

LOGISTICS HUBS AN INTEGRATION OF TRANSPORT INFRASTRUCTURE

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ABSTRACT

Logistics hubs are very well established internationally and many examples exist where these have been successfully built and implemented. This success have lead to the proliferation of such hubs and in South Africa there are many “decision makers” that have jumped on the band wagon pushing for logistics hubs to be established in their regions or within their areas of jurisdiction. The feasibility of a logistics hub is dependent on a number of criteria with access to ideally more than two but preferably three modes of transport plus a whole range of other very critical conditions. This paper will define the concept of a logistics hub, outline the criteria that should be used to evaluate any proposed development of such a hub and outline conditions that need to exist to ensure success of any endeavour to establish a logistics hub. A local real-life case study will be used to illustrate and demonstrate how the authors went about to assist a local authority in determining the feasibility of a proposed location for a logistics hub.

1. INTRODUCTION

South Africa needs to facilitate economic growth for the country as well as the region. However, there are challenges in this regard which are not necessarily unique to South Africa, but are surely exaggerated such as poverty alleviation and basic service provision to name a few. The result of this is that other developments such as transport infrastructure establishment and even maintenance are shifted to the background. This does not mean it should be forgotten. For South Africa to regain and maintain global competitiveness with the current trend of globalisation, it has to consolidate current infrastructure. This article will aim to do exactly that with the introduction of logistics hubs in South Africa. The remainder of this article is dedicated to logistics hubs and whether, from a logistics point of view, they are in fact a viable option for South Africa. A specific case study will be used to demonstrate the potential of South Africa to indeed optimise infrastructure and in doing so, becoming a global player.

Logistics hubs are a fairly new phenomenon especially in South Africa and it is thus important, at the onset, to get a common understanding of what a logistics hub entail. The term logistics hub has been used internationally over the last number of years although there is also reference to a logistics precinct in this regard. Information with regard to such facilities is not readily available, and no one term has been defined and used as such.

Transportation hubs are described as: A location where traffic is exchanged across several modes of transport. These modes may include any of railway, tramway, metro or rapid transit, bus, coach, automobile, truck, airplane, spacecraft, ship, ferry, pedestrian, or any other kind of transportation. The term is used for both passenger and freight transfers. Some transportation hubs also allow transport to be exchanged between the same kinds

of transport mode (Wikipedia, 2008).

A broad definition of a logistics hub is: Integrated centres for transshipment, storage, collection and distribution of goods (Jorgensen, 2007).

The Texas Transportation Institute (2008) defines an inland port as: A site located away from traditional land, air and coastal borders. It facilitates and processes international trade through strategic investments in multimodal transportation assets and by promoting value-added services as goods move through the supply chain.

According to Europlatforms (2004) logistics centres can be defined as: The hub of a specific area where all the activities relating to transport, logistics and goods distribution – both for national and international transit – are carried out, on a commercial basis, by various operators.

The operators may be either owners or tenants of the buildings or facilities (warehouses, distribution centres, storage areas, offices, truck services, etc.) built there. In order to comply with free market rules, a Logistics Centre must be accessible to all companies involved in the activities set out above.

A logistics centre must also be equipped with all the public facilities necessary to carrying out the above-mentioned operations. If possible, it should also include public services for the staff as well as users' equipment. In order to encourage intermodal transport for goods handling, a Logistics Centre should preferably be served by a variety of transport methods (roads, rail, sea, inland waterways, and air).

It is vital that a Logistics Centre be managed as a single and neutral legal body (preferably by Public-Private-Partnership) if synergy and commercial cooperation are to be ensured. Finally, a Logistics Centres should comply with all standards and quality performance in order to provide the framework for commercial and sustainable transport solutions.

In essence a logistics hub is a centre which facilitates more than one mode of transport. Transport is managed in such a way that it simplifies the process and aims to make it seamless, all the while driving down costs. It assists with logistics activities such as warehousing and transshipment which results in the provision of a value added service and complete end to end solution to the customer.

Internationally a number of logistics hubs have been successfully developed. Infrastructure at these hubs are not necessarily the same, however they all share a number of common attributes which will be discussed later. Duisport International Inland Port and logistics hub in Germany, Hams Hall Distribution Park in the United Kingdom, Virginia Inland Port in the USA and Dallas Logistics Hub are a few examples of established logistics hub internationally. For a logistics hub to be successful there has to be a market need for such a resource. It should also have the ability to attract further business investment and attract major companies to locate at the facility.

Logistics hubs give a regional advantage to both the city where it is located as well as the country in which is it situated. A study was conducted in 2005 to promote Germany as Europe's Logistics Hub. The study focused on its geographical position, its transport infrastructure, the logistics and transport industry in Germany, industrial development and investment guidelines. This was compared to the rest of the European Union (Invest in Germany, 2005). South Africa can be seen in a similar light for the SADC region in Africa. The next chapter aims to highlight South Africa

2. SOUTH AFRICA AS A REGIONAL LOGISTICS HUB

2.1 Geographic position

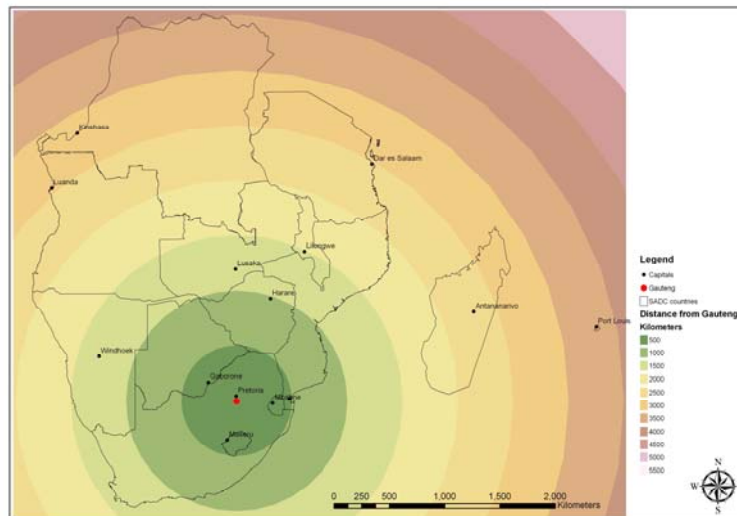


Figure 1 Geographic position of South Africa in the SADC region

Geographically South Africa forms the southern most tip of Africa. It's arguably the continent's commercial hub with access to the rest of Africa north of its border, and further access to the rest of the world predominantly to the east and west.

Figure 1 illustrates the accessibility of South Africa to the rest of the SADC region. The concentric circles indicate 500km intervals from the midpoint namely Gauteng. Johannesburg alone accounts for 20% of the country's exports and a further 39% passes through the city of Johannesburg. This is the reason why Gauteng is used as a starting point for movements from South Africa (Corporate Planning Unit, 2002).

The vision of SADC is one of a common future, a future in a regional community that will ensure economic well-being, improvement of the standards of living and quality of life, freedom and social justice and peace and security for the peoples of Southern Africa. There are three main objectives which aligns itself with the further development of South Africa as a logistics hub, namely:

- Achieve development and economic growth, alleviate poverty, enhance the standard and quality of life of the people of Southern Africa and support the socially disadvantaged through regional integration;
- Promote self sustaining development on the basis of collective self-reliance, and the interdependence of Member States;
- Promote and maximise productive employment and utilisation of resources of the region.

(SADC, 2007)

2.2 South Africa – Leading economy in SADC

The South African economy is the largest economy in the SADC region. Its GDP comprises 67% of the total GDP of the region. South Africa has a population of 47.4 million which gives it access to more consumers resulting in more consumer power than most countries in Southern Africa, second only to the Democratic Republic of Congo. The GDP growth for the country also remains constant and is registered as 5% for 2006. Apart from the pure economic aspects, South Africa has the second highest literacy percentage

in SADC of 86%, second to Zimbabwe, and the literacy figure is well above the 74% average for the region. A concerning factor for future developments however still remain the high percentage of HIV prevalence in the population. The figure for 2005 indicates that 18.80% of our population between the ages of 15 and 49 are infected with the disease. Traditionally, this specific sector of the population comprises the majority of the labour force. This figure is above the average of 14.34% for the region.

On the whole however, the South African economy is head and shoulders above the rest of the region. Of the 14 member states of SADC, the closest country in terms of GDP to South Africa is Angola with a further 11.62% of the total GDP. As a result, the two countries account for nearly 80% of the region's GDP and the leading economy comprises two thirds of the GDP (World Bank, 2007).

2.3 South Africa's international trade

Globalization has benefited South Africa in various ways, none more so than it's trading with other countries. South Africa's export market showed an annual growth of 21.7% and the import market increased by 19.0% from 2006 to 2007.

2.4 Transportation infrastructure

South Africa has the longest road network of any country in Africa. The highway network of South Africa is designed to exploit the geographical advantage of the country. The South African National Roads Agency Limited (SANRAL) is currently the custodian of 16 150km of national roads. Apart from the extensive road network, Transnet Freight Rail's infrastructure accounts for approximately 80% of infrastructure in the whole of Africa. (Transnet, 2007)

Transport infrastructure in South Africa is constantly being improved and integrated. Government will mobilise an investment of more than R25 billion from both public and private sectors over the next five years for utilisation on national roads. This is over and above the R2 billion allocated annually to SANRAL to manage non-toll roads. Transnet Freight Rail also announced a R4.1 billion capital expenditure plan over the next five years. All of these factors combine to give South Africa an unprecedented transport infrastructure in the region (CIA, 2007). Figure 5 maps out road and rail infrastructure in South Africa as well as border posts to its direct neighbours. It gives a clear indication of the excellent coverage of infrastructure throughout the whole country.

2.5 Intermodal integration

South Africa does however have one major inadequacy when comparing it to both developing and developed countries, which is the lack of intermodal integration and transshipment facilities. In the study conducted on Germany as Europe's logistics hub it is said that the value of any transport node increases with its ability to interface with multiple transport nodes. This is often referred to as the "law of intermodality" (Invest in Germany, 2005). The development of logistics hubs could be seen as a means to an end to overcome this problem.

3. LOGISTICS HUB ATTRIBUTES

There are a number of successful logistics hubs elsewhere in the world and based on these, criteria for the establishment of such hubs have been developed. Baluch (2005, p159) lists the following mix of ingredients for a successful regional logistics hub. These factors will be considered in relation to this study. These assume that there is also a water port involved which does not necessarily hold in all cases:

- Adequate multi-modal transfer systems
- Good telecommunications systems
- Reasonable port charges
- Adequate cargo and container handling facilities
- Numerous berths and container terminals of varying sizes, capable of handling various commodities, including dangerous goods
- Available rail and road connections to link the hub with local consumer and industrial areas

In addition King & Keaton (2006) suggested that any logistics infrastructure such as a logistics precinct can be examined using a number of major categories, namely:

- Transportation and warehousing industry
- Workforce
- Highway access
- Road and bridge conditions
- Road density and congestion
- Road infrastructure
- Vehicle taxes
- Railroad infrastructure
- Proximity to market and market need
- Location away from residential areas
- Developed at a reasonable cost
- Water port infrastructure
- Air cargo infrastructure

In addition to all the above there will be specific requirements that freight logistics providers will have as well. One of the major requirements in this regard will be securing freight within the facility, but also the controlled movement into and out of the facility.

4. TSHWANE LOGISTICS HUB CASE STUDY

To the north of the City of Tshwane is an area adjacent to where the N1 and N4 national roads meet and intersect (see figure 2 for the location of the study area), which has been earmarked for the possible establishment of a logistics hub. The focus of the study is on the establishment of a logistics hub and therefore in essence on whether the location is suitable as a logistics hub from a logistics point of view. It has to be emphasised that the

research done is only focused on logistic aspects. As will become apparent from this research there are still many other aspects and issues apart from logistics that will require much more in depth study and analysis. To ensure that the area is indeed suitable for the development of a logistics hub it is critically important to be sure and convinced that from a logistics point of view, this area is suitable for the establishment of such an envisioned logistics hub.

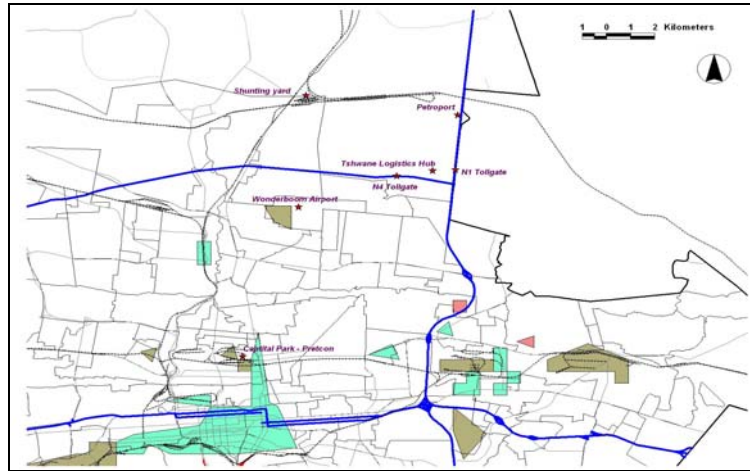


Figure 2 Location of proposed Tshwane logistics hub

In doing a comprehensive evaluation two alternatives need to be considered, namely, where only two modes are involved and where three modes are involved. In the case of two modes these modes would be road and rail while a third mode, air transport, could be added if the possibility of the establishment of an airport in the area is considered. Air transport as a third mode will add additional functionality and viability but will also lead to an increase in the cost to such a logistics hub, whilst it will incorporate all the aspects associated with only two modes. The fourth mode namely sea together with a port, is obviously not relevant here. Although pipeline as a mode of transport might in this case prove to be viable in the long run, the success or development of the logistics hub does not depend on it.

Table 1 assesses the study area against the attributes identified.

Table 1 Assessment of Tshwane logistics hub

CRITERIA	RATING	SUMMARY OF ASSESMENT
INFRASTRUCTURE	Excellent	The N1 and N4 highways borders the site identified. Rail infrastructure is already in place, however a few adjustments will have to be made, but this will have to be addressed by Transnet Freight Rail.
BASIC SERVICE	Excellent	Services such as water, electricity and sanitation are already in place.
ECONOMIC DEVELOPMENT/ ACTIVITIES	Excellent	International trade is an important driver for the city of Tshwane with tangible exports accounting for 45% and imports 22% of the city's GGP.
TELECOMMUNICATION SYSTEMS	Excellent	City of Tshwane's systems readily available for use.
TRANSPORTATION AND WAREHOUSING INDUSTRY	Excellent potential	This site, should it be developed to its full potential will give any company an excellent competitive advantage, and can be used to attract industry.
WORKFORCE	Good	Informal settlements located in close proximity, has the potential to alleviate unemployment. Workforce has lower pay rates compared to other parts of the city.
HIGHWAY ACCESS	Excellent	The N1 highway passes adjacent to the farm on the eastern side and joins the N4 highway south-east of the farm. The N1 creates north-south connection. The N4 highway runs south of the farm and gives direct access to the site via the K99 (Dr Swanepoel) interchange.
ROAD AND BRIDGE CONDITIONS	Good	Potential for further bridge utilisation to the north of the farm. Roads around the farm are in well maintained by SANRAL. Sufficient road capacity available.
ROAD DENSITY AND CONGESTION	Good	Normal peak hour traffic is experienced, but is north of the renowned heavy congestion.
PLANNED ROAD INFRASTRUCTURE	Excellent	The K99 extension has a direct impact on the logistics hub and is of cardinal importance to gain access to the site. The PWV 9 development which is key to the Maputo Corridor Development opens new opportunities.
VEHICLE TAXES AND FARES	Moderate – Good	Both the N1- and N4 highways are toll roads.
RAILROAD	Good - Excellent	Pyramid switchover yard is adjoining

INFRASTRUCTURE		to the farm at the northern border. Turnaround loop already in existence. Transnet willing to investigate the possibility of further development
PROXIMITY TO MARKET AND MARKET NEED	Moderate – Good	Main industry not located north of Tshwane, however, there are multiple opportunities including the automotive industry, Lion Matches and the tourism industry.
LOCATION AWAY FROM RESIDENTIAL AREAS	Good	Located away from residential area. Able to operate 24 hours a day.
DEVELOPED AT A REASONABLE COST	Moderate – Good	Rail connections already in place. Only small lengthening of the K99 required to gain direct access to the northern part of the farm. Opportunity to attract private investors.
AIR CARGO INFRASTRUCTURE	Potential	First Land Development willing to develop farm into competitive international cargo airport.

All the factors discussed above will remain the same should an airport be developed as a third mode of transport, however there are additional aspects which need to be taken into account. The impact and effect on Wonderboom airport should be investigated, the impact of proximity to OR Tambo Airport should be examined as well as the political support for such a development and the ownership of the airport if it is indeed developed.

5. RECOMMENDATIONS

The location of the farm Doornpoort 295 JR is excellent for the development of a logistics hub. There are two major highways leading directly into it, with minor roads feeding the highways. Apart from that, there is existing rail infrastructure which can be utilised in container- and freight movements. There is sufficient open space for development with an excellent opportunity for the development of a world class International Airport in Tshwane, as well as a container depot and warehousing. From a pure logistics point of view it is hard to imagine a more favourable location for the development of a logistics hub. Major infrastructure is already in place, and the opportunity arises to market a formidable economic prospect, thus attracting private funding.

A logistics hub with two modes of transport, namely road and rail, can be of benefit to the region, however the recommendation is that a logistics hub with an additional mode, namely air transport will be most beneficial. With this there are immediately additional issues which arise. These areas are briefly listed below:

- Moving Wonderboom Airport
- Should Government (local or other) manage a airport
- Impact of OR Tambo International Airport
- Exchanging the land of Wonderboom and Doornpoort 295 JR
- Air management and regulation
- Proximity to markets and market need

It is the recommendation of the authors that logistics hubs are a very good intermodal solution to implement in South Africa. It is not suggested that the site in the City of

Tshwane is the only feasible site to develop into a logistics hub, there are definitely other suitable sites along with the site in Tshwane. These different study areas should be viewed as complementary to each other and not in competition. It should be developed in collaboration with each other, local government, national government and the private sector. This last point can not be overemphasised.

All relevant sectors should have a shared vision as to the goals they want to obtain when developing logistics hubs. It should be seen as the optimisation of South African infrastructure and the creation of jobs as well as a competitive advantage in the global market. The world is getting smaller and South Africa as a country and SADC as a region should establish the role it wants to play in the global market place. From this position it should align all strategies to obtain the specific goal, not compete within the borders of the country and in the region.

In 2005 total logistics costs was R223 billion and accounted for 14.5% of the total GDP of South Africa. It shows a 9% increase from 2004. It is also clear that the biggest component of the country's logistics cost is transport costs. It amounts to 63.1% of the total logistics costs (CSIR, 2006). In comparison to this, the total logistics cost of the United States are US\$1 305 billion and is the equivalent of 9.9% of the GDP in 2006. The total transportation costs for the US was US\$365 billion which comprise 27.97% of the total logistics cost (CSCMP, 2007). This should be an indication for our country that there is indeed room for improvement. Seamless freight movement is a step in the right direction. Logistics hubs, logistics precincts, transshipment facilities or inland ports are methods to obtain this goal. For South Africa to be competitive in the global market, it has to improve their cost of transport operations thus lowering the total cost of logistics. To obtain this goal, it is necessary for the country to manage current existing transport infrastructure and to invest in strategic new infrastructure.

The physical internet is described as the global network connecting firms, suppliers and consumers. According to the World Bank's Logistics Performance index (2007), the ability of countries to access this global network depends on the quality of its national infrastructure as well as the effectiveness of its policies and institutions. Expanded supply chains put a new premium on moving goods in a predictable, timely and cost effective way. Well connected countries can have access to many more markets and consumers. But for poorly connected countries, the costs of exclusion are considerable and growing, and the risk of missed opportunities looms large especially for the poorest landlocked countries, many of them which are in Africa. Organisation base their decision of in which country to establish itself on the performance of a country's logistics. High logistics costs are seen as a barrier to trade and foreign direct investment and thus to economic growth. The answer lies in better processes, higher quality services, and the operating environment. Seamless, paperless systems should be the goal of each country to optimise logistics processes. (World Bank, 2007)

Some of the factors determining logistics performance include the quality of infrastructure of which IT and telecommunication systems are of the utmost importance. In the case where communication infrastructure is not up to standard, the freight forwarder's main concern would be a breakdown in the supply chain, and not on the service provided to the client. Transport infrastructure is fundamentally important and should be able to satisfy rapidly growing demands. The competence of private and public logistics service providers is another key aspect. The performance of the supply chain depends on the quality of service provided by private sector in collaboration with the proficiency and diligence of public agencies such as the border control. Corruption and transparency is cardinal in the overall governance of logistics systems, and when establishing logistics

hubs, this issue should be taken into account and addressed where necessary. The last factor is the reliability of the supply chain. Quality of service along with reliability is the key in the age of globalisation. Customers tend to value the latter more than the cost of the service provided. (World Bank, 2007)

South Africa was rated a respectable 24th on the Logistics Performance Index (LPI), but the major area of concern is the high logistics costs where it was rated 124th. Through this an opportunity arises which South Africa should exploit. The development of Logistics Hubs addresses all of the factors which determine logistics performance, thus resulting in improved efficiency and effectiveness of the country's logistics system. Not only will it improve the South Africa's logistics performance, but it will also give the country the opportunity to access the "physical internet" which is the global market and in turn result in economic growth.

6. REFERENCES

- [1] Baluch, I. 2005. Transport Logistics: Past, Present and Predictions. Winning Books. Dubai. United Arab Emirates.
- [2] CIA. 2007. CIA Fact book. Available at: <https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html> [2007, 7 December].
- [3] Corporate Planning Unit, City of Johannesburg. 2002. Joburg 2030. Johannesburg, South Africa.
- [4] CSCMP. 2007. The eighteenth annual State of Logistics. National Press Club. Washington D.C. USA.
- [5] CSIR. 2006. Third Annual State of Logistics. Pretoria.
- [6] Dallas Logistics Hub, USA. 2007. Available at: www.dallaslogisticshub.com [2007, 11 November].
- [7] Daventry International Rail Freight Terminal, United Kingdom. 2007. Available at: www.dirft.com [2007, 31 October].
- [8] Duisport International Inland Port and Logistics Hub, Germany. 2007. Available at: www.duisport.de/en/ [2007, 6 November].
- [9] Hams Hall. 2007. Available at: www.hamshall.com [2007, 31 October].
- [10] Virginia Inland Port, USA. 2007. Available at: www.vaports.com [2007, 29 October].
- [11] Invest in Germany. November 2005. Germany: Europe's Logistics Hub. Berlin, Germany.
- [12] Jorgensen, A. 2007. Presentation: A perspective on freight transport in South Africa. 6 September 2007, Johannesburg.
- [13] King, B & Keating, M. 2006. The top 50 Logistics cities in the United States. Logistics Today. Available at: <http://www.logisticstoday.com/displayStory.asp?sNO=8267&pNum=2&OASKEY=CurentIssue> [2007, 24 June].
- [14] SADC. 2007. SADC vision. Available at: http://www.sadc.int/about_sadc/vision.php [2007, 15 November].
- [15] Transnet. 2007. Available at: http://www.transnet.co.za/AR_2007/or_rail.html [2007, 7 December].

[16] World Bank. 2007. Developing countries statistics. Available at: www.worldbank.org
[2007, 3 December].