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Green Freight Movement: The Dilemma of the Shifting of Road Freight to Alternatives

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Abstract

Today, there is a real issue of an alternative to road freight transport. This paper presents experience from Egypt during which time a mathematical procedure was developed to analyze the impact of shifting cargo movement from the road transport sector to the alternatives of water and rail. Currently in Egypt more than 90% of national cargo is carried via the road transport sector. In fact Egypt has a distinctive advantage in comparison to many other countries with respect to modal shift from the road sector. A proportion of national Cargo movements are along the alignment of the Nile River which for the most part is navigable. There is an existing parallel rail alignment. During this analysis, there were several issues for consideration in the transfer of Cargo to an environmentally friendly or a green freight alternative. Not least of these issues was the fact that fuel was heavily subsidized at that time in the country. So road cargo transport providers did not pay for the use of road infrastructure but in addition also had the usage of cheap fuel. Whereas cargo providers on the alternatives within the water and rail sector had to fund fuel and infrastructure maintenance costs. The mathematical model described in this paper is used to consider freight modal shifts under various infrastructure development scenarios. It was the intention during this analysis to emphasize the change from the fact that road infrastructure currently receives the highest investment priority but the utilization of this capacity is weak due to less-than-optimum management as well as poor transport equipment (outdated and badly maintained).The outcome from the analysis results in a recommendation for the future development of national cargo transport to shift from the road sector to the non-road sector. This shows that within the framework of mathematical analysis that it is possible to evaluate the impact of the shift of the movement of cargo away from the road sector.

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1. An Overview

The road mode is an essential factor in economic activity and has historically played a strong role in the development for many countries across the world. Within the context of Egypt, the use of the road-based transport mode has increased exponentially in the last few years. Whilst this phenomena has fulfilled a variety of social goals and expectations, unfettered growth is increasingly

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contributing to various negative social, economic and environmental impacts. This high level of usage is a historic consequence of growing vehicle ownership, pricing policies (such as the fuel subsidy), and "road focused" capital works programs. There is a beginning of an understanding of the notion that a more balanced approach to providing mobility is desirable especially in respect to the transportation of cargo within the borders of Egypt.

The increasing movement of cargo via the road mode will also lead to an increase in emission gases. Whilst to some degree, such emissions from within cities for personal mobility have been contained. This is not the case for the movement of cargo especially over long distances. These phenomena are not limited to Egypt but are common elsewhere especially in large geographical countries. For example, in another large country such as Australia, over the period 1990 to 2006, overall transport emissions grew by 27.4 per cent, however emissions from freight grew by 40 per cent. Freight transport emissions now contribute around four per cent of the national emissions total in that country and are forecast to more than treble to thirteen per cent by 2020 as reported in a freight transport paper, Total Environment Centre Inc (2008).

Likewise, the European Union also has a problem with its heavy dependence on road transport. The Agenda 2020 of the European Union calls for member countries to reduce greenhouse gas emissions and increase renewable energy. There is implicit in this agenda within the EU of taxing fuels on road based transport, Bartocci et al. (2013) thus encouraging a modal shift away from the dominant road sector.

2. The Context

In this paper, the Egyptian situation for the movement of cargo is presented both today and in the form of a twenty year projection with alternative scenarios investigated to control the growth in the Cargo road mode share thus moving Egypt towards a greener movement of freight with consequently fewer greenhouse emissions. In consideration, one must first present the existing situation of network infrastructure and cargo modal movement. The future projection was estimated via the development of a mathematical computer model, JICA (2012).

2.1. The Existing Network Structure

The existing transport infrastructure within Egypt is dominated by a road system that extends over approximately 100,000 kilometres, nearly 23,500 kilometres of which is managed and maintained centrally. This network is broken down by category as depicted in Table 1 and shown geographically in Figure 1. The major road network is densest within the Nile Delta, coastal areas, the Sinai Peninsula and flanking the Nile River which traverses Egypt from north to south. Cairo tends to serve as the "hub" of the national "spoke" of roadways. The road network is varied comprising expressways, toll roads, primary inter-city roads and other road types. Responsibility for higher-order roads lies mainly with the General Authority for Roads, Bridges and Land Transport, part of central government. The remainder of Egypt's 59,500 kilometres of paved roadway network is administrated by the country's local administrations, under supervision of the Ministry of Local Development, JICA,(2012).

The rail network, also shown in Figure 1 extends over some 5,100 kilometres, or about 9,600 track kilometres. Almost thirty percent thereof is double tracked, the remaining network is single tracked. The entire system is standard gauge and not electrified. There exist some 700 stations, and almost 1,300 level crossings, only about one quarter of which are provided with electrical warning devices.

The Inland Water Transport (IWT) network encompasses 2,635 kilometres consisting of 1,696 kilometres within the Nile Valley and 936 kilometres within the Nile Delta. Navigable waterways classified as 1st class require specified vertical clearance, fairway width, maximum draft and minimum water depth. The 1st class network includes 980 kilometres between Cairo and Aswan, 205 kilometres between Cairo and Alexandria as well as 241 kilometres between Cairo and Damietta. These three waterways feature 3 locks and 24 bridges, 7 locks and 27 bridges, as well as 3 locks and 16 bridges, respectively. Approximate 320 cargo vessels (comprised mainly of barges and tug boats) as well as 2,200 passenger vessels (including tourist boats, ferries and other light boats) are currently registered to operate on the IWT network. About thirty percent of the cargo vessels and ninety percent of the passenger vessels are owned by the private sector, the remainder being under public sector ownership.

Table 1. The National Road System

Category	Road Length (kilometers)
Expressway	395
Primary Road	15,002
Secondary Road	8,189
Total	23,586