

Trucking Industry Perceptions of Congestion Problems and Potential Solutions to Container Transportation in Sri Lanka

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Abstract— *Inland Container transportation is coordinated and interacted between port terminals, Container Freight Stations, exporters, consignees, clearing agents, freight forwarders and primarily container transport companies.*

The key objectives of the study were to reveal the perception of container transportation industrialists with respect to road Congestion problems in Sri Lanka; and propose recommendations to improve the intermodal freight transportation. Therefore the factors that make an impact on road congestion namely, Road; Timing; Human; Vehicle; and Weather were examined.

It was revealed from the study that the congestion experienced by trucking companies is considerable thus congestion mitigation measures are needed especially in the urban areas. Better coordinating of traffic Signals and implementing effective system to attend emergency crews in clearing accidents should be implemented. Visibility in the system with respect to customs and other border management agencies in order to install electronic clearance stations at international border crossings would be essential. Further research on dedicating a single lane to truck traffic, having truck-only lanes on some surface streets; truck-only streets for access to ports, rail terminals, and airports; Eliminating some on-street parking during certain periods would be necessary prior implementation.

Keywords: Congestion, Containers, Transport, Trucking, Intermodal, Freight

I. INTRODUCTION

Efficient maritime transportation is heavily dependent on the smooth operation of land transportation. Swift modal transfers are key to successful inland operations. This paper focuses on inland Container Transportation that are coordinated and interacted between port terminals, Container Freight Stations, exporters, consignees,

clearing agents, freight forwarders and primarily container transport companies. The Government of Sri Lanka (GoSL) has embarked on a development agenda with the objective of converting the country to a Naval, Aviation, Commercial, Energy and Knowledge hub in Asia. Commercial Hub Regulation of Sri Lanka and the Free-Port Concept proposes the declaration of Colombo and Hambantota ports and Mattala Air Port as Free ports; declaration of Katunayake Exports Processing Zone (KEPZ) and Koggala EPZ as Bonded areas for the purpose of the Hub operation; and Mattala air port and Mirijjawila EPZ will be declared as Bonded areas. According to new developments that are based on the Commercial Hub Regulation No. 1 of 2013 a new enterprise which is engaged in business activities referred to Commercial Hub Regulation be subject to a synchronized operational procedure/s that shall be introduced by the Department of Customs, the Board of Investment of Sri Lanka and Sri Lanka Ports Authority in respect of or Free Port or the Bonded Area. (GoSL, 2013).

Accordingly, the inland transportation of containers needs to be very efficient and effective to face the future demand. Infrastructure is the necessary condition for efficient cargo handling operations and adequate infrastructure is needed to avoid congestion (Acciaro & Mckinnon, 2013). Ports will have to come up with viable alternatives to reduce the impact of congestion and relieve local communities from the negative externalities generated by increasing cargo flows. (Acciaro & Mckinnon, 2013). As consequent to containerization more trucking companies commenced operations increasing heavy and long vehicles on roads. As traffic volumes increase the congestion grows on highways and urban roadways.

Traffic Congestion particularly in and around ports is a serious problem for trucking companies and comes at a high cost. Traffic congestions in

metropolitan areas have developed to a major problem in many countries (Kathawala & Tueck, 2008) and is increasing including environmental degradation (Jacyna, 2013). The common complaint by the trucking transporting companies in Sri Lanka is the additional cost they incur on delays due to road congestion. Sri Lanka incurs a huge economic loss of around Rs. 40 billion annually due to road traffic congestion and air pollution with too many vehicles on a limited road network (Sirimanna, 2013). The timely actions in developing roads should be highly commended because this situation would have been even worse if such critical decisions were not taken in the recent past. Sri Lanka has made heavy emphasis on improving infrastructure to facilitate the hub concept. Country even now serves as an effective hub for maritime goods transport. (Edirisinghe & Jayathilake, 2014) However, equally the density of vehicles too has increased over the years in response to country's development activities. Given the fact that country is determined to capitalize its geographical advantage to make the country the most preferred hub in Asia it is important to study the performance of trucking industry which could create a heavy impact in this aspect. There is encouraging progress made with respect to the road network in Sri Lanka in the recent past. The Quality of roads has improved from 55 out of 139 countries in 2012 to 49 out of 148 in 2014. (WEF, 2012-2014). Therefore it is imperative that the said improvement should be effectively managed to ease the road congestion that appears to be making a negative impact to the final outcome of improving mobility. Accordingly, the objectives of the research are as follows.

- (i) Reveal the perception of container transportation industrialists with respect to road Congestion problems
- (ii) Propose recommendations to improve the intermodal freight transportation

II. LITERATURE REVIEW

On road traffic congestion is a growing problem for trucking companies operating in urban areas. (Golob & Regan, 2003). Congestion costs to businesses go beyond the mere vehicle and driver costs of delay. (WHO, 2011) The other issue is that delivery service operators become increasingly challenged to maintain dependable and reliable schedules. Those who depend on road transport affected by the degree of unpredictability and

variation in delays associated with growing congestion (Weisbrod & Fitzroy, 2011) As a consequence the various techniques in supply chain management such as JIT- Just in Time fail miserably. WHO (2011) identifies four type of various costs such as increased inventory costs, logistics costs, and last-minute processing costs, and reliability costs would be added as a result of congestion. Growth of traffic congestion adds to total transport costs for delivered products, causing firms to shift location and shipment size configurations to re optimize net revenues. (Weisbrod & Fitzroy, 2011).

As cited in Islam & Olsen, (2014) truck transportation has received much greater attention in recent times because of the continuous growth occurring in the containerized trade, the introduction of bigger ships and the rising level of port competitiveness (Moura et al., 2002; Lannone, 2012). Road transportation plays a vital role in the multimodal transport system. In the present context in Sri Lanka goods movement is heavily performed by means of inter-modal containers. Inter-modal transportation is a specific type of multi-modal transportation (Marchet, et al., 2012). Traffic congestion is a condition on road networks that occurs as use of roads increases thus the sharp increase in vehicle importation in the past decade. Operators have found the flexibility, cost, ease of market entry and reliability of road transport much more favourable than the other modes (Department for Transport, 2011) However, road congestion is a serious recurring problem to any citizen in most of all countries. Congestion impacts on supply chain flows created a risk for maintaining regional competitiveness in a global economy (Weisbrod & Fitzroy, 2011).

Traffic volumes and congestion affects supply chains and truck-dependent businesses both of which are of increasing importance for both public policy and private sector operators (Weisbrod & Fitzroy, 2011) this is a problem in most cities around the world, especially in developing regions. A large number of Sri Lankans spend more time on the roads, paying more for fuel, as the number of vehicles on the roads is rapidly increasing and it takes longer to reach one's destination. (Sirimanna, 2013). Effective traffic incident management is a fundamental factor in road safety and congestion control, decreasing the occurrence of secondary incidents at scenes and minimizing the impact of resultant traffic congestion and emissions.

(Cattermole, et al., 2013) The container trucking industry characterized by a thin profit margin and cut-throat competition poses additional challenges for minority owned trucking firms (Min, 2013). The quality of logistics services trucking forwarding and customs brokerage is also central to the trade efficiency. (Edirisinghe & Muller, 2014). Just in time and lean manufacturing create a major demand for the transportation industry for reliable and timely pick-up, delivery, and high level of flexibility (Deshpande, et al., 2007). Decisions regarding location, scheduling, and deployment of vehicles and labor resources can also contribute to congestion or be used to minimize the effects of rising traffic congestion (Weisbrod & Fitzroy, 2011) As volumes increase, alternative modes of transport, such as rail or short-sea shipping are being promoted both to reduce both congestion and environmental impacts. (Acciaro & Mckinnon, 2013). The economic role of freight movement and its sensitivity to rising traffic congestion is a matter of concern.

Weisbrod & Fitzroy, (2011) suggests two types of delays namely, (1) *recurring daily traffic delay* and (2) *non-recurring traffic delay*. The former occurs as vehicle speeds are reduced and vehicle queues are increased due to a high volume/capacity ratio on specific corridors at specific times, while the latter refers to delays when there are incidents such as collisions, medical emergencies and vehicle breakdowns. It was revealed during the interviews with industry experts that various internal and external factors may influence congestion on roads including Road conditions or other related factors; the timing of the day; Human factors such as the status of drivers; Vehicle related factors that may cause frequent breakdowns; and also unfavourable weather conditions.

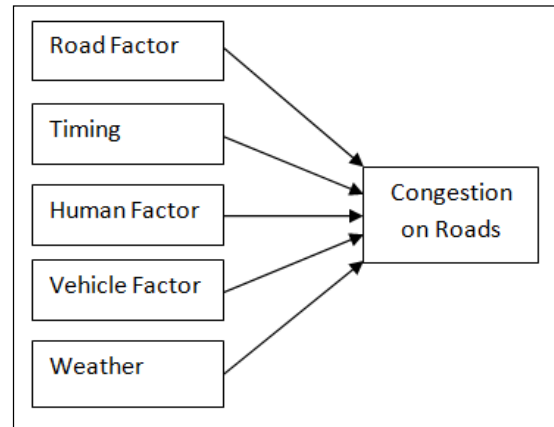


Figure 1: Factors that cause congestion on roads

III. METHODOLOGY

There are 102 major trucking companies registered as members of Association of Container Transporters Sri Lanka (Incorporated) and operated in the country and they are essentially based in and around Colombo city where the container port is located. They provide services to all customers in the island including Hambantota port. The survey was conducted as a questionnaire survey and unstructured interviews. Questionnaires were distributed among the operations manager in charge in the respective 102 trucking companies. Responses from 61 respondents were obtained which reflects a response rate of 59.80%. Statistical analysis was done using the EViews software. The study also considered the past data and future projections of Ports in Sri Lanka. Depth interviews have been conducted with two members of each Trade Associations such as Association of Inland Container Depot Operators, Ceylon Association of Ships Agents, Sri Lanka Association of Vessel Owners, Sri Lanka Shippers Council, Ceylon Chamber of Commerce, Department of Inland Revenue, Customs and Board of Investment of Sri Lanka.

IV. DATA ANALYSIS AND FINDINGS

This statistics shows that the congestion is inevitable as vehicles keep on adding to the daily traffic movement on the roads. It was also noted that 1,279,616 vehicles have been issued with valid revenue licences in 2012 in the Western province where Colombo city is located. This figure reflects 38 percent out of the total vehicles of 3,374,479 running in the country in all nine provinces.

Therefore it is evident that roads in and around Colombo city is continue to be getting congested. Figure 1 explains the growth in container movement with respect to domestic imports and exports including empty containers.

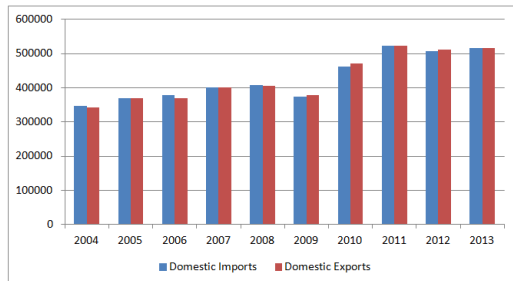


Figure.2: Domestic Imports and Exports containers handled in Sri Lanka 2004- 2013

Source: (CASA Per. Review, 2004-2012)

This information is vital because every domestic container contributes to the traffic movement on road network. For example an import container needs to be transported from port to the consignee’s warehouse that usually involves two trips. (I.e. empty trailer from trucking company to the port and return trip with import container to the consignee’s warehouse. Similarly exporters need to collect empty containers from designated container yards and transport to manufactures warehouse and later deliver it to the port after stuffing of cargo.)

Out of 61 respondents 59 respondents (97%) were engaged in both pickups and deliveries at port for intermodal operations. According to the study 79 percent of respondents view that traffic congestion as a critically serious problem in intermodal transportation. Figure 2 shows that maritime intermodal carriers are more likely to miss schedules because of traffic congestion. All the respondents at least some times missed the schedule due to congestion.

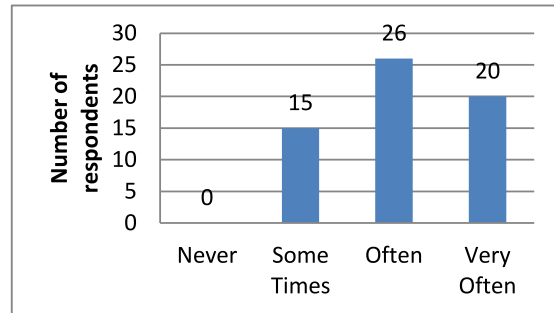


Figure 3: schedules are missed due to congestion.

Source: Survey data (2014)

46 participants have missed schedules either often or very often while 15 have some time missed the schedule due to traffic congestion. Therefore another finding is that every respondent have missed their schedule due to congestion.

A. Road Related Issues

There were 36 and 19 respondents who believed that delays ‘sometimes’ and ‘often’ occur due to accidents on roads respectively. Only 6 respondents said that delays occur very Often due to accidents. Similarly 36 respondents have re-routed drivers because of traffic congestion some times while 10 responded often re-routed drivers because of traffic congestion while 7 respondents re-routed drivers very often.

Perceptions of tracking industry whether delays are caused due to waiting time at traffic signals on roads revealed that only 3 respondents never had this experience. However, 19 respondents felt that delays are sometimes caused due to waiting time at traffic signals on roads while 31 responded as it happened often. 8 respondents said that delays are caused very often due to this. Delays are caused very often due to narrow road according to 11 respondents while 26 respondents felt it happened often. 18 respondents and 6 have said that delays are caused sometimes or never respectively due to narrow roads.

There were 31 respondents who perceived that delays are often caused due to truck driving restricted to left lane on roads while 15 said very often.12 responded that delays are sometimes caused due to truck driving restricted to left lane on roads while only 3 responded negatively. There were 13, 31, and 8 respondents said that delays are caused due to breaking of road traffic rules some times, often and very often respectively while 9

respondents believed that delays are not caused due to breaking of road traffic rules by drivers.

With respect to whether delays occur due to Construction work on roads, no one responded negatively. 31 respondents (51 %) said it occurs sometimes. 6 responded often and 24 said that delays occur very often due to Construction work on roads. There were seven road related causes the congestion has been identified in the survey. It was noted that all seven causes have some kind of contribution to the congestion according to the responses as explained in the above analysis.

Four main and sensitive routes/areas namely, Colombo-Negombo road; Colombo-Kandy road; passage Between Colombo-Kandana; and Area within Colombo city limits have been chosen to study the density of congestion in each designated area and how the trucking industry contrast and perceives them.

Table 1: An assessment of routes in which the most traffic congestion is occurred

Route	Never	Some Times	Often	Very Often
Colombo-Negombo road	0	15	36	10
Colombo-Kandy road	0	19	35	7
Between Colombo-Kandana	0	6	50	5
Within Colombo city limits	3	7	42	9

It was revealed that traffic congestion often experienced in all selected routes/areas.

Table 2: Statistical analysis of routes in which the most traffic congestion is occurred

Variable	Mean	95% Confidence Interval for Mean
Colombo-Negombo Road	1.9180	1.7541-2.0820
Colombo-Kandy Road	1.8033	1.6425-1.9640
Between Colombo-Kandana	1.9836	1.8740-2.0932
Within Colombo City Limits	1.9344	1.7603-2.1086

It is plainly visible from table 2 that there is no statistical significance in the observations under four key areas as the Confidence Interval for mean

is overlapping. Accordingly it can be concluded that these key areas/roads are often congested.

B. Time Related Issues

Respondents were asked the time duration that most traffic congestion is occurred on roads in Sri Lanka in general. The responses are provided in table 3.

Table 3: Timings that the most traffic congestion is occurred

Time slot	Never	Some Times	Often	Very Often
6 am – 12 noon	3	12	31	15
12 noon- 6 pm	7	13	26	15
6 pm – 12 midnight	3	10	31	17
12 midnight- 6 am	47	11	3	0

Table 4: Statistical analysis of timings that the most traffic congestion is occurred

Variable	Mean	95% Confidence Interval for Mean
6 am – 12 noon	1.951	1.7447-2.1569
12 noon- 6 pm	1.803	1.5611-2.0454
6 pm – 12 midnight	2.016	1.8100-2.2228
12 midnight- 6 am	0.2787	0.13739-0.41999

There is a statistical significance in the observations in table 4. Accordingly, it can be concluded that congestion occurs often or very often during three time slots except 12 midnight- 6 am.

There were 25 respondents who said they never wait for less congested times to arrange pickup and delivery to their customers while 22 wait some times. Only 3 respondents wait very often for less congested times to arrange pickup and delivery and 11 respondents wait for less congested times often. According to this finding it is clear that customers of trucking companies were compelled to compromise to some extent as the trucking companies have a practice of waiting for less congested times to arrange pickup and delivery to their customers. This may not be a healthy situation unless the trucking companies do this with the consent of their customers.

C. Human Related (HR) Issues

With respect to human related issues 28 respondents said that congestion sometimes occurred due to drivers' inefficiency while it occurs

very often for 13 respondents. 15 said congestion often occurred due to drivers' inefficiency while only 5 were negative.

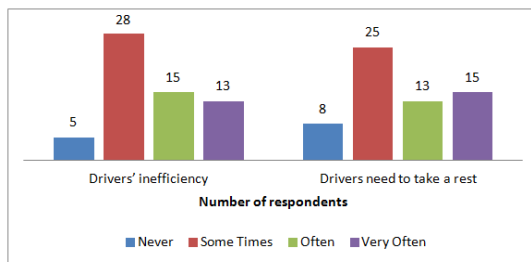


Figure 4: Impact of HR related issues

Source: Survey data (2014)

According to 25 respondents congestion sometimes occurred due to drivers need to take a rest and park vehicles on roads. No one responded that they faced this often and very often respectively. Therefore it was found that there is a moderate impact on the issues associated with respective drivers of trucking companies.

D. Vehicle Related Issues

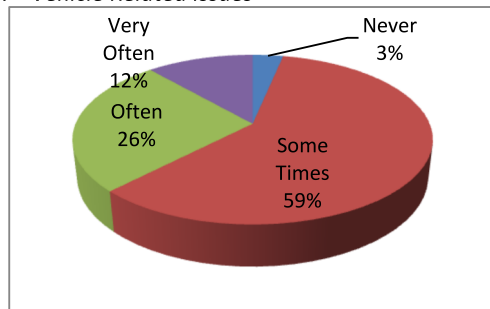


Figure 5: Impact of vehicle breakdown

Source: Survey data (2014)

36 respondents felt congestion was sometime occurred due to vehicle breakdown while only 2 were negative. 16 and 7 respondents said congestion occurred often and very often due to vehicle breakdown respectively. This factor creates a big impact on road congestion and unpredictable too. It was revealed by some respondents that all the major variation of travel time to regular destination had some relevance to a vehicle breakdown.

E. Issues Relevant to Weather

General perception of trucking companies is that rainy weather may cause congestion and 42 respondents said delays were sometimes occurred due to rain and floods while only one responded

negatively. 10 and 8 responded said that they faced the issue often and very often respectively. However, this is a natural phenomenon which is something beyond control. Trucking companies most of the time operates on strict and tight time schedules particularly with respect to export consignments. Therefore it is usually impossible to avoid times that potentially cause congestion even if accurate weather forecasts have been announced.

F. Evaluation of Effectiveness of Recommended Congestion Mitigation Proposals

The respondents were asked about their perception towards nine potential congestion mitigation proposals recommended by the researchers. The proposals were based on the comments made by respondents at the interviews with industry experts mentioned previously.

Perception of the industrialists on proposed solutions were measured using five point likert scale from 1= Strongly disagree to 5= Strongly agree. Total value of the response measured by the likert scale then weighted and arranged according to the descending order. Results are shown in table 5.

Table 5: Weightings of the perceptions of trucking companies towards proposed solutions

Solutions	Weighting
1 Dedicating a single lane to truck traffic wherever possible	0.1324536
2 Having truck-only streets for access to ports	0.1304985
3 Better coordinating of traffic Signals	0.1256109
4 Having an effective system to attend emergency crews in clearing accidents	0.1182796
5 Adding more expressways wherever possible	0.1158358
6 Eliminating some on-street parking during certain periods	0.115347
7 Installing electronic clearance stations at international border crossings	0.1124145
8 Having truck-only lanes on some surface streets	0.1055718
9 Imposing a toll on all vehicles travelling during rush hours	0.0439883

Source: survey data (2014)

According to the analysis allocating a dedicated single lane to truck traffic is the most preferred solution perceived by the industry. Having truck-only streets for access to ports was the second most preferred option followed by better coordinating of traffic Signals. It was then proposed by the industry to have an effective system to attend emergency crews in clearing accidents. There are two expressways in operation in Sri Lanka as at 2014. The trucking industry feels that adding more expressways wherever possible could be a solution to mitigate the congestion problem. Eliminating some on-street parking during certain periods was the next option followed by installing electronic clearance stations at international border crossings and having truck-only lanes on some surface streets. Imposing a toll on all vehicles travelling during rush hours was perceived by the industry as the last option in mitigating congestion problems on roads.

V. CONCLUSIONS

Congestion experienced by trucking companies is considerable as 79 percent of respondents view that traffic congestion as a critically serious problem in intermodal transportation. The continued growth of traffic and the rapid improvements owing to implementation of the commercial hub concept may create serious road congestion in future particularly in urban areas. As a consequence the maritime intermodal carriers are more likely to miss schedules because of traffic congestion. Therefore, congestion mitigation measures should be adopted especially in the urban areas at this time to face future challenges successfully.

Road related actions that need policy decision should be seriously considered.

The study had considered five key variables that may cause congestion. This includes road, time, and weather related issues as external factors while HR and vehicle issues represent internal factors of trucking companies. The trucking industry perceives that the congestion occurs often or very often during 6am-12 midnight while 12 midnight- 6 am is free from traffic congestion. It was revealed that traffic congestion often experienced in Colombo-Negombo road; Colombo-Kandy road; passage Between Colombo-Kandana; and Area within Colombo city limits. Based on industry perception Colombo-Negombo Road particularly the distance Between Colombo- Kandana should be improved

and eliminated the congestion. Similarly Colombo-Kandy Road and all key roads leading to Port of Colombo should be given priority for improvements.

The actions with respect to development of road infrastructure are already making positive contribution to the country's logistics performance. Therefore, adding more expressways wherever possible should be looked into. Further research should be carried out prior to taking any policy decisions with regard to certain sensitive proposals. This includes, 1) dedicating a single lane to truck traffic; 2) designating truck-only lanes on some surface streets; 3) truck-only streets for access to ports, rail terminals, and airports; 4) Eliminating some on-street parking during certain periods. It would be necessary to implement a system for better coordinating of traffic Signals and an effective system to attend emergency crews in clearing accidents should be done.

Commercial Hub Regulation in Sri Lanka is subject to a synchronized operational procedure/s that shall be introduced by the Department of Customs, the Board of Investment of Sri Lanka and Sri Lanka Ports Authority. Therefore it would be necessary to have more visibility in the logistics system with respect to activities and process of customs and other border management agencies in order to install electronic clearance stations at international border crossings. Further improvements in maritime intermodal operations may require creative public/private sector collaboration and would help for "sustainable" growth of country's logistics performance. Increased use and reliability of Container Status Inquiry systems (CSIS) that supply carriers with information about movement of trucks would be beneficial from the trucking companies' point of view.

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