in these terminals.

3) The role of terminals in (Intermodal) container transport

In Europe, terminals are differentiated according to the number of transshipments performed per year and are grouped as follows:

- Small < approx. 20,000 transshipments/year

[32] *As was argued before, rail transport has already built up expertise in container transport and can use that knowledge to develop container traffic to Cairo. River transport on the contrary has no expertise in the field and lacks the basic equipment to transport containers via the river. Similar to developing river container terminals, the sector should develop a small fleet of simple container river vessels.*

- Medium approx. 100,000 transshipments/year
- Large > approx. 250,000 transshipments/year

Most existing rail and river terminals are small terminals and should be developed from that perspective. Because more important than its size, terminal operations and productivity are determined by the expertise of the operators and the condition of the fleet and equipment. The basic attention should be oriented towards these elements, rather than to the size of the terminal.

At present, these elements speak in favor of the railway sector as compared to river transport and as the study on Ather el Nabi Port strongly argued, the success of the "Intermodal" river terminal will depend upon following critical conditions:

1. The interface between land and sea should shift from the seaports to the Cairo region and the terminal(s) in Cairo should be given the same status as seaports (Free Zone);
2. The efficiency of the project will highly depend upon the willingness of the relevant authorities (RTA, Customs, etc…) and upon market acceptance;
3. Port and barge operators, forwarders, road transporters all have to work together to provide an integrated transport service.

An important starting point is that rail and river operate several terminals inside and near Cairo, see next figure. Improving their operations and marketing could increase in the short-term the volume of bulk cargo that is transported to Cairo, reducing the number of heavy trucks on the road. But its future lies also in the potential of some of these terminals to transform into value added container terminals.

An interesting study in that respect is the study on "***Improving the role of container units to support foreign trade in Arab Republic of Egypt***" which includes valuable information on the potential and the ways to realize container transport by the three modes, road rail and river[33]. The red circles represent railway terminals with the potential to develop container transport, the green circles identify river ports where container transport could be organized.

An average (river) container terminal[34] requires approximately 2 ha of hard standing, surrounding it with a fence, small and low profile office and as primary equipment a gantry container crane with a capacity of 44 tonnes, able to handle containers of 20 to 45 foot and with a reach over water of 20 m. A reach stacker is necessary for stacking and handling the containers on land.

Some additional (non critical) features are a container repair department and a container cleaning centre. Finally, there is customs clearing facilities to allow efficient container throughput.

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[33] *Arab Republic of Egypt Ministry of Transport - Transport Planning Authority: "Improving the role of container units to support foreign trade in Arab Republic of Egypt"; Draft of the final report, January 2001; Civil Engineering Studies and Research Center Faculty of Engineering – Cairo University in cooperation with The Consultant Bureau for Transport Planning and Engineering*

[34] *The description is of the Meerhout Container Terminal on the Albert Canal, approximately 80 km from the port of Antwerp.*

The total investment is around 4 million €, just under half of which was needed for the construction of the 200 m long quay, with the rest going to the superstructure.

Such a terminal is efficient / profitable if it handles between 30.000 and 40.000 TEU per year[35]. An example of a river terminal with ship/shore cranes is visualized in next figure.

[35] *During the first year operations, the terminal handled 43.110 TEU. This was much higher than expected, and indeed was not foreseen in even the most optimistic market scenario.*

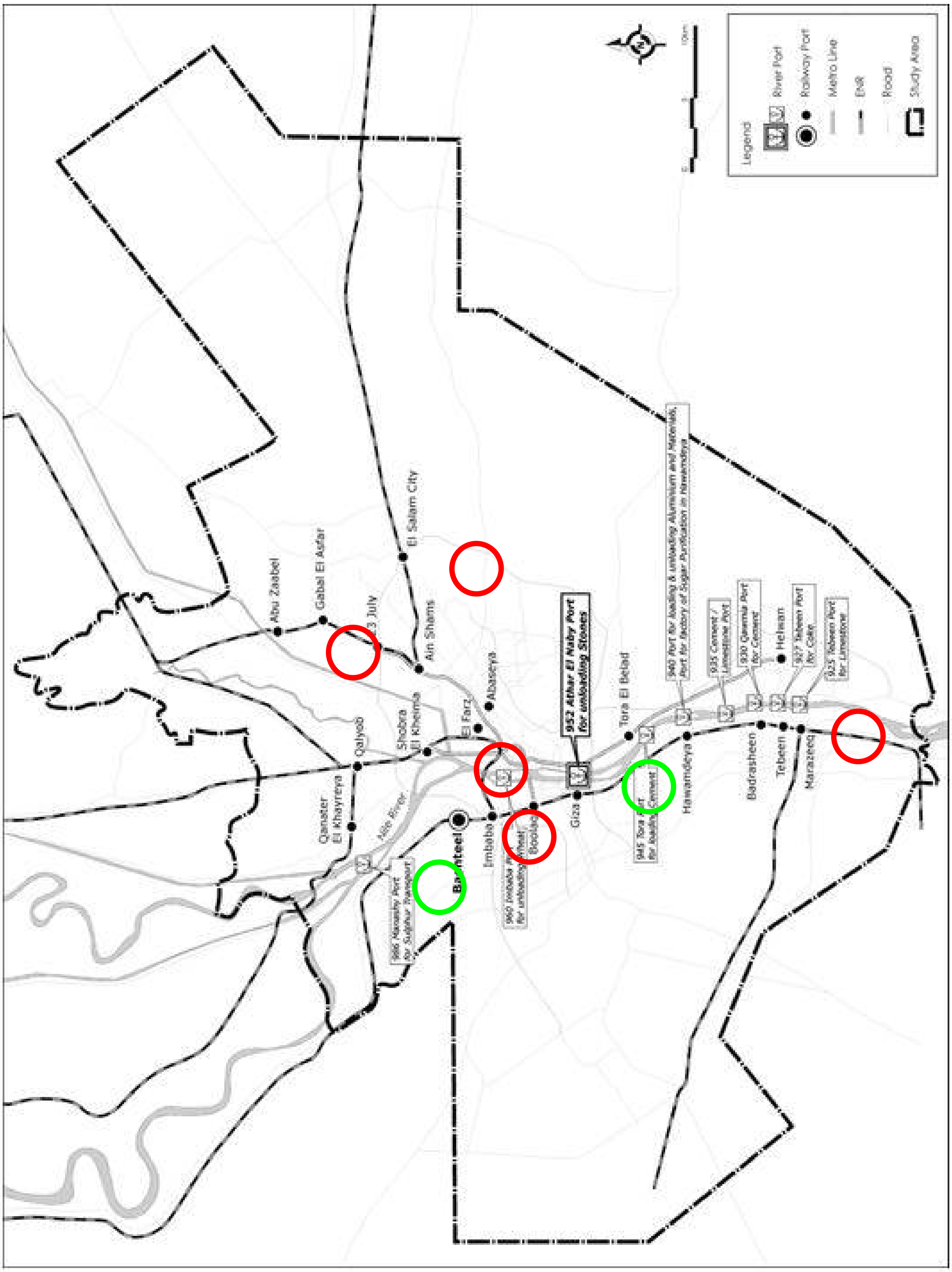


Figure 7.4.14 River and Railway Terminals in the GCR

Source: JICA Study Team

Source: Innovative Technologies for Inter-Modal Transfer Points - ITIP

Figure 7.4.15 River Terminal

A conventional rail terminal in Europe is built in 2 separate blocks, each with 1 gantry crane. Both blocks together serve 5 rail tracks. The rail tracks have a length of 600 to 720 m. It is possible handle trains with a length of 700 m. The trains do not have to be separated to be loaded or unloaded. As visualized in next figure, such terminals are very efficient and are equipped with Gantry / Portal cranes, preferably on tires.

Source: Innovative Technologies for Inter-Modal Transfer Points - ITIP[36]

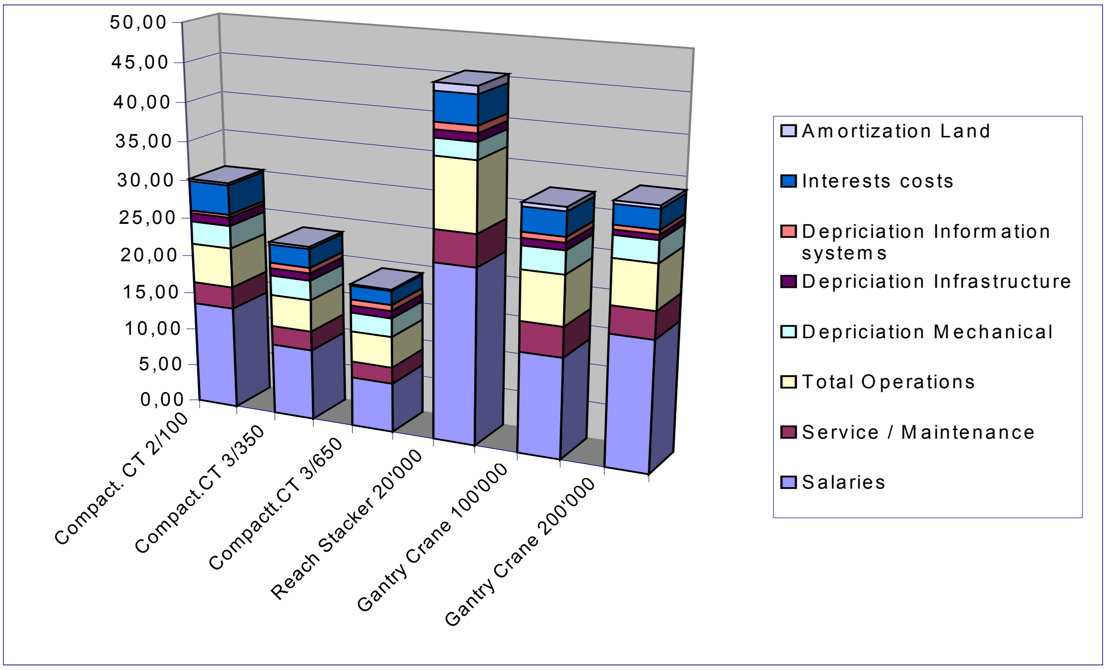
Figure 7.4.16 Railway Terminal

For Egypt, gantry cranes are even not necessary, therewith substantially reducing the investment requirements. Trains could easily be served with traditional reach stackers.

[36] *The picture is of the "Maasvlakte terminal" in the port of Rotterdam and is only to demonstrate the basic river gantry crane.*

Next table gives an overview of the operating costs of a rail terminal. If the necessary investments for a small rail terminal with a reach stackers and a volume of 20.000 lifts per year are taken (first cost column in the table), the initial investment and operational costs are feasible, certainly if compared to the investment and operational costs of a terminal equipped with gantry cranes[37]. These cranes are only necessary on terminals with an annual volume of over 100.000 lifts per year. None of the rail and river terminals will reach that level in the short- or medium-term future.

Further costs savings are possible if the introduction of innovative terminals are considered. An example is given in next figure where the operational costs of a Compact Terminal are compared with the operating costs of traditional rail terminals[38].



Source: Intermodal concepts and management - ICM

Figure 7.4.17 Rail Terminal Investment Costs

37 _An average modern reach stacker container crane costs approximately 800.000 €, which is low compared to the cost of a basic gantry crane which costs around 4 million €. The latter also requires investing in hardware for electricity provision, which further increases the investment with 300.000 €._

38 _The COMPACTTERMINAL was developed by Tuchschmid and allows road-rail and rail-rail transfer_

Table 7.4.6 Operating Costs for Railway Terminal

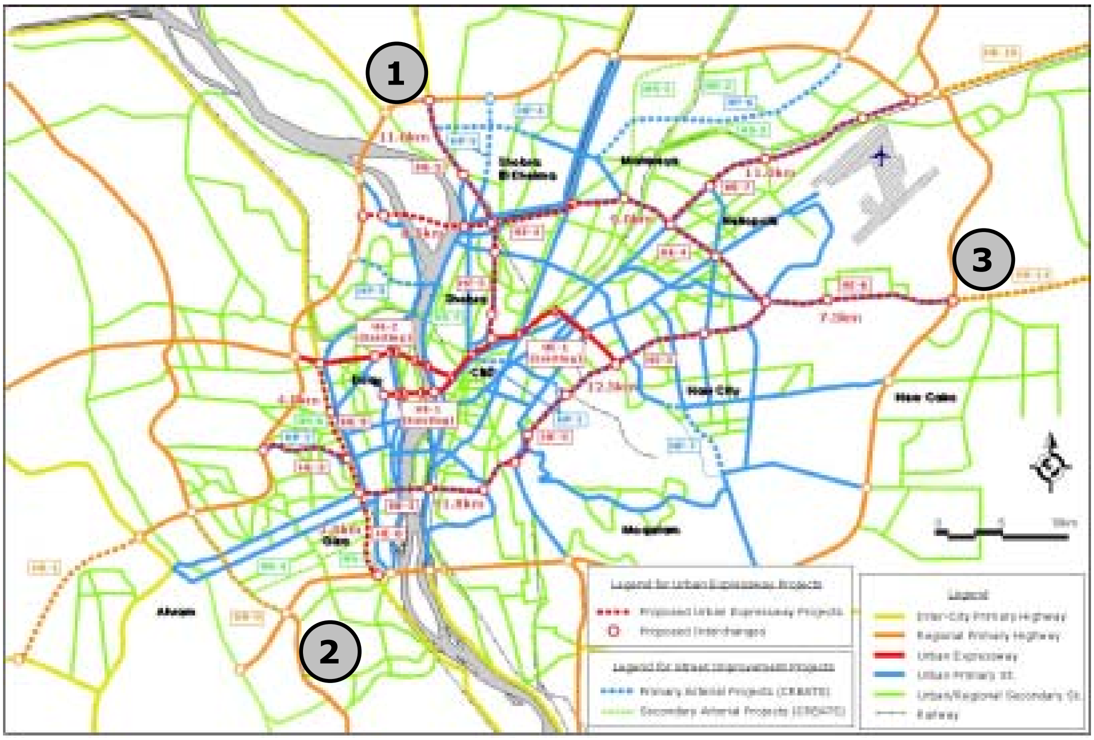
Operational Data		**Conventional Terminal**					
		Reach Stacker		**Gantry Crane**		**Gantry Crane**	
Lifts/year		20'000		100'000		200'000	
Operating costs Techniques	5%	110.500.-	10%	348'950.-	7%	597'100.-	7%
Operating costs infrastructure	2%	11'800.-		38'500.-		48'500.-	
Operating costs train handling		140'000.-	8	270'000.-	15	450'000.-	25
Total operating costs		*262'300.-*		*657'450.-*		*1'095'600.-*	
Service/ maintenance Techniques	5%	94'500.-	10%	318'150.-	7%	553'700.-	7%
Service/ maintenance infrastructure	2%	11'800.-		38'500.-		48'500.-	
Service/maintenance computer system	10%	16'000.-		44'000.-		62'000.-	
Total Service / maintenance		*122'300.-*		*400'650.-*		*664'200.-*	
Personnel		8 h	16 h	8 h	16 h	8 h	16 h
Module transhipment		3	0	3	6	4	7
- Module road		0	0	0	0	0	0
- Operations		2	0	2	4	3	6
- Gate		1	0	1	2	1	2
- Management		1	0	1	1	1	1
- Administration		1	0	1	1	1	1
- Maintenance		1	0	1	2	1	2
- Yard personal		3	0	4	8	6	12
-							
Total Personal		*12*	*0*	*13*	*24*	*17*	*31*
Basic capacity level			50%		60%		60%
Adjusted Capacity 1		50%	90%	50%	90%	50%	90%
Adjusted Capacity 2		60%	110%	60%	110%	60%	110%
General operating conditions terminal							
Peak Capacity / h			24		60		120
Transhipments/day			100		350		650
Transhipments/year (incl. Saturday morning)		29'000		101'500		188'500	
Depreciation building							
Amortisation of land							
Additional costs related to railway transport							
.. number of locomotives		Operational cost per locomotive			640.- Euro / liter		
.. working hours		Salaries Team			1'545.- Euro / liter		
.. diesel fuel		Cost diesel fuel			1.- Euro / liter		

Source: Intermodal concepts and management - ICM

The Egyptian transport sector needs in the first place to concentrate upon the use of ISO containers, predominantly used for import and export through Egyptian ports. It is only in a later stage, when both the industry and the transport sector have transformed and modernized their transport operations, that the step towards specialized (Intermodal) container transport should be envisaged.

But terminals are not only important to increase the share of rail and river transport and to develop container transport. They also contribute to improve road transport and can help the introduction of policy measures to restrict access to certain areas (see recommendations).

Terminals for road transport could be located nearby the Ring Road in the north, south and east to accommodate trucks from respectively Alexandria Agricultural Road, Upper Egypt Desert and Agricultural Road and Suez Desert Road. Each of these corridors is characterized by an important volume of heavy trucks for which access to the inner Ring Road area is restricted / prohibited during day time. Next figure visualizes the area where these terminals could be located.



Source:JICA Study team

Figure 7.4.18 Truck Terminal Locations near the Ring Road

The first location is near Alexandria Agricultural Road. This terminal could be used by heavy trucks from Alexandria Agricultural Road and the road to Qanater. The second is near Upper Egypt Desert Road to service heavy trucks from that road and from Upper Egypt Agricultural Road, which could access the terminal via regional secondary road.

The third and final terminal should be located near Suez Desert Road to accommodate the large number of heavy trucks on that corridor. Other locations could be considered, but detailed studies should be conducted to identify the optimal location in terms of maximizing access possibilities and minimizing the negative impact on the environment.

In the immediate future, these terminals could be developed as simple _truck stops_. These stops will accommodate the heavy trucks that wait to access the inner Ring Road area. Most of these vehicles at present are parked randomly and uncontrolled along the inter-city access roads and create a nuisance to other traffic.

In the short-term future it is, however, highly recommended to introduce a cargo transfer function for these road terminals where cargo is transferred between heavy trucks and light trucks. Cargo that enters / leaves the GCR in heavy trucks can be transferred from / to these trucks to / from smaller trucks which are responsible for the transport from / to the truck terminal to their final origin / destination within the GCR, and in particular within the inner Ring Road area.

The transfer of cargo between large and small transport units (predominantly containers and trailers) is referred to as stuffing (consolidating small cargo units into large transport units) and stripping (distributing large unified volumes over different smaller transport units). The proposed cargo transfer function can in a later phase without any problem be extended to containerized transport, where the concept is common practice.

Efficient cargo transfer is closely related to two specific logistics professions:

- Warehousing
- Freight Consolidator and Integrator

Warehousing is a relatively new profession that emerged from traditional storage. Warehousing integrates storage of goods into the production process via the provision of production supporting services such as final assembly, packaging and distribution for target markets. These ‘new’ activities require a totally different approach in management as compared to the traditional storage approach.

With the increasing privatisation of the transport sector and the development of Intermodal transport, the profession of transport integrator will emerge. Freight integrators have the natural effect that existing (uni-modal) transport processes must take a back seat. This is a direct consequence of a natural demand by the private sector seeking a maximisation of profit among others via a reduction of transport costs. Thus, predominantly well paying, frequent freight goods over long distances are sought out and services by freight integrators.

As becomes clear from the above brief description, the development of cargo transfer terminals is predominantly a task for the private sector. The role of the public authorities remains limited to stimulating measures.

A supporting side development of these truck terminals is the additional potential to create value added such as gas stations, restaurants and coffee shops, truck repair and cleaning and other services. Introducing value added to these truck stops enables public authorities to generate revenues from these public truck stops or to transfer the development of these truck stops to the private sector via BOT schemes.

The truck terminals will strongly support a stricter enforcement of the truck ban and will contribute in implementing the measures to control truck flows that were proposed in the previous chapter.

An expansion and improvement of these terminals (or sections of them) is the transformation from truck stop to cargo terminal with equipment to handle containers (reach stacker crane). At these terminals, stuffing and stripping of containers could be possible and in combination with warehousing services stimulating over time the development of a truly Intermodal transport profession: namely ***the cargo consolidator and integrator***.

The above discussion focuses on infrastructure development. However, it should be stressed here that the most urgent need for cargo transport is a comprehensive and detailed <u>Transport Sector Restructuring Study</u> that identifies the needs and sets the framework for transport efficiency improvements. Only when transport services improve, container transport and Intermodal transport can be developed.

An important element in the proposed study of the cargo transport sector will be the concept of EDI and the Virtual Information / Integrated Transport Chain (VITC). Transport efficiency requires in addition to expertise and equipment front-line information technology such as EDI and other automated data transmission methods. The general objective of introducing automated data transmission is to develop an integrated network approach via a Virtual Information Chains, emphasizing both the need for vertical and horizontal integration of the various actors in the Intermodal transport chain, and the need for efficiently interconnected information systems. Here, particular attention will be given to the possibilities of developing ***information warehouses***.

The importance of effective information and communication systems for the improvement of transport efficiency should not be underestimated. Information technology will (have to) penetrate at all stages of value added (transport) chains, which will lead to a significantly higher level of control and synchronization of the various stages in these logistical chains[39]. This phenomenon was already a long time ago recognized by parcel companies (the original *integrators*) such as TNT, UPS, FedEx and DHL, whose success is based on integrated transport systems and time-guaranteed transports. In that respect, Gopal and Cypress[40] emphasize the need for shared databases and networks in order to provide the logistical chain with shared and easily accessible information. An increasing number of leading companies are ar present implementing the concept of *the information warehouse*. An information warehouse can be a single database or a large number of databases linked to each other throughout the logistical chain. Information warehouses also include customer information in order to conduct real-time market analyses.

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[39] See for a detailed discussion Wandel S. & Ruijgrok C.: *Innovation and structural changes in logistics : a theoretical framework,* in: <u>Transport and communications innovation in Europe</u>; Giannopoulos, G.; Gillespie, A. (editors); Belhaven Press, London, 1993

[40] Gopal, Christopher & Cypress, Harold; *Integrated distribution management: competing on customer service, time and cost*; Irwin, Homewood, 1993

7.5 RECOMMENDATIONS

7.5.1 Intermodal Public Transport

The CREATS Master Plan foresees in the upgrading of existing public transport services and the creation of new infrastructure. Additional initiatives / steps will be necessary to make the development of the proposed infrastructure successful. In summary, achieving efficient cargo transport requires in addition to the transport infrastructure:

- The transformation of key interconnecting points from mode-based terminals into efficient Intermodal terminals;
- The introduction of new transport vehicles to reduce operational costs and to increase efficiency;
- The commercialization of the different operators to better manage the public transport offer;
- The interconnectivity of the different public transport services via integrated services such as single tickets, time table alignment and increased consistency of the public transport offer;
- The improved exchange of information, both internal between operators and external towards the passengers.

Requisite policy and infrastructure recommendations are presented in Chapter 4, *Public Transport System*, as well as this Chapter 7. To provide additional insight into likely quantitative benefits associated with enhanced Intermodality, the CREATS transport model was applied to test the sensitivity of public transport utilization to three stimuli:

- Conversion of public modes fare structure to a single, common system;
- Changes in the absolute amount of fare levied; and,
- Adjustment of route structure from competitive to enhanced Intermodal status.

At present, three different types of fare structures exist in the formal public transport sector. These are distance proportional (metro), flat (trams) and route specific (public bus). The latter case somewhat combines flat and distance proportional concepts in that pricing for a given bus line, for example, could vary depending on length, perceived service or type of equipment provided. The testing of future public transport scenarios carries the implicit assumption that current fare structure is retained, although fare amounts expressed in terms of constant year 2001 Piasters, change in line with forecast real economic growth. Thus, the average public transport trip yield increases roughly by a factor of 1.5 between the base year and target year 2022.

The weighted average public sector fare for Scenario D (the recommended plan), year 2022 conditions, is on the order of 6.6 Piasters per kilometer. The initial test therefore has two elements: (a) that all public sector operations use a common, distance proportional fare structure, and (b) the average unified public fare ranges from five to 10 Piasters per kilometer.

Findings of the sensitivity analyses indicate that (Table 7.6.1):

- Systems which apply a flat tariff, or close approximation thereof, attract more ridership under a distance-proportional scenario. In case of trams/supertrams and ENR (the Wings are largely expected to carry a route specific fare), for example, ridership considerably increases under any distance-proportional scenario. The tram/supertram daily patronage increases from 1.12 million to near two million, while ENR ridership (suburban plus Wings) also hovers near two million per day. Average trip distance changes. In case of tram/supertram, from near nine to near five kilometers, and in case of ENR from near 17 to near 13 kilometers. This suggests that these modes become much more attractive to shorter (cheaper) trips, and, in case of tram/supertram, may actually be attracting car trips from wealthier suburbs such as Heliopolis and Nasr City.

- The overall level of public transport usage changes in line with adjustments in ticket price, but not dramatically so. The base case Scenario D public ridership is some 15.56 million boardings per day, which grows to 16.46 million under a unified five Piaster scenario, and decreases to 15.07 million under a 10 Piaster unified fare scenario. Overseas experience suggests that each 10 percent increase in fare will result in a three percent loss in ridership; however, these statistics may be of questionable validity in Cairo given the high degree of transit captive patronage. It is also of relevance to note that in case of buses, the private sector (shared taxi) average single-journey fare is, at present, about twice the CTA bus base fare, and considerably higher than the average public bus single-journey fare (58 Piasters versus 25 Piasters and 34 Piasters, respectively).

- The use of a unified fare suggests that overall public sector ridership will increase at similar fare levels. The core Scenario D public ridership, which totals 15.56 million under a weighted average fare of some 6.6 Piasters per kilometer, still increases to some 15.9 million persons under a slightly higher, but unified, average fare of seven Piasters per kilometer.

- Private sector (shared taxi, cooperative minibus) ridership also varies even though the fare is assumed to remain constant for all scenarios tested. As public fare is decreased (and ridership increases), private sector boardings decrease slightly given that public services have become economically more attractive. As public sector prices increase (and ridership decreases), private sector boardings tend to increase as pricing benefits now accrue to the private sector. In general, private sector boardings decrease under a unified fare scenario as more, and shorter, trips are diverted to the public sector.

It is important to stress that any raise of the fare value should be considered from a **practical point of view**, taking into account social, financial, economic and other elements.

Table 7.5.1 Absolute Variation in Year 2022 Public Transport Passenger Demand Fare Structure and Fare Amount Sensitivity Analysis

Mode(1)	Million Daily Boardings, Scenario D(2)			
	Unified Public 5 Piasters/Km	Independent Public Fares	Unified Public 7 Piasters/Km	Unified Public 10 Piasters/Km
Public Bus	3.668	3.910	3.508	3.165
Tram, supertram	2.050	1.129	2.017	1.869
Metro	8.711	9.082	8.398	8.142
ENR(3)	2.007	1.438	1.953	1.865
Subtotal Public	16.456	15.561	15.899	15.068
Private(4)	3.936	4.761	4.091	4.517
Total	20.392	20.322	19.990	19.585

(1) Nile ferry not shown due to small ridership vis-à-vis other urban modes.
(2) Unified public defined as all public modes of transport having an identical distance proportional fare at unit rates of five, seven and 10 Piasters per kilometer. Independent public fares defined as current fare structure with real growth in fare amount; weighted average approximated at 6.6 Piasters per kilometer. Private fare unchanged in all scenarios; reflects current fare structure with real growth in fare amount. All amounts in 2001 constant Piasters. All sensitivities based on Scenario D (recommended scenario) public transport structure.
(3) Suburban operations including services to satellite cities.
(4) Shared taxi and transport cooperative minibus.
Source: JICA Study Team.

These findings carry three important implications for the public sector; namely that (a) the use of a common fare policy is likely beneficial in terms of ridership; (b) that a distance-proportional fare applied uniformly to all public operators can be a catalyst for increased ridership, and (c) that opportunities exist for increasing (commercializing) absolute fare levels with modest impacts upon ridership.

Developing an Intermodal public transport system reliant upon a public and private sector partnership requires the efficient integration and interconnection of the different public transport elements. Under such an approach, as presented in Section 4.2 of Chapter 4, one may argue that fixed-route and high capacity systems should be given priority in the scheme, while other more flexible public transport systems should be superimposed to create an integrated network. Conversely, low capacity but highly demand-responsive and flexible systems such as shared taxis could be considered end-line service providers and should not necessarily be constrained by a fixed route network.

A further test is to compare the public transport performance of an integrated system as included in the recommended Scenario D, vis-à-vis the continuation of the current practice where the public transport modes largely operate in a competitive, not supportive, environment.

Table 7.5.2 Variation in Year 2022 Public Transport Passenger Demand Route Structure Sensitivity Analysis

Mode(1)	Million Daily Boardings(2)		Boardings Ratio	
	Integrated Route Structure	Non-integrated Route Structure	Integrated Route Structure	Non-integrated Route Structure
Public Bus	3.165	2.898	1.00	0.92
Tram, supertram	1.869	0.998	1.00	0.53
Metro	8.142	7.725	1.00	0.95
ENR(3)	1.865	1.664	1.00	0.89
Subtotal Public	15.068	13.285	1.00	0.88
Private(4)	4.517	9.312	1.00	2.06
Total	19.585	22.597	1.00	1.15

(1) Nile ferry not shown due to small ridership vis-à-vis other urban modes.
(2) Unified public distance proportional fare at 10 Piasters per kilometer. Private fare reflects current fare structure with real growth in fare amount. All amounts in 2001 constant Piasters. All sensitivities based on Scenario D (recommended scenario) public transport structure.
(3) Suburban operations including services to satellite cities.
(4) Shared taxi and transport cooperative minibus.
Source: JICA Study Team.

The conclusions in that respect were again clear (Table 7.6.2):

- The integrated network is more attractive to public services. Under the integrated scenario, some 15.1 million public services boardings are recorded, which decrease to 13.3 million under a non-integrated (current) route structure.

- The private sector, in turn, doubles daily boardings from some 4.5 million to 9.3 million persons under a non-integrated scenario.

These findings clearly imply that continuation of the current approach to providing public transport services will see a growing domination by private sector (shared taxi, cooperative minibus) services. Yet, findings also suggest that shared taxis and similar operations fulfill a valuable role and that, if properly integrated into an Intermodal network, can provide a notable contribution toward meeting the mobility needs of Cairenes.

It should be stressed that the above proposed integration of fares between shared taxis and formal modes like CTA bus is complicated and will require additional and detailed studies on the practical and regulatory conditions.

7.5.2 Intermodal Cargo Transport

In spite of the many technologies existing Intermodal and combined transport are not as successful as could be expected, even in Europe. Only on specific routes and under specific conditions, Intermodal transport is feasible. Even when operating successfully, Intermodal systems require a high level of technology and expertise in addition to the basic hardware, which is already highly sophisticated. Many technologies exist and depend upon the transport modes, the unit load type and the type of transshipment technology at the terminal.

Because of the high costs involved, Intermodal and combined transport are increasingly divided between container transport and (semi)trailer transport. The former requires less technological efforts and standard equipment can be used to handle the basic types of containers (in particular ISO containers which are used by sea vessels). Trailer Intermodality concentrates on the use of rail/road combinations and requires complicated technology at all stages of the transport chain. The truck, the railcar and in many cases the transshipment equipment in the terminal need to be adapted to the type of trailer. Finally, Intermodal operators as well as truck operators increasingly control truck flows and cargo via modern communication technology. Information obtained from the position of the truck and the condition of the cargo is automatically processed and relayed to wider Information Management Systems.

As argued in previous sections, the short and medium-term future of cargo transport in the GCR is to be found in container transport and transport service improvements rather than in developing Intermodal Transport.

The future cargo transport policy should therefore focus on stimulating

- Container transport to and from Cairo and
- construction of container terminals for road, rail and river transport;
- initiating a transport sector restructuring program, including
    - The qualitative improvement of the different transport modes in terms of basic equipment (trucks, railcars and river barges and terminal equipment);
    - Integration of transport modes via the development of the profession of transport integrator and consolidator;
    - Introduction of Electronic Data Interchange (EDI) in the truck industry;
    - Increase of transport expertise in the sector.

It should be noted that further study is necessary (preferably within the context of the Cargo Transport Sector Restructuring Program), given the existing mix of public and private companies and services.

All these components will be briefly discussed hereafter.

<u>Stimulating container transport</u>

Detailed studies per transport mode (and even per region) are required to evaluate the potential, the needs and the development conditions for container transport in Egypt. This chapter provided some insights into the complexity of modern Intermodal logistics and container transport, without pretending to be comprehensive.

The merits of this review lies in informing public authorities that Intermodal logistics is very complex and requires many detailed studies before concrete investments can be considered, in particular in markets where modern logistics has not yet penetrated.

In the short-term, the development of sea container transport by all transport modes should therefore be of the highest priority, simultaneously with the restructuring of the transport sector (see further).

The review on present and future transport in Cairo also argues in favor of container transport by rail and river to and from Cairo. River transport presently does not transport containers, while the railways concentrate on transporting transit containers between the Egyptian ports and only to a limited extent on container transport to Cairo. They too should transform towards increased transport of containers.

Improvement of equipment and terminals for all transport modes

The present condition of most cargo transport equipment and terminals is low to bad and is unsuitable for efficient transport of cargo, in particular containers. It is therefore imperative that in conjunction with the planned development and rehabilitation of terminals, sufficient consideration is given to the equipment that is used by the transport sector and terminal operators.

The Egyptian transport sector is undergoing a trend to privatization which will continue in the future. Public authorities therefore are limited in their options to stimulate the introduction of modern equipment. It could however be considered establishing in the future a program to financially support private operators to replace their outdated transport units by modern equipment, in particular adapted for the transport of containers. The support program should concentrate on equipment that is suitable to transport the most commonly used containers in the world, an overview of which is provided in next table.

Table 7.5.3 Overview of Container Use

ANALYSIS OF THE WORLD TEU CONTAINER FLEET
BY LENGTH (HEIGHT) AND GEOGRAPHICAL REGION
(SOURCE : CONTAINERISATION INTERNATIONAL, 1995)

	EUROPE	NORTH AMERICA	CENTRAL SOUTH AMERICA	NORTH ASIA	SOUTH EAST ASIA	MID-EAST INDIA	AUSTRAL ASIA	AFRICA	TOTAL
20 ft (8 ft)	67.129	7.956	2810	7.225	1.115	407	1.933	1.219	89.794
20 ft (8 ft 6 in)	1.249.420	1.273.749	51.882	524.480	69.445	92.629	32.793	59.161	3.353.559
20 ft (9 ft 6 in)	1.079	701	-	378	80	-	3.331	1.661	7.230
40 ft (8 ft)	1.452	2.828	200	1.400	70	-	-	44	5.994
40 ft (8 ft 6 in)	803.738	1.994.438	43.884	732.602	57.606	112.342	2.248	7.512	3.754.370
40 ft (9 ft 6 in)	126.778	438.424	7.216	186.390	3.850	15.882	600	42	779.182
45 ft (9 ft 6 in)	20.498	52.846	2.200	20.094	1.125	-	-	-	96.763
48 ft (9 ft 6 in)	-	138.180	-	-	-	-	-	-	138.180
53 ft (9 ft 6 in)	-	15.595	-	-	-	-	-	-	15.595
Other *	55.936	37.911	69	675	30	5	2.589	1.550	98.765
TOTAL	2.326.030	3.962.628	108.261	1.473.244	133.321	221.265	43.494	71.189	8.339.432

* Includes all platform flat/half -height and non-categorised lengths

Source: Containerisation International, 1995

Transport integrators and consolidators

Selecting the right and most efficient mode of transport chain is based on different criteria at any given time, transport flow "organisers" are emerging in Europe. The freight integrator as a profession is modelled on what has been done at the world level for package distribution and specialises in the integrated transport of full loads (exceeding around 5 tonnes). These "freight integrators" combine the specific strengths of each mode to offer their clients the best service in terms of efficiency and price.

The original freight integrator was the parcel service industry (DHL, FedEx, UPS, etc…), who created fully integrated hub and spoke transport networks to transport in the most efficient way parcels from origin to destination.

The European parcels market has grown at different rates in each country, due to national regulations and market protection (such as postal monopolies). The opportunity for further growth is not so large. For that reason, parcel operators started to penetrate markets where freight forwarders and international road groupage operators (cargo consolidators) were very strong.

The competitive advantage of the parcel operators came from their centralized hubs and mechanized sorting methods, and from their highly sophisticated information management systems. The European Commission sees benefits in their expertise and intends to promote the development of similar technology in the cargo transport sector.

Although transport in Egypt does not require highly sophisticated and automated freight integrators, a moderate form of that profession could have interesting development possibilities in the future. As freight integrator, they can consolidate cargo volumes (groupage specialist) and stuff these LCL cargo volumes in containers to transform it into FCL container loads. They can than make efficient use of container transport by rail or river, if this type of transport will once be efficiently developed in the future.

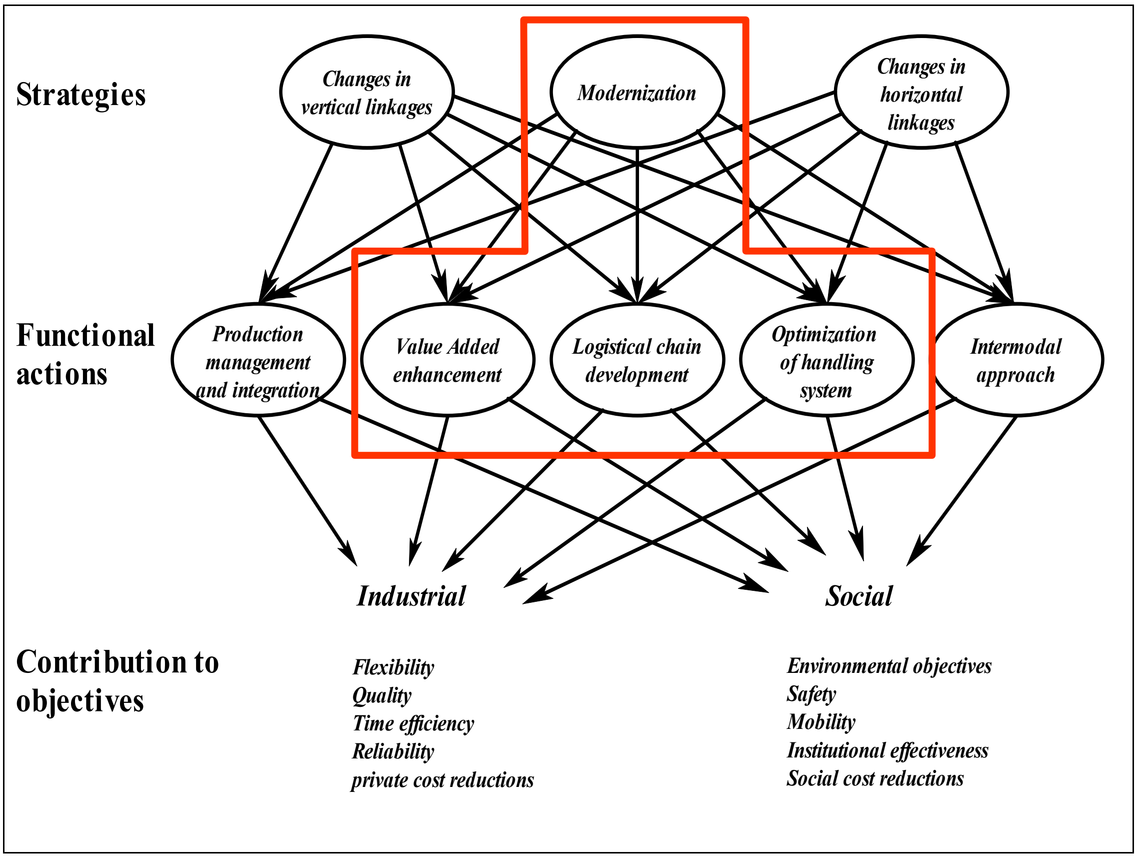
The introduction of the freight integrator is thus closely linked to the future of container transport in Egypt. The profession of freight integrator, together with the groupage specialist (freight consolidator), is also linked to the possible development of private logistics terminals.

Transport sector restructuring

As was argued throughout this chapter, efficient cargo transport is not only achieved by creating new hardware. It requires even more efficient equipment and human expertise.

It is therefore urgently recommended that a large scale Transport Sector Restructuring Study is initiated that identifies the framework to assist the sector in moving forward.

A general overview of logistical trends that could serve as a guideline for the sector restructuring program is visualized in next figure. The model includes three layers (strategies, functional actions and objectives), each consisting of several elements.



Source: JICA Study Team

Figure 7.5.1 Critical Areas for Transport Sector Restructuring Study

As a general transport logistics principle, both customers and competitors force logistical service providers to contribute to 5 industrial **objectives**. The highly specific and fast changing needs of customers require *flexibility* and *quality*. *Time* is becoming a very important element in logistics (e.g., in the concept of JIT-transport), although *reliability* is often considered even more important. Many customers assess their suppliers in terms of the time taken to satisfy orders, as well as their reliability. Reliability and a short lead time (the length of time taken to receive an order after it is placed) are essential for stock minimization. The shorter the lead time, the smaller the inventories in the distribution chain, whereas reliability affects the levels of safety stock. Stock minimization is a means to reduce the logistical *costs*. However, firm strategies should also take into account social targets, as long as they do not jeopardize achieving industrial objectives. Important social objectives include improvements of the environment, safety, mobility, the compatibility of corporate actions with the institutional framework as well as a reduction of social costs.

Functional actions undertaken by logistics service providers intend to meet the proposed objectives. Their actions can be concentrated in one or more of five groups:

Production management and integration are activities aiming to reduce lead times, achieve stock minimization and improve quality. These activities focus on internal processes and system improvements and on the integration of production and transport into a single integrated process. Through *value added enhancement,* companies provide a better customer service, by complementing the core transport activities with other services, such as packaging, physical distribution, etc... Accurate and on-line information is an essential part of value added services. Actions to develop more efficient *logistical chains* are aimed at reducing stock, storage time and the total lead time of commodities. Here, each individual company in the chain needs to improve its own efficiency (sub-optimization), but all parties in the chain also need to fine-tune their processes to each other. Logistical chains include suppliers, manufacturers, transporters, forwarders, storage facilities, as well as ports, terminals and distribution centres. *Optimization of handling systems* emphasizes the reduction of handling time and damage caused during the handling of goods. This group of actions includes various initiatives for a more efficient use of freight space, the search for faster loading and unloading systems and the continuous trend towards containerization. Efforts in this field are targeting future increases in co-operation and the development of infrastructure for *Intermodal traffic*.

The functional actions described above are at present often supported by an explicit **strategy**. In modern logistics, three important strategies appear to be relevant: changing vertical linkages especially through outsourcing, changing horizontal linkages especially through cooperation and modernization. *Outsourcing* (buying services, 'third party logistics') is more and more considered by companies, mostly in order to reduce their logistical costs. It is frequently applied in production management (e.g. modular-sourcing), value added logistics (e.g. value added partnerships) and in the development of logistical chains. The second strategy focuses on *changes in horizontal linkages*, at present often through strategic alliances. Setting up *strategic alliances* may be very effective when optimizing handling systems or developing Intermodal traffic. Strategic alliances could improve the efficiency of the whole logistical chain, the value added logistics or production management.... *Modernization* of logistics is a third strategic option and generally involves the optimization of the cargo and information flow. Modernization, if no longer the main strategy in advanced logistics, remains a driver in virtually each new logistics application.

However, in the Egyptian context, the level of requirements is not generally as high as in the industrialized countries. This means that the needs are lower and the transport sector does not need to introduce the most modern logistics concepts and can concentrate on some strategic efficiency components. In the context of the proposed sector restructuring study, the focus should be on the issues highlighted in red in above figure. They include modernization through improved cargo handling, value added services and transport chain development. The introduction over time of EDI and other information management techniques will be a critical success-factor