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The International Environmental Legislation in Logistics Processes to Multimodal Transport of Containers by Brazilian Railways

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Abstract The sustainable management of multimodality depends on public policies which in Brazil are not associated with environmental legislation to practices in transport. The lack of infrastructure interorganizational between ministries prevents efficacy by Ministry of Environment to discover one right way for public benefits on developing container transportation by railway model.

Keywords Sustainable Transport, Environment Law, Management

1. Introduction

In case the planning of the environmental impact for transport activities and cargo handling at ports. The Ministry of Environment action it is still strategic to understand the need for more legislative force that specifically, it only occurs to introduce new public policies.

The Brazilian inland logistics for many years presents public investments directed exclusively to the trucking industry. This effect has justified the progressive effect of this modal, due to the fact that the State has acted in a way tacitly in favor of these unsustainable practices, to direct resources more quickly with road transport.

However, the transportation multimodal depends of experience by operators to reach new directions in the Brazilian port access, where the modal with appropriate infrastructure can dispute territories and slices of cargo and passenger.

Although the recurrent problems of the lack of public infrastructure in ports has justified, in terms of growth in comparing what is happening in other ports with better infrastructures and niches loads.

As structures improvements and operation options examples as constructing of railways or new docks for mooring barges inside ports seems to be a main lack of public policies for development of multimodal transport and the waterway mode to minimize the index of atmospheric emissions.

For other hand, more and more there is greater participation of highways in transport activities in economic development. The containerization phenomenon is important for multimodal operation, which starts from high investments in the purchase of new vessels and ships from major ship-owners, which depend on waterway infrastructure better defined for public politics for maintaining deeper maritime access at port for better productivity in shipping, which is crucial for competitiveness to the nation to every scale economy of long haul from or arising out of international ports.

The Law on sustainable procurement contract logistics services does not establish guidelines that require the hiring of sustainable transport services by the public sector. In this sense, the article describes the legal responsibility of the state and private companies, in terms of eco-efficiency in production logistics processes. The article aims to promote environmental awareness, according to sustainable port of legitimacy with a view to current normative precepts of international environmental law in the fight against global warming.

This observation is important because of the growing expansion of the road fleet is constant, and, above all, by the unbridled consumption behavior of large cities.

2. Justification of the Relevance

At first place we are looking for the actions from regulatory agencies in terms for legitimizing by new standards for sustainable transport practices.

In second part we comment is about effectiveness to stimulate organizational innovations in port logistics model which it will be adapted on Brazilian Port Law for constructing efficacy sustainable transport practices rules which configure new behavior of the risk society. This new point of view, it can characterize several changes in environmental perspective in case of multimodal system, although we know that Brazilian environmental law is insufficient to induce a new behavior from corporations.

Third point is about the customs about technical

knowledge developing that is necessary for understanding by new rules from ANTT and PROCONVE public program which will add knowledge to the sustainable management model to adapt changes the Modal Shift benefits in regarding Brazilian reality. From this point, we are noticing that to create on model by sustainable transport in Brazil it will be necessary coercive force specific from Brazilian Legislation to force corporations with environmental impact control management in choice of transport mode.

Finally, we believe modestly that this research can to contribute for inducing about what will be expected as management results how the Brazilian case of the juridical legitimacy by sustainable transport management.

3. Environmental Law Searching New Rules from Scenario Politic

The reason of the federal government have not given more emphasis on the analysis of public and private investment can be justified in the past but not right now with the lack of infrastructure in other transport modes necessities which always been the triggering event of these postures of politics green.

However, the delay of this resources news in application of eco-efficient modal coming from the State could be decreasing negative effects or inhibiting externalities which historically were proven technically.

To the predominance of the participation of road transport in cargo transportation statistically, one can see the sovereignty of the shares and their participation of this modal given the current matrix of Brazil's transport.

On the other hand, the other modes of transport remained in the political wilderness of public investment.

The maritime shipping of cabotage has not strengthened the multimodal transport system in coastal or otherwise more integrated to railways and or barges, whatever alternative in the geography or existing opportunity to waterways by public ports. In order to operate other maritime waterways and roads in the domestic scenario which are not explored, due to the absence of public policies without legislative imposition especially in to offer benefits about friendly practices to the environment, in right way to sustainable transport.

This kind of public posture to stimulate investments could be the main management of investors and multimodal operator's loads based on what determines the Brasil's Law 12,815 / 2013[2]. However, in this law there is no new guidance on the current infrastructure of railway sidings installed on leased areas from public ports even when in favor of the development of cabotage in the implementation of strategies shipping by "feeders services".

Theory by Modal Shift in Management Logistic Process

The concept of Modal Shift(Akabanes et al [1]) can infer more holistically to assess the full impact of air emissions by organizational practices in integrated logistics services network, which to be sustainable, it should involve a change of management paradigm by the advent of SCCM (Sustainable Supply Chain Management) where competition tends to increasingly occur between networks (open) services that work integrating supply chains (closed), but green and not just between companies operating in isolated forms.

In multimodal transport, sustainable solution needs in most cases of the application of the concept of Modal Shift that will also depend on port technological knowledge in choosing the modal port by the user.

To Jolic and Strk Lesic [3], the distance is the most influential factor in this making decision process, rather than calculating the environmental impact of each modal applied in logistics.

This organizational management mode from ports has been a form of corporate strategic planning more comprehensive and complex, requiring from the executives an interdisciplinary knowledge of international environmental law practice, which involves analyzing different types of transactions being developed by these:

- Number, location, capacity, types of plant and distribution centers;
- set of suppliers to meet their demands for raw materials, components and services;
- distribution channels;
- transportation to be used;
- flow of raw materials and components needed to feed its factories;
- flows of finished products between plants of the production chain and consumer markets;
- policy stocks of raw materials, components and finished products.

Strategically, for public policies it is necessary to increase the participation of cabotage to the country, and consequently air emissions even when resulting from road transport will be small. On the other hand, due to the Law of the Sea, in international organizations to the better measure of accessibility in ports it aims of more eco-efficient as possible, keeping suitable vessels and ships for better navigability of access to ports channel.

The sea, from earliest times of universal history, proves to be, undoubtedly, as the space that stands out in the world economic development.

Technological developments unveiled other perspectives of exploitation of the seabed and marine subsoil, revealing the nations that the sea has a relevant source of wealth and key strategic importance as a supplier of raw materials, further enshrining the maritime space as one of the bastions of the globalized international economy.

4. For Developing by Modal Shift Organizational Philosophy

At first, the concept of Modal Shift means the modal exchange with lower energy consumption where environmental law can be observed in the transport process,

for protection of each mode, and when public service object in hiring specialized sector of transport services private, provided with such technical condition granted by the grantor.

In Konami's [4] research, Modal Shift is a pragmatic concept that allows preserving the environment in transportation activities, with lower emissions of environmental burden on the planet. The multimodality strategy depends on of the study case as following:

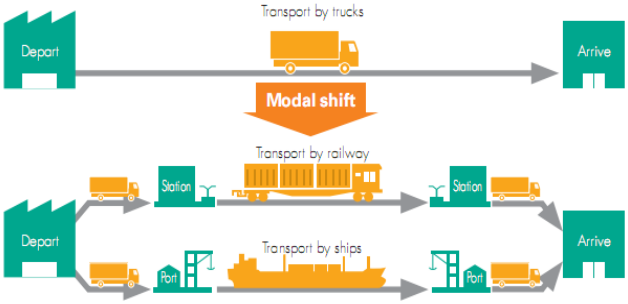


Figure 1. Model by Sustainable Transport with Modal Shift Strategy (KONAMI, 2010)

As Ogawa [5] Application of Modal Shift depends on the interest of organizations to exchange a modal with high CO_2 emissions by a mode of transport that impairs the environment less.

To Ogawa [5], Modal Shift concept is an organizational innovation that has a perspective centered by a particular organization; minimize environmental impact in the sector in transport, based on the concern about global warming (GHS).

To Geerts [6] Modal Shift is an organizational model of transport which determines the index Potential Intermodal (IPI) of a region, from the form of local modal decision, which occurs in a cultural way and therefore ultimately lead the predominant modal model in a given territorial transportation network.

5. Geography Model Comparison for Ecoefficiency by Multimodal Transport

According to Rodrigue, Comtois and Slack [7] the Modal Shift depends on a geographical study of regional characteristics that suggest a systemic analysis in the process of multimodality decision making.

Geerts [6] proposes the adoption of Intermodal Potential Index (IPI), which analyzes the potential of intermodality is another way, that is, from the relationship between the market and the current market potential and cargo transport in which analysis can depend on various factors such as transfer pricing; delivery time door to door; frequency; tracking information (delays); reliability and distance.

One must consider the distance to calculate the environmental impact in the strategic planning of a particular supply chain, should be included options more eco-efficient transport modes by analyzing the distance, where the modal may depend on the multimodality by transhipment infrastructure and location closer to the hinterland.

6. ANTT's [8] Annual Monitoring Reports by 2012 from Concessions Railways

The air emissions inventories are environmental management instruments allow correlate issuers agents with the types and charging gases and pollutants that each emits over time, forming strategic elements to guide more effective intervention measures in different fields, from technical and operational until the field which gives the improvement of sectoral policies and their regulatory mechanisms.

In Brazil, the emission inventories on history of the Transport Sector in scale National has been, to date, represented by the 1st and 2nd National Communication to the UN Framework Convention on Climate Change by MCTI [9] which reported emissions at Greenhouse Gases, and the First National Inventory Air Emissions by Vehicle motor Road by MMA[10], which accounted, in a very broken way, both the emissions of local pollutants regulated by CONAMA [11] at Proconve and Promot Programs, as of Greenhouse Gases.

Especially on the transport of loads, at 80's decade the railway sub-sector did not have a specific study that would allow understand at the same time both emissions of air pollutants and subsector of Greenhouse Gases, for instance as it was demonstrated as a whole the participation on second inventory by railway dealers individually ANTT [8].

According to ANTT [8] with respect to emissions of Greenhouse causing Gases National Inventories, coordinated by the Ministry of Science and Technology MCTI [9], pointed the Transport Sector as a whole, as the second largest source country, accounting for nine percent of CO_2 emissions.

Table 1. Greenhouse Gas Emissions by Modal of Transport

Modal of Transport	Fuel Consumption (g/t km)	CO_2 Emission (g/t km)	Kind of Fuel
Airplane	100 - 200	315 – 630	Kerosene
Truck (up to 30 ton) / (2 TEU)	24	70	Diesel
Train - Full Container (5,000 t)	See note[1]	25 – 50	Electricity / Diesel
Ship – Conventional refrigerated	7.5	24	Bunker oil
Ship – Full container (4,500 TEU)	6.2	20	Bunker oil
Ship – Full container (8,500 TEU)	3	10	Bunker oil

Search: CONAMA [11] Adapted by Author - Soares [17]

1 The fuel usage per type of locomotive should be scaled to the national statistics to ensure that the overall energy balance of the inventory will be maintained. Check Graphic

The 1st Brazilian National Inventory therefore presents the total annual emissions aggregate 2002 to 2011, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), monoxide carbon (CO), volatile organic compounds Non-methane (NMVOC), nitrogen oxides (NO_x) and particulate matter (PM), followed by emissions calculated for dealership rail and production of transport, comparing further CO_2 emissions in freight transportation by road and rail.

In this inventory were adopted therefore the CO_2 emission factors, CH_4, N_2O, CO, NMVOC and NOx proposed by the IPCC [12] and used in the preparation of the 2nd National Communication of Brazil to the UN Framework Convention on Climate Change by MCTI [9].

In regarding about rules and Resolutions of the National Environmental Council CONAMA [11], there are not specific regulations in Brazil for railway emissions and thus are not available average factors emissions for locomotives in operation in Brazil.

According to the National Land Transportation Agency - ANTT [8], interstate and international road transport of passengers in Brazil is an essential public service responsible for a top drive a hundred and forty million users / year.

However, as for the particulate matter (PM) adopted the emission factor suggested by the European Environment Agency (Table 2).

Table 2. Emission factors adopted (i)

Pollutant	Emission Factor	Unit	Reference
CO_2	20,2*[2]	tC/TJ	
CH_4	5		
N_2O	0,6		
CO	1000	kg/TJ	MCT (2010)
NMVOC	200		
NO_x	1200		
MP	1,44	kg/t diesel	EMEP EEA (2009)

Search: 1st Brazilian National Inventory - Adapted by Soares

Font: ANTT [8] (2012)

About by Diesel oil consumption there are two sources of official information existing in the country for consumption rail fuel: (i) Annual Monitoring Reports Concessions Railway ANTT, and (ii) National Energy Balance EPE [13].

The EPE is a public company incorporated under Law No. 10,847 [14], of March 15, 2004, and Decree No. 5184 of 16 August 2004. Its purpose is to provide services in the area of studies and research aimed at support the planning of the energy sector, such as electricity, oil and natural gas and its derivatives, coal, renewable energy sources and energy efficiency, among others.

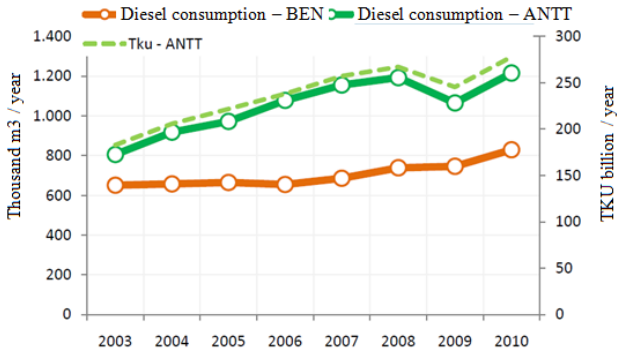
2 * Value corresponding to the carbon content of diesel fuel. On it applies oxidation fraction (0.99), so consider incomplete combustion and, ultimately, the molar ratio of the weights of carbon dioxide molecule and atom carbon (44/12).

The Law No. 10,847, in its Article 4, section II, established between the powers of the EPE to prepare and publish the National Energy Balance - BEN.

Consolidated report from the National Energy Balance - BEN documents and reports annually extensive research and accounting related to energy supply and consumption in Brazil, contemplating the activities of extraction of primary energy resources, converting them into secondary forms, import and export, distribution and end-use of energy.

In addition to EPE publishes the Synthesis Report in the first half after the base year, which summarizes the information about the accounting of the supply, processing and final consumption of energy products in Brazil.

For proving this assertive in this research, it was decided to use the ANTT [8] database that consolidates information declared by the concessionaires, and it shows greater adherence to the evolution of the load, as shown in the figure by graph 1, as follow:



Font: Production of cargo transportation by railway sub-sector in tku.

Graph 1. Evolution of domestic consumption of rail diesel ANTT [8] and BEN [13]

However, the numbers shown here come contribute to the development of scenarios correlate GHG emissions to production in cargo transportation and estimates emission reduction potential arising from the transfer to rail in face of national large-scale investments in transport logistics ANTT [8].

7. Brazilian Politic Policies – PROCONVE Deployment Strategy for Trucks and Heavy Vehicles and Environmental Law

Thus, since the 80's the increasing numbers of the fleet in the country and the poor state of maintenance showed that, in the last decade, it became crucial to reduce the emission levels of the main vehicle pollutants, including carbon monoxide (CO), nitrogen oxides (NO_x), hydrocarbons (HC), particulate matter (PM), aldehydes (CHO), sulfur oxides (SO_x) and lead compounds (Pb).

These include therein carbon dioxide (CO_2) which, although not considered a pollutant due to its low toxicity, it composes gases contributing to the greenhouse effect.

Historically, for best environmental practices, CONAMA Resolution No. 18/86 thus gave the first referrals to control the emission of diesel vehicles.

As CONAMA, Resolution No. 18 of CONAMA of May 6, 1986 created the Program for Air Pollution Control by Motor Vehicles - PROCONVE, coordinated by IBAMA [14], and that has come to define the first emission limits for light vehicles and contribute to the fulfillment of Air Quality Standards established by PRONAR.

In regarding, BRASIL [16] in October 28, 1993 Law No. 8723 was established the obligation to reduce pollutant emission levels of vehicular origin, contributing to induce the technological development of fuel manufacturers, engines and parts, and allowing domestic and imported vehicles, turned out to meet the established limits, as following:

> "…CONAMA Resolution No. 018/1986 - "Provides for the creation of the Air Pollution Control Program by Motor Vehicles - PROCONVE". - Date of legislation: 06/05/1986 - Publication Gazette of 06.17.1986, p. 8792-8795
> Status: Amended by Resolution No. 15 of 1995, No. 315, 2002, and No. 414, 2009. Complemented by Resolutions No. 08 of 1993 and No. 282, 2001..."

> "... CONAMA Nº 018/1986 - "Dispõe sobre a criação do Programa de Controle de Poluição do Ar por Veículos Automotores - PROCONVE". - Data da legislação: 06/05/1986 - Publicação DOU, de 17/06/1986, págs. 8792-8795
> Status: Alterada pelas Resoluções nº 15, de 1995, nº 315, de 2002, e nº 414, de 2009. Complementada pelas Resoluções nº 08, de 1993, e nº 282, de 2001…"

In respect to the technical measurement methodology, which is determined by law, the obligation of compliance with these requirements is measured through standardized testing dynamometer and "reference fuels."

Another important point to emphasize is that control of the program starts from the classification of vehicles because of their Total Gross Weight - PBT, and the phases characterized by "L" for light vehicles and "P" for truck comes being implemented seconds differentiated schedules.

The automotive industries have demanded continuous improvement of fuel quality and vehicle technology, and urban mobility solutions, which are a set of measures necessary to achieve and maintain air quality standards compatible with protecting the health of populations exposed.

8. Good Practice Guidance for Land Use, Land Use Change and Forestry

The National Inventory of Emissions and Removals of Greenhouse Gases Anthropogenic not controlled by the Montreal Protocol (Inventory) is part of the National Communication to the United Nations Framework Convention on Climate Change (Climate Change Convention). The National Communication is one of the main commitments of all signatories to the Climate Change Convention.

The responsibility for drawing up the National Communication is the Ministry of Science and Technology [9] responsible for coordinating the implementation of the Climate Change Convention in Brazil, as division of labor in the government that was established in 1992.

The Second Brazilian National Communication has been produced according to the Guidelines for development of country National Communications not Listed in Annex I to the Convention (developing countries) (Decision 17 / CP.8 of the Convention) and the methodological guidelines of the Intergovernmental Panel on Climate Change - IPCC [12]. Some estimates already take into account information published in the "2006 IPCC Guidelines for National Greenhouse Gas Inventories", published in 2006.

According to the guidelines, the inventory must be complete, accurate, transparent, comparable, consistent and be subjected to quality control process.

The preparation of this included the broad participation of governmental and non-governmental entities, including ministries, institutes, universities, research centers and industry sector entities. Elaborate studies resulted in a set of Background Reports, of which this report is part containing the information used, description of methodology and criteria.

No terrestrial absence of rail infrastructure and lack of adequate draft in the public maritime shipping ports, there is no other way for sustainable transportation management, but decrease the amount of trucks circulating in adjacent urban land access area around the ports.

In leased public ports, the environmental management is uncertainly because public service is measured by the own lessee or representative of the private sector. Henceforth due to the current inventories global need for control in atmospheric management ECO_2 in the port area to be detected by environmental audit to be transparently report the inventory of greenhouse gas emissions.

From now on the constitutional public interest has been preserving the environment to create hard public policies in case of ensure railroad investments in the country, from the port areas to improve air and to promote good conditions environmental.

9. Brazilian Regulation – Multimodal Legislation and Environmental Law

In part, an organizational innovation of the management collaborative logistics processes in shipping. In alignment for an integrated logistics with new attitude towards the environment, this depends on the commercial and operational success of multimodality. As Soares [17] apud Nazario [18]:

1. Combined Transport: Transport which main route is by air, rail or sea, supported by road transport.

2. Intermodal transport: system using at least two different modes of transport, through the transfer of responsibilities from one mode to another, from one load unit.

3. Multimodal Transport: Transport governed by a single contract Multimodal Transport Knowledge Loads, which has the following definition: a system that uses two or more modes of transport from the source to the load destination - according to the Brazilian Law No. 9611/98 which provides for the Multimodal Transport charges and other provisions BRASIL [19].

In Brazil, the unimodal maritime transport system as a rule, the jurisdiction and the incidence of Brazilian law in maritime areas comply with the principle of territoriality.

Exegesis emanating from the general rule of the principle of territoriality shows the consecration of civil jurisdiction, criminal and administrative respected Brazil to the extent of restrictions and limits and regulations unless exceptions beyond the cases of extraterritoriality.

In order concurrent environmental public control, there is the concern with the productivity of backyard to the consequent environmental improvement resulting from the tenants tenure, which have not committed or effective in order to corroborate the government's eco-efficiency target federal, from preserving operational and pricing strategies to better use of eco-efficient modes to encourage users of the port.

10. The Normative Unification of Maritime Spaces

In Brazil it is common in Vetting System consisting of the evaluation procedure and acceptance of ships adopted by port terminals and / or bulk cargo shippers, especially oil and derivatives. Octaviano Martins [22] as the Vetting establishes minimum standards that allow access to maritime terminals observing the basic rules of quality, safety and environmental protection. Usually ships are examined considering the characteristics and condition, physical condition of the ship before its acceptance for operation.

Brazilian ports are considered obsolete, and Brazil, for decades, is considered a country "carried" and not a carrier country. Unfortunately, they are spending on sea freight approximately seven billions of dollars which only three percent are transported in Brazilian flag vessels as informed by Octaviano Martins [21].

ANTAQ's rules by global environmental law being required sustainable practices of the clients of the port in terms of modal choice, which are actions that could be verified as legal standards required in the ISPS CODE, by port authority, at least within the organized port or public port.

Inexorably, the sea fundamentally stands out for the development and survival of nations. And in this scenario, it is necessary to highlight the need to delimit environmental risks the maritime spaces and the sovereignty and jurisdiction of coastal States.

Octaviano Martins [21] explains that extensions and limits of maritime areas and the exercise of sovereignty and jurisdiction of Brazil are regulated by BRAZIL's [20] Law 8.617 / 1993.

The area including the extension of the Brazilian territorial waters is twelve miles, added to the EEZ 188 miles and the extension of the continental shelf, due to its vastness and wealth is called "Blue Amazon".

The port security process should point inherently the appropriate parameters of the management of environmental impact. Therefore, the environmental impact is not only related to emissions but especially to the control of time of the vehicle control process excessively which extends the port lead time of customs procedures and therefore generates externalities.

In this respect the desirable method should find the appropriate customs control, without generating bureaucracy to more eco-efficient modes, especially through exploring the methodological diversity of environmental audits, every transport operation carried out in the harbor.

For lack of specific regulations, the movement of productivity of the port terminal in terms of loading and unloading on the railroad is not adequate, especially when the main indicator is the control of time / number of containers handled per hour or MPH in Brazilian ports.

The result of the productivity of port operator in cargo delivery by carrier vehicle can edit the minimum targets for the operator who does not act in a timely manner in the loading and unloading of the vehicle, which according to port management may be penalized in the absence of adequate resources transshipment in the profile of the polluter who is paying in case one does not minimize emissions of greenhouse gases.

Proper environmental goal for port management depends on the flow of user information in a single format, in order to measure patterns that can establish lasting gains in a sustainable way for all the logistics of the public port network, bringing the right products to the right places at the right time and with the desired service level of atmospheric emissions, mainly, the economic premise of the lowest cost possible for the port to become competitive in the global market.

11. Considerations

We are noticing that it will be necessary coercive force specific from Brazilian`s Act to lead with environmental impact control management in choice of transport mode.

In this article, the legitimacy is linked to the problem of constant implementation of environmental audit, especially where it is expected to ask. The Ministry of Science and Technology is responsible for coordinating the implementation by inventories with methods appropriated of

the Climate Change Convention in Brazil.

The International law does not have a single basic norm in global terms to control environmental impact. Unlike what happens within the sovereignty of the State for legitimizes the federal constitution of the country with fundamental standard patent for the protection effect. In this case we have in the Federal Constitution of Brazil internal to protect the legal interests for needing to improve the environment through new public policies presented in this article. So, the state is the main responsible an objective rules way with regarding to preserving the quality of air because is main responsible to control environmental law.

Therefore, it is possible to create the rule with new public politics from a huge list of environmental priorities ranging from maritime security, port productivity and social environmental.

The focus in this study was reveal the importance of port with railway and waterway infrastructure, which can limit the impact environmental, especially where the jurisdiction decisions are diplomatic situation as predetermined for each limit by nation, based on the Global Sea Constitution. For inducing about what will be expected as management result how the case of the legitimacy by sustainable transport management.

Besides of the habitual failure of the criminal model of the "status quo" by Brazilian law for constructing new rules by common law which help the organization by civil law solution to behavior from risk society.

This new point of view, we characterize the imminent change of focal perspective of research, although we know that Brazilian law is in constant evolution.

The Brazilian Law needs to promote benchmarking of the common law from other countries where it is possible to grant benefits or tax rebates to regulate the strict liability of damages for public policies that protect the environmental impact and the emission control of greenhouse gases effect.

Finally, the maximization of resources for services contracted in integrated supply network within the Supply Chain Management SCM vision, can promote the ecoefficiency when linking the colaborative transport to reach sustainability in ports public.

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