The environmental law studies new regulatory frameworks for public ports in practice by sustainable transport

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Abstract
The environmental law studies new regulatory frameworks for public ports in practice of sustainable transport logistic. The system of Brazilian ports for environmental management depends voluntary actions from operators for developing rules to increase the multimodality consciously. The article links the concept of eco-efficiency with modal shift management models on container transport.

Keywords: Modal Shift, Management, sustainable transport.

Introduction

In the past, businesses have implemented innovative managerial initiatives such as Total Quality Management – TQM, Just in Time – JIT, Business Process Reengineering - BPR, and Balanced Scorecard to stay ahead of competition. However, in recent times managers have adopted a different approach to give strategic direction to their companies. In order to achieve the green initiative for sustainable logistic, this paper proposes use of metrics for measure and monitoring voluntary environmental systems when the focus is practices adopted by transport companies.

The interdependency of eco-innovative strategies in cargo handling can be obtained with the adequate combination of modes in a sustainable way and by enabling the practice of multimodal transportation. Such has resulted in the transition allowing the utilization of more than one mode in cargo handling, in the use of containers, and chiefly in eco-efficiency.

However, such procedures demand a new and complementary analysis or perception of energy resources, concerning the development of the modal strategy to create a more sustainable and productive market, within the area of transportation services, and to fight global warming.
The adoption of sustainability and intermodal system by new logistics operators shall establish paradigms in their corporate strategies, aiming at international competition and contribution to society and environment, with the help of sustainable logistics, to reduce CO2 emission by adopting eco-efficient modes.

Nowadays, in the broad and metaphorical sense employed in business practices, when the transportation management uses the expression “Modal Shift”, they refer to an immediate and widespread idea of “modal interface”, “intermodal”, “multimodal”, which involves cargo handling through a “succession of modes”, or to the representation of each mode inset in the sustainable chain of logistics services.

In this paper demonstrates the contribution of modal shift to reduce CO2 emission by monitoring each section of the route. Identify the viability of cargo physical distribution in a sustainable manner.

The MARCOPOLO methodology is based in emissions of greenhouse gases inventory collected directly from ITRI's company a multimodal logistics operator.

This analysis occurs into a third party logistics provider to supply the production plant by container in Brazil.

Theoretical Reference

According to Gonçalves (2011) information guides decisions that give logic to the actions operating through telecommunications or highways, which are logistical resources in fundamental processes that involve greater complexity in an integrated manner across multiple systems or international operations.

Gonçalves (2011) argues that as they continuously process information captured through any real-time technology, the various actors in the chain automatically achieve goals or demonstrate strategic thinking in an integrated network. Regarding the performance of new technologies for logistics information, the control strategies are created to establish differential firms that operate as an open system, however, these companies rely on investment or an operation plan in the dissemination of accurate information, especially when entered in transport systems.

In this case, the type of inter-organizational network design implemented into a transportation system can improve performance and facilitate the alignment of goals to strategic thinking, and can provide the suppliers involved more collaborative projects. According to organizational priority, it can guide the focal point of the applicability of resources for various technical dimensions, even when attention is directed to a transport system.

According to Gonçalves (2011) the process of formation of hierarchical levels of the texture of a network is extremely complex. It stems not only from the interaction of corresponding levels of the organizations network components but as interactions between different levels of various organizations. See Figure 1, below.

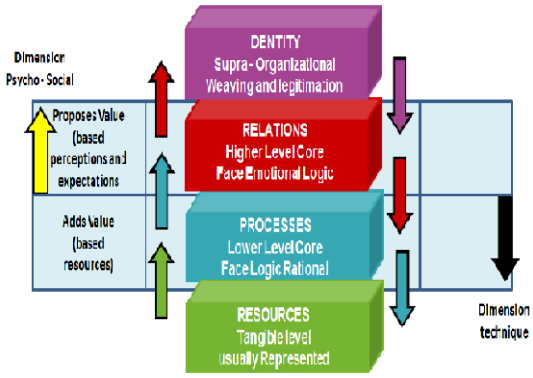

Figure 1 - Hierarchy Levels and Social Dime
Source: Gonçalves (1990).

The complexity of instituting any concept of network innovation successfully depends on several factors of this archetype where levels include: (1) infrastructure resources, (2) information flows

and decision, (3) organizations and regulatory mechanisms, contracts, agreements and operational rules of arbitration of conflicts of interest, and (4) principles and business models universally accepted (Gonçalves, 2011). Based on this breakdown of the archetype of Gonçalves (2011) it is possible to understand the development of a hierarchical approach to innovation, as well as links for network function.

However, emerging strategies can occur between the following levels, following the archetype of networks characterized as inter-organizational entities, the analysis of a structure of a more collaborative projects, as in a technical causal texture of an inter-organizational entity which is an archetype developed from Gonçalves (1990).

A private sector since taking over the port operations in public ports, has presented materials handling records now never seen in public ports Brazilians, however, these parameters to be distinguished should be analyzed and compared with the equality of multimodality technology both in the public or private sector, to legitimize through equality, the effectiveness of current results and better port productivity offered to the Brazilian economy in recent times.

According to the Brazilian environmental legislation the corporate organizational by multimodality innovation paths in public ports are increasingly becoming the essential mission control management for all port activities, including new port terminals with licenses areas outside the organized port.

A concept of the multimodality to reach the sustainable logistic

From Act No. 9.611/98, such activities became one of the functions of the Multimodal Transportation Operator, in order to reduce logistics costs and total costs, in the following stages:

1. Operationalization of the activity, adding value throughout the process and making loading, unloading and transshipment operations more efficient.

2. Improvement of the information flow and the reduction of documentation with simpler legislation, ensuring some warranty to operation control.

Once Act No. 9611/98 has been enforced, the MTO is held responsible for the execution of the multimodal agreement, including eventual losses resulting from losing, damage or harm to cargo under their custody, as well as for those resulting from delivery delay (when there is an appointed delivery time).

The difference of the MTO's function, when compared to the intermodal logistics operator's function, is that the responsibility for the transport operational stages is integrated in the CTMC, which can only be issued by an MTO, who, before the customer, assumes the custody of the cargo until its delivery at the final destination ensuring the actions or omissions of their collaborators, agents, institutors or third-parts, hired or sub-hired to execute the services of Multimodal Transport.

With respect, port terminals installed in organized ports, areas under the auspices of public management.It is observed that the Law 12,815 / 2013 prevails with the premise of sustainable port operations in private hands, but with control of the granting authority.

Thus, the Brazilian environmental legislation should be applied in port operation of public ports, mainly through the private sector intervention; the business need is to meet specifically any productive sector.

The purpose of the culture of best practices aimed at eco-efficiency and sustainability of the sector, with appropriate administrative tools to control emissions.

In managing a sustainable port development and implementation of the PRTR in Brazil favors the management on the generation, release and the fate of these releases and transfers of chemicals over time, to allow the analysis, review of progress in reducing of releases and transfers.

According to the Ministry of the Environment (2014), the Issue Log and Transfer of Pollutants can bring other benefits such as:

- ✓ Providing support tools for environmental management, assisting in the creation of government policies;
- ✓ Improvement of production processes;
- ✓ Ensure the commitment to citizenship through the public disclosure of data and its debate, and consequent initiatives from the information generated.

Legislation - Brazilian model to contribute the Environmental Law International

The Stockholm Convention provides in Article 10, paragraph 5, each State Party shall endeavor to carrying out studies on the possibility of developing mechanisms, with regard to the better management of legal issue which must be aligned legislation site, to resolve questions to organizational models implemented where the example of Brazil, the PRTR is fundamentally guided by five points:

1) National Environmental Policy, Federal Law No. 6938 of August 31, 1981, which created an environmental system for the purpose of preservation, improvement and recovery of environmental quality, and defines as one of its instruments, the Federal Technical Registry of Potentially Polluting Activities and / or users of Environmental Resources.

2) Federal Constitution / 88, Article 225, paragraph 1, item V, citation in verbis: "V - control the production, marketing and use of techniques, methods and substances that represent a risk to life and the environment";

3) Federal Law No. 7347 of July 24, 1985, which governs the civil action of liability for caused to the environment and other measures;

4) Federal Law No. 10,165, of December 27, 2000, which regulates the potentially polluting activities and those that use natural resources, with emphasis on the Activities of the Manual of the Federal Technical Register / IBAMA;

5) Federal Law No. 10,650, of April 16, 2003, which provides for public access to data and environmental information in the organs and entities of the National Environmental System – SISNAMA (2014).

Internally, in Brazil through public policies can regulate the sector through legal instruments of prevention and precaution of environmental damage with constitutional power.

However, in terms of emissions control management by sector of economic activity, like legitimate priority measures or environmental standards.

According BRAZIL (2014), Law No. DOU, de 17 de junho de 1986, Seção 1, páginas 8792-8795was established to strengthen the intent of the National Policy on Climate Change (NPCC). The Brazilian hierarchy of government activities to governance may result new legal rules on standards that guide the NPCC - National Policy on Climate Change.

The study of new tools for sustainable management depend standards or state guidelines as well as the environmental legislation that deals with the sustainable logistics.

In this way, through specific legislation, is reflected in building the important bases for emission control through building stronger public policies to force companies to report emissions of their respective activities, which should produce objectively affiliated products what

determines the life cycle by following the legitimacy control of the market parameters as global environmental protection.

In terms of priorities and governance directed to better control and management through corporate environment. Brazilian public policies can advocate a voluntary commitment of Brazil to the UN Framework Convention on Climate Change.

In fact, at the time, was stipulated voluntarily by the Brazilian Federal Government to cooperate fully with the primarily scientific point of view between the parties; which includes strategic sectors, the example of transport and ports sectors where the country with new methods to search the reduction of greenhouse gas emissions in the order of 36.1% and 38.9% considering the projected emissions by 2020.

Method for an analysis of data with Marco Polo Programme Model

From the example of organizational practices applied in the European market, according to information disclosed in the Marco Polo Programme (2009), we have investigated the method for the calculation of provision, per estimate of reduction in "tons per kilometer" and of "carbon dioxide emissions", in the "covered distance per mode", to analyze the Modal Shift systems.

With regard to the environmental aspect, the calculation of CO2 emissions proposed by the IPCC (2010) was carried out. In the calculation of emissions, data collection and parameters for the methodology of emissions are defined by four parameters with respective subdivisions (a,b,c,d):

a. The logistical product (type of cargo): Container
b. Analysis of the areas or places of cargo transfer.
d. Transportation Modes: Road and Rail
e. Calculation of CO2 emissions for definition of route.

Parameters of the analyses are as following:

1) Transport distance: Route in [km]
2) Fuel consumption (in liters): per mode (consumption total)
3) Fuel Efficiency: Relation Distance/Weight/Consumption
4) Cargo weight: Amount of cargo (in tons).
5) User's participation: in tonnage per vehicle
6) Participation of the cargo: (%) in the total capacity of the transportation system
7) Consumption participation (%): availability of cargo per vehicle
8) TKU = tonnage of the cargo in the covered distance in (Km)
9) Calculation of emissions per mode: Fuel Consumption (per cargo) multiplied by the coefficient available per mode.

The organizational concept like the *Modal Shift* can help decision-modal decision to transport and comes instruct the tenants of these port areas to monitor environmental performance by management actions and emissions control which cause environmental damage.

The results were presented by comparing the calculation of emissions resulting from consumption of diesel per different modes in the same route.

Table 1.1: Spreadsheet with the calculation of emissions of the CBC (2010)

Distance	Fuel Consumption	Fuel Efficiency	Transported Cargo		User's Participation			
			Total weight	USER's Participation	Fuel Consumption		Tonnage Distance	CO_2 Emission
(km)	(L)	(km/L)	(ton)	(ton)	(%)	(L)	(ton-km)	(CO_2 ton)
(1)	(2)	(3) =(1)/(2)	(4)	(5)	(6) =(5)/(4)	(7) =(2)x(6)	(8)=(5)x(1)	(9) =(7) x Coeff.

Source: Adapted by IPCC (2010) – CBC

The observation focused on the comparison of the parameters in the unimodal system: between road and rail modes, and afterwards to complete the analysis integrated to the view of a multimodal system. It starts off from premise that rail transportation must be used for most of the distance and road mode for the shorter part of the distance, for cargo distribution centralized in a combined way in multimodal practices.

In regarding the Modal Shift studies which has been proposed for transport practices. Hochhaus and Wild (2008) has explained that ship and air transport are the most used worldwide. If the costs and CO2 emissions per tonne-kilometer of these two are compared, clear values are obtained as follows at Table 1.2:

Table 1.2: Comparison of fuel usage and emissions adapted by Authors

Modal Transport	Fuel Consumption	CO2 Emission	Kind of Fuel
Parameters	g/t km	g/t km	
Airplane	100 - 200	315-630	kerosene
Truck	24	70	diesel
Train		25 - 50	Eletricity/Diesel
Ship - Conventional refrigerated	7,5	24	bunker oil
Ship - Full container / 4.500 TEU's	6,2	20	bunker oil
Ship - Full container / 8.500 TEU's	3	10	bunker oil

Search: CARGOFRESH TECHNOLOGIES by Dr. Hochhaus e Dr.Wild - Jun/2008

A container ship that can transport 4,500 containers (TEU) burns about 6.2g of oil per tonne of transported goods per kilometer. This leads to CO2 emissions of 20 g per tonne kilometer. In comparison, a jumbo-jet burns 100 – 200 g of kerosene per tonne of freighted goods per kilometer and produces 315 – 630g CO2 (HOCHHAUS & WILD, 2008).

The management research environment and the harbor reveal normal operational resources such as trucks, locomotives, barges and ships which can be own vehicles, or outsourced, however, regardless of the modal emissions from these modes must be controlled - which in most often are not managed as priorities of port terminals - as appropriate for the administration of the port terminal - because they do not make use of appropriate technology to minimize CO2 emissions.

In fact, the concept of Modal Shift was introduced as a modal shifting practice by several agents and it has increased to improve global efficiency in goods circulation systems – mainly of containerized cargo. Such a concept may be a practical solution to bottlenecks, which yield conflicts in urban logistics, to the physical distribution of goods.

According to Jolic, Strk and Lesic (2007), distance is the decisive factor of major influence on the decision towards the adoption of intermodality, considering that the strategic planning can only be defined from the geographic position of the port to its hinterland.

The scenario with high port costs is the result of additional costs to transport and such is caused by the difference between maximum and minimum distances of the transport.

Port costs are complementary to distribution logistics, as well as cargo transshipment costs in ports. Transshipment operations depend on specific equipment and on the available infrastructure for the modes, in logistics, to the terminal's modal shifting.

When such complementary costs are high, the strategic positioning of cargo transshipment and costs can be adopted as a tool for the analysis of port competitiveness, of the available infrastructure to define modes, and of modal shifting.

Frequently, the European Commission (2003) states that intermodal transportation maybe a reliable solution, with a combination between road and rail modes.

Rodrigue et al. (2008) consider that the increase in the demand for a transportation mode to the detriment of another, may entail an increase that is not at all restricted to one single modality, but to all those directly involved in modal shifting.

Thus, the conditions for an eco-efficient market of cargo transportation may become feasible since there is a strategy for an efficient cargo transfer, counting on the participation of maritime, rail and fluvial transportation, through implementation of new services with technological innovations or improvement to the existing services (EUROPEAN COMMISSION, 2003).

According to Rodrigue et al. (2006), the comparative advantages are confirmed, in terms of economy of scale, from one mode to another or in the functional integration of the supply chain, where, in terms of logistics costs, the advantages may be noticed in the physical distribution by means of other factors, such as convenience, swiftness, reliability.

In the analysis of an integrated transport-oriented perspective, a modal transfer may become feasible in the context of organizational changes in order to develop innovations in the corporate environment, from the macro-perspective, with a local and regional environmental policy, or from the micro-perspective, where the changes in transport offer must orient strategic decisions based upon the behavior of consumption (of people) or companies (production). For instance, in intermodal transportation of perishable goods, other specific characteristics, such as shorter distances (transit time) and transshipment time lengths are required (BONTEKONING et al., 2002).

Therefore, organizational models for transportation management, in processes of business logistics, demand to over to models of innovations reflecting needs in accordance with the modal characteristics, such as: speed in long distance, reliability for high value-added cargo, and as for short distances, higher frequency of services, which are important innovations, mainly with inclusion of rail mode.

For Jolic, Strk and Lesic (2007), distance is the factor of greatest influence for decision-making processes to adopt intermodality in port operations, considering that, in the strategic planning of a supply chain, one must include options for transportation modes with geographic position near the hinterland.

The practice of transportation via more than one mode in Brazil demands further technical studies that might enable the practice of cargo modal displacement in a sustainable way according to the type of technology per product.

In that respect, contextualizing Modal Shift in cargo-transporting business management implies concerns that at first may conflict with the production system and with the location of the consumption market.

Considerations from ITRI`s Study Case

The proper operational analysis, as this study tries to determine by taking the aim at sustainability in transportation, depends on the operational characteristics of the type of mode available as per geographic space and political environment, in order to put into effect the concept of Modal Shift, which can be broadly propagated in the macroeconomic setting of business logistics.

For instance, the model examined in the functional diagram of Modal Shift of the ITRI shows rail transportation for most of the itinerary (distance), that is, from the Port of Santos to cargo transfer up to the Rumo Terminal (Campinas), to later delivery to the provider located in several areas (up to 150 km). In the case study of ITRI, from qualitative and quantitative approaches, we have concluded that multimodal transportation in Campinas City by truck.

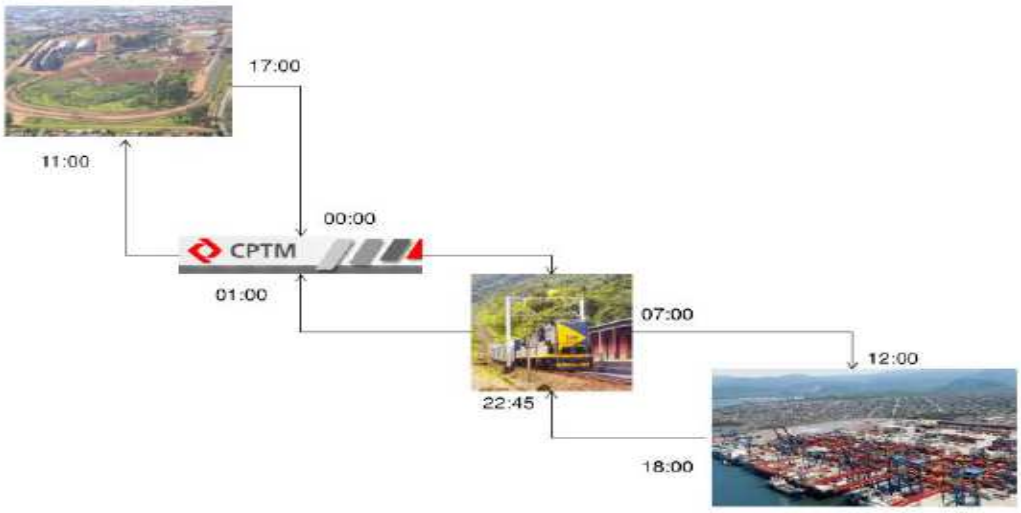

Figure: Container Railway Transport Schedule by Santos City up to Campinas SP State
Source: ITRI (2013).

In the case study of ITRI – RODOFERROVIA the principal methods to assess CO2 emissions in this research were taken from the GHG Protocol and Marco Polo Programme, which ground the management of the Modal Shift.

In the sphere of organizational innovations by means of Modal Shift, some possible sustainable solutions in logistics can be identified, with emphasis on the integrated approach, for cargo mobility between transportation modes and the attenuation of social-environmental impacts, which will be the subject of further detailing.

In this regard the state with the inertia of public agencies which are supposed to regulate and standardize the practice of publishing emissions reporting mandatory form within the public port can be conniving to environmental damage.

However, if it kind environmental process system can be compared with the unimodal transportation system (road), we can get by multimodal eco-efficiency in logistics and, consequently, sustainability in cargo transportation management.

Conclusion

We can conclude that the existing organizational models can be more eco-efficient in the multimodal transportation as long as, in what regards the choice for modes, energy consumption is minimized and higher productivity is achieved in cargo transportation.

Multimodality, by the study of Modal Shift, can make cargo mobility more susceptible to the decreasing of greenhouse effect gases, mainly with the model of the transfer of containerized cargo from a unimodal system (road) to a multimodal solution (road-rail).

The technical proposal of environmental engineering corroborates the administration section, to solve anomie more collaborative systems for emission control which in Brazil more evenly, not yet present or duly certified and accredited.

It is necessary to suggest immediately in port operations, the reflection on the best applicable and functional model of emission control operational methods, which applied when they should retain acceptable control data for various complex scenarios of logistics, sample activities port.

Finally, It is suggested to first understand the transport system unimodal, multimodal modal or in combination; that when practiced by port logistics is possible to register the schedule accessibility respectively by mode of transport, environmental damage.

However, the scope of sustainability via multimodality in transportation must start with the environmental dimension aiming at reaching a holistic view for other dimensions, such as cultural, social, economic, spacial and geographic dimensions; and, finally, it shall reach the expected corporate social responsibility by defining a nationwide matrix of more eco-efficient and sustainable cargo transportation.

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