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Review Article

Investigating the Green Challenges within the Maritime System Supply Chain Constraints: Literature Review

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Abstract

From centuries, many incidents happened in the ocean shipping that have mostly condemn the water sear with harmful substances that pollute the marine fauna. And with the coming evolution into the ships size, the challenges that concern the Marpol contamination is constantly increasing. Conventions and legislations in that concern have put many actions for that issue, in order to stop disease of ocean ecology and maintain its sustainability. This paper seeks to review the topic of Sustainable development and its impact on the different phases of moving the Classic logistics into the green logistics within the maritime industry.

Keywords: Marpol, Green Logistics, Shipping system, Hydrocarbon wastes.

1. INTRODUCTION

Pursuing companies' requirements, in order to eliminate and consuming the residues, a process of reverse logistics has been born. Traditional logistics, used to task "…the movement and handling of goods from point of production to the point of consumption or use…" American Marketing Association, (1948). Over the course of time, enterprises have continued to plan, produce, distribute and sell to satisfy its customers. At that time, the term of optimisation was taking the lead in the market, and that was by combining a tryptic of 3 major criteria: Cost; quality and delay, so the customer satisfaction could be reachable. Today, with the latest degradation of raw materials and its indiscriminate consumption, due to toxic contamination, the end user/ customer started to be aware of sustainability development.

The term of sustainable development has been undergone various phases since its introduction. It has seen many attendances from different entities, in which nowadays, most of them are collaborating highly in implementing its principles and objectives.

At first, Sustainable development have concerned only economics and environment evolving relationships, while today, it is tackling to include social metric. That might lead to analyse the impact of this tough interaction between the three metrics (Seuring and Muller, 2008). At this regard they have concluded that, the evolving nature of sustainability requires an adaptive process that involves the active participation of all stakeholders (Buchholz *et al*. (2007).

For this purpose, companies needed to reduce their ecological footprint by developing preventive practices, so eventually, they could achieve a rational use of resources that does not threaten the future of future generations (Bansal, 2005). Adding, that the social metric, stated that everyone should be treated fairly: Social equity should be granted to all stakeholders in the enterprise and not only to the shareholders (Bansal, 2005).

However, some scholars have defended the idea of non-sustainability, in a way that growth is limited by the finite nature of resources—the rising price of oil, for example indicates a near term exhaustion of this resource, and as a consequence, the decline or impossibility of economic growth (Meadows (1992), Deffeyes (2001)) or (Simmons,2005). To the point, that economy is, particularly, about producing wealth, an added value by being effective and efficient.

Among the sectors that have faced difficulties in implementing Sustainable development, and between those who have provided more effort in performing it, is the maritime industry.

Indeed, it has been playing an important role in the international trading scene with over 80%, by volume, and more than 70% of the trade value has been handled by vessels and seaports worldwide. Today, the maritime industry is facing both new challenges and opportunities: challenges that have been created with the evolution of the shipping system and opportunities that have resulted from the green mindset.

2. Green Logistics and reverse logistics

According to Rodrigue and al (2001), green logistics is presented as an efficient and environmentally friendly distribution in transportation system. Practically, it came up with the same basis of classic logistics, but with environmental pigments. Wu and Dunn (1995), from their side, they have mentioned that green logistics is more than a reverse logistics because it seeks to save resources, eliminate waste and improve productivity. This definition looks into more sustainability, than reverse the supply chain. It casts around regaining a used product after been consumed at 90%. In other words, reusing the waste to sustain the resources and maintain the productivity.

Meanwhile, Hart (1997) goes further and adds that it should have the smallest environmental footprint. To more details, evaluating the value of a returned or a consumed product: reverse distribution should be considered as the pre-owner of this approach. Since, sustainable management intend this way, a process-based approach must be taken as granted to track down waste and enhance the company's environmental, social and economic efficiency. Also, some authors have discussed the reverse distribution by inserting a split of dangerous & non dangerous goods. As an example, Kroon and Vrijens (1995) suggest a definition of reverse logistics as a "referring to management skills and activities necessary to reduce, manage and recycling hazardous and non-hazardous waste from packaging materials and products.

The need to implement strategies for sustainable development as applied to the growth, performance and organization of the transportation system has led to the dissemination of several conventions and legislation.

Indeed, there is a large number of documents dealing with environmental pollution generated by ships. Their content is related to the management of residues resulting from navigation operations - ballast water, air pollution or dredging - marine sediment (Bravard, Piegay, Landon and Peiry, 2000; Corbett and Fischbeck, 2000; De louis, 2001; Corbett and Farrell, 2000). Similarly, the globalization of markets and the increase in trade have led to an increase in maritime traffic along the crossing shipping routes, in various hydrological and metrological conditions off heavily populated coastal areas.

The Environmental Impact Assessment (EIA) is a preventive instrument in the setting of an environmental protection policy. It normally concerns three components:

a. Supervision and monitoring of the state of the environment.
b. The repair of damage caused by man.
c. The prevention of future damage.

This environmental policy has aimed to prevent further degradation of the environment related to human activities. Indeed, Morocco has committed itself at the international level to use this environmental impact assessment, by adopting it during the Rio Conference:

- the text of the United Nations Agenda 21 which insists in several chapters on the importance of impact assessments to prevent environmental degradation;
- the Rio Declaration which stipulates in particular that “when they have adequate decision-making power, governments must submit to an environmental impact assessment any project likely to cause significant damage to the environment;

And with the adoption of the law 12-03 relating to the Environmental Impact Assessment (Dahir N° 1.03.60 of 10 Rabii I 1424), the action of preservation and promotion of the environment in Morocco took an unprecedented scale.

3. Maritime industry and environmental footprint

The maritime industry is eminently international. Ownership systems, types of flags, routes and cargoes carried are international. Maritime transport involves many routes, which implies international agreements, port of calls and commercial operations. It must be recognised, while, the international regulatory system is a slow and contentious process. As per its internationalisation, legislations and regulations have been unified.

The IMO is the main international body responsible for providing mechanisms for cooperation between governments in the regulation and practices of technical aspects of commercial shipping, maritime safety and efficiency of commercial navigation.

The activity of the International Maritime Organisation could be summarised in four main areas: Safety of maritime navigation; Prevention of marine pollution; Training of seafarers; and Port and ship security.

The first area, safety of navigation, is the most important activity of the IMO. Through the 1974 Safety of Life at Sea Convention (SOLAS), the IMO had an instrument to regulate the control of different types of ships and the safety documentation on board.

The COLREG, Convention on the prevention of collisions at sea sets out priority rules and regulates the speed and conduct of ships on real "maritime routes".

The International Safety Management (ISM) Code regulates the safety management of ship operations on an international scale.

The SOLAS Convention makes this code mandatory. Thus, each shipping company must designate a person responsible for safety management on board the ship and inland.

The SAR (Search and Rescue) Convention of 1979 coordinates the action of States Parties in the event of an accident at sea. Although the obligation to assist ships in distress is traditionally recognised in maritime law, no text prior to this Convention organised search and rescue operations.

The second axis has entitled the prevention of marine pollution discussing the International Convention for the Prevention of Pollution from Ships (MARPOL) which is recognised as the major treaty for the protection of the marine environment. This convention only entered into force on 2 October 1983 and applied to all ships flying the flag of a State party to the Convention. Oil pollution damage resulting from a marine casualty, that is compensated at two levels: First, liability is channelled to the shipowner (Convention on Civil Liability for Oil Pollution Damage, or CLC), which is automatic but limited. The second level is provided by the International Oil Pollution Compensation Fund (IOPC Fund) which intervenes when the first level is insufficient.

The third area of seafarers' training deals with the STCW Convention (Standard of Training Certification and Watchkeeping), which concerns the standards for training seafarers and issuing watchkeeping certificates. The IMO carries out mandatory and systematic monitoring, which encourages Member States to comply.

The fourth area of port and ship security is the International Ship and Port Security (ISPS) Code. This code has been in force since 2004 and is applicable on-board vessels and in ports. It requires, among other things, a security plan for each ship and It requires, among other things, a security plan for each ship and port facility to prevent the introduction of weapons, dangerous substances or devices on board, to establish procedures for responding to security threats, such as evacuation procedures.

In order to offset the inter-Governmental Maritime Consultative Organisation, the original attributing name to IMO before 1982, gave a light on the Marpol Convention.

The Marpol Convention is an international convention for the prevention of pollution from ships, promoted by the International Maritime Organisation and approved by virtually all countries. It disposes for special construction methods related to the prevention of accidental pollution, and allows for loading and unloading procedures.

The Convention includes regulations to prevent and reduce pollution from ships or accidental pollution that may occur during routine operations. Indeed, special areas are subject to strict controls on operational discharges which are included in the 6 annexes, described below:

- Annex I (entered into force on 2 October 1983).
- Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force on 2 October 1983).
- Annex III Prevention of Pollution by Noxious Substances carried by Sea in Packages (entered into force on 1 July 1992).
- Annex IV on prevention of pollution by sewage from ships (entered into force on 27 September 2003).
- Annex V for the prevention of pollution by ships' rubbish (entered into force on 31 December 1988).
- Annex VI on the prevention of air pollution from ships (entered into force on 19 May 2005).

It constitutes the Regulations for the Prevention of Oil Pollution by Accidental Discharges through Operational Measures. These regulations are part of the Convention and apply to all ships. The 1992 amendments to the Annex made it mandatory for new double hull oil tankers and set out a progressive timetable for existing tankers to adapt.

Among other things, as an obligation to ships, they must be equipped with shock monitoring systems, continuous recording equipment, oil content monitoring, tank cleaning, settling tanks of sufficient capacity for all waste generated during tank washing and oil separators.

Basically, ships must have a register where any discharge or release of oil from the system must be reported. Reason enough for the supervisory authorities to carry out inspections in the ship's next port of call. On the other hand, the MARPOL 73/78 Convention establishes the process of inspection, certification and detention of ships in ports and, where appropriate, sanctioned by the flag state.

However, according to Chapter 6 which elaborates on Regulation 38 on reception facilities outside a special area "Governments of Parties to this Convention undertake to ensure the provision, at oil loading terminals, repair ports and other ports where ships have oil residues to discharge, of facilities for the

reception of residues and oily mixtures which oil tankers and other ships may still have to discharge; the capacity of these facilities must be adequate to meet the needs of the ships using them without causing undue delay to them. "

Thus, while the type and size of reception facilities depends on the particularities of each terminal, failure by Member States to comply with these obligations constitutes a breach of international commitments and increases the risk of illegal discharges by ships.

4. Constraints of wastes management

Containerships, Tankers and other types of vessels are usually confronted to evacuate wastes. These residues could be divided into two categories: Food wastes and hydrocarbon wastes. Previous research was done in a company that is located in Port Tangier Med of Morocco, which is main activity is evacuating wastes when requested. The following table provide an overview of the amount of each sub-category that should be pumped:

Table-1: Storage Capacity of wastes

	Type	Waste to be delivered in m3	Max dedicated capacity in m3	Amount of wastes retained on board in m3	Port at which remaining waste will be delivered	Estimated amount of waste to be generated between notification and next port in m3
Wastes of Oil	Sludge	NIL	25.8	1.93		0.3
	Bilge water	NIL	32.5	0.7		0.2
	Others					
Garbage	Food	0.18	0.4	NIL		0.11
	Plastics	0.12	0.2	NIL		0.10
	Others	0.15	0.2	NIL		0.13
Cargo associated waste						
Cargo residue						

Source: Personal

The table above is explaining the amount that should be evacuated by the vessel before arriving to the next port. In case of control, and finding an exceeding amount. The C/O may assume its legislation duties.

In this context, P. ENGELSETH, 2017 in his paper Int. J. of Design & Nature and Eco dynamics. Vol. 12, No. 3 (2017) 348-356, discusses reverse logistics as a complex system: 'A CASE STUDY OF WASTE MANAGEMENT IN NORWAY IN AN OFFSHORE OIL INDUSTRY'. The latter works on the problem of waste management which is considered as another form of physical distribution but inverted. These case studies points of uncertainty linked to the exploitation of a flow of cuttings from offshore installations, treatment on land to its final form.

Indeed, the description of the case suggests an inherently complex form of supply chain. Contingency theory, emphasising the interdependencies associated with interaction, is applied as an approach to indicate how to develop this waste stream as a complex system that involves taking into account the characteristics of sequential, mutualised and reciprocal interdependencies, focusing firstly, on the CUTTING THROUGH AND COMPLEXITY where a unique case study on waste management in the Norwegian offshore oil and gas and industrial sectors has been made.

Reverse logistics is associated with waste. The focus is more specifically on the waste operations of drill cuttings management since these are large offshore wastes or subsea facilities associated with drilling operations. This drilling operations are connected with exploration or production. In the case of oil and gas production, these operations are more or less continuous on offshore or subsea production platforms. However, drilling in relation to ongoing production is necessary to increase the oil or gas, well extending the life of such offshore installations. Being at sea, this too can lead to increased productivity of weather conditions and problems in coordinating different operations with other offshore operations; offshore platform. The drill cuttings reverse supply chain is presented as follows below:

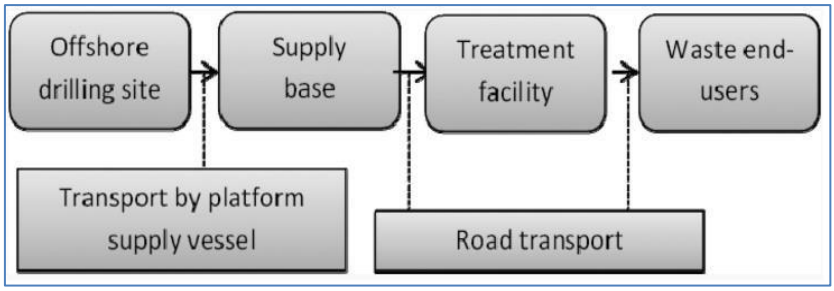

Fig-1: Reverse supply chain for drill cuttings waste
Source: P. ENGELSETH, 2017

The contingency theory perspective of organisational science originates from Woodward's work in emphasising that technologies directly determine differences in organisational attributes such as span of control, centralisation of authority and formalisation of rules and procedures. They are found in an organisation's environment, its context includes the factors in which an organisation where they are considered open systems; there is no optimal way to organise and operate the production of such systems interacts directly with technology, plus supply chain agents, customers and end users, government and business.

According to Morgan (2002), the way in which this is organised varies from industry to industry. It is therefore imminent from the point of view of contingencies to address the particularities of the industry type. In this general approach, to study organisational structure and interaction, Fielder developed a contingency model. This model focuses analytically on organisational behaviour in an environmental context. It emphasises a three-dimensional investigation:

- leader - member
- the degree of task structure
- the power of the leader's position

The three dimensions provide analytical tools that can be used to explain the inner workings of environmental processes. Following the cross-sectional model, the importance of local management can be considered. The management of this reverse waste stream can be seen as a co-ordination of emerging production steps in a piecemeal fashion. This also indicates that the nature of these flows as "reverse" is of little importance from an analytical perspective. It simply describes that what is produced is not initially a product valued by the end user. However, the supply chain described the waste as unit that is processed and marketed. In line with Engel Seth, waste can therefore be associated with value. It can be taken into account when it is processed, as a product to the extent that it is valued by a customer. This product value is a cognition co-created through local interaction, interactions that are sequentially interdependent.

Customer value is clearly in this picture as an emergent phenomenon. Future research should aim to understand how this supply chain development can be considered as a complex system from the perspective of contingency theory and can be implemented in industrial practice.

In the same framework, a study that was carried out on the environmental impact of hydrocarbon liquids on drainage logistics by the authors: Gilberto Mourão, Getulio K Akabane, HamíltonPozo, Julia Rosa Borges MunizBarreto and Vicente Miguel SinkunasJunio, had two objectives: the first operational and the second strategic. The first one focused on the activities related to drainage pipes in a section usually called a drainage basin and, more specifically, the drain valve, which forms an integral part of the pipeline transportation network of this industry. The second purpose refers to contributing to the internal strategy for improving the operating conditions and safety of the pipeline and the operating costs of the transportation process.

Although, the beginning of the research has mentioned the importance of transportation to meet the customer's expectations. It also highlighted its negative impact on the environment.

Adding that, pipeline transport first, appeared with the supply of water to ancient villages, and after its discovery, oil, as a natural substance of great importance to the world economy, was also transported in pipelines, in its raw form, between extraction and processing in stations. In addition to that, a pipeline failure can have several negative consequences, some of which can pose a serious environmental threat to people and property in the vicinity of the crash. At this stage, several accidents have released toxic or flammable substances and have caused numerous consequences for populations in the vicinity of existing pipelines (Viana, 2011).

And, it turns out that according to Santos et al. (2009), pipelines are a relatively inexpensive means of transportation compared to the transportation of liquid hydrocarbons and derivatives, and are safer worldwide. Nevertheless, the operation of pipelines poses

significant environmental risks. Several accidents, in Brazil and around the world, involving the release of toxic or flammable substances have had a serious environmental impact on flora and fauna, as well as death and health-related damage to people living near pipelines. This has led to environmental requirements relating to the operation and maintenance of hydrocarbon pipelines. Environmental damage on another level results from the installation and operation of petrochemicals which supply raw materials and their derivatives through refining. This is said to have an impact due to the wide variety of processes and operations involved. A significant number of the compounds used and produced in refineries come from processing in the form of air emissions and solid waste effluents. Air emissions include: fugitive emissions of volatile compounds present in crude oil and its processing fractions and generated by the combustion of fuels during production. Typically, they generate pollutants that include volatile hydrocarbons, carbon monoxide, sulphur oxides, nitrogen oxides, particulate matter, ammonia, hydrogen sulphide, metals, acids and spent toxic organics (FADE Environmental Impact Report 2006, cited in Do Monte Gurgel *et al*. 2009).

Similarly to the context, another case study was set in a petrochemical industry in the state of São Paulo. In Which it focused on operational issues that were studied over time, rather than being considered as isolated events or incidents: What is the efficient approach to reduce the environmental impact of hydrocarbon pipelines? The operationalisation of the case study followed a model described in the table below:

Table-2: Study Elaboration

Aim of the study	**Identify the how through logistics of drainage**
Collecting Data: Analyse documents	Operational work on maintenance and hydrocarbon liquid drainage
Collecting Data: Observing	Visit and study the process of draining hydrocarbon liquid while defining the different parameters that can explain parameters that could explain the leaks
Features to Analyse	Safety operators, leakage volume, drainage maintenance process maintenance process, test and solution
Collection Instrument	Aspect to be analysed in an operational way following a semi-structured research and observation
Data Analysis	Data analysis for optimal solutions that can reduce leakage

Source: Gilberto Mourão, Getulio K Akabane, HamíltonPozo, Julia Rosa Borges MunizBarreto et Vicente Miguel SinkunasJunio, 2014.

From the collected data, the authors calculated the volume of liquid hydrocarbons contained in the pipe and during the transfer to the sump tank is 155 ml per second. After removal, assembly and testing, the volume is 837L of hydrocarbons.

Table-3: Estimated Costs

	Volume in L	**Quantity Similar by Year**	**Value/units (US$/unit)**	**Sub-total**
Product drained to sump tank	837	283	0 ,58	137, 385.18
Reprocessing cost	837	283	0 ,23	54,480.30
Total				191,865.51

Source: Gilberto Mourão, Getulio K Akabane, HamíltonPozo, Julia Rosa Borges MunizBarreto et Vicente Miguel SinkunasJunio, 2014.

This table presents details on the cost losses associated for each item. For optimisation, the company recognises the need to employ best technology and best practice using Best Available Techniques (BAT)/Industrial Emissions Guidelines (IEDs) to achieve implementation of, amongst others, measures to limit and reduce emissions and discharges of hydrocarbon gases and vapours. Waste and the need to maximise product reuse are also taken into account.

In addition, the authors used equipment consisting of a positive displacement hose pump to capture and transfer the drained hydrocarbon into the tank, using a pump with the appropriate volume for the product.

Table 4 details the value of the equipment required and the annual cost reduction generated by the proposed action.

Table-4: Saving calculation

	US$
Equipment cost to pump the hydrocarbon liquid Reprocessing cost	20,000.00
Annual savings	171,865.51

Source: Gilberto Mourão, Getulio K Akabane, HamíltonPozo, Julia Rosa Borges MunizBarreto et Vicente Miguel SinkunasJunio, 2014

5. METHODOLOGY

Identifying the purpose of the research is a key and essential phase for any project of this type (Van Campen houdt& Quivy, 2011), it allows us to access the research question, explained in the previous section. "The research question is a lighthouse; it indicates the course to follow. It is a tool for focusing the activity" (Koenig, 2002, p. 2).

Our research object stems from a previous study and that it has continued to be constructed throughout this project, enriched by our readings and thanks to the back and forth between the field and theory.

Throughout this study, the objective to be achieved is the study of the different green issues - constraints for a supply chain in the maritime industry. To this end, our research has proceeded with two methods: descriptive study and interviews (qualitative approach).

6. Interviews

The interview is a qualitative approach that frequently used in human and social science research (Romelaer, 2005). The interview is a face-to-face situation between a researcher and an interviewee (Baumard, *et al*., 2007). There are three ways of conducting an interview: directive (which can be likened to an "oral questionnaire"), semi-directive (the interviewer has themes to address but no specific questions or order) and direct (the interviewer has to ask the respondent questions). In our work, we opted for a mixed interview: directive interview & direct.

7. Analysis and discussion

In order to answer our research question: what could be the green challenges that maritime company could face? We had the opportunity to conduct interview (Annexe1) at APM Terminals Medport Tangier 13th September 2021 in the office of each manager and it has lasted between 30 minutes to 1.5 hours:

- Head of Operations Manager
- HSSE Manager
- Safety and Dangerous Cargo Manager

At the beginning of each interview, we reminded the interviewee of the project and our research approach, trying to be as little theoretical as possible. We also reminded the interviewee that we would guarantee his or her anonymity in the future use of the verbatim records (Demers, 2003).

Based on the answers of our interviewee, we come up into the fact of being greener in a maritime industry; it is always linked to the equipment used: Either it is a Seaport Terminal or a shipping company.

In the case of a Seaport Terminal, a kind of benchmark between types of Terminals could also explain this point.

Table-5: Equipment comparison based in Terminal type:

Conventional Terminal (Manual Terminal)	Automated Terminal
RTGs (Rubber Tired Gantry)	ARMGs (Automated Rail Mount Gantry)
STS (Ship to Shore)	DSTS (Double Ship To Shore)
Shuttle carrier	Hybrid Shuttle Carrier

Source: Personal

The table present an easy comparison between a Manual Terminal and an automated terminal, describing how the type of equipment chosen could reduce the emission of CO2, and so the footprint of other harmful substance.

RTGs in a conventional Terminal consume only gasoil that is feeded by a truck. The constraint in this case, is the stoppage in the middle of the working flow (Yard) where many other shuttle carrier drivers are crossing their road lifting containers. Beside to that, the circulation of the truck in the yard, transporting the gasoil, may affect safety Mesures, if whenever an accident happened.

Thence, Automated Terminal was designed in a context of delivering higher performance with low footprint impact. At a Macro view, this is type has reached an advanced level of sustainability that could be explained by the performant resources deployed: Automated systems that gave instructions to the equipment to execute efficient moves in terms of operations but also environmentally. If looking forward to the machine's specificity of an automated Terminal: ARMGs, were designed to consume less energy. They are fully Electrical, high qualified in terms of non-needed moves and stops automatically at anytime of high wind. More than that, shuttle carriers are hybrid blue print. They reduce 40% of Gasoil Consumption and in condition of lack of gasoil it switches automatically to electrical.

Digging deeper, the purchase of the complementary product to the equipment is very tiny of CO2 emission. Tyres that could be depreciate after 2 years, which will gain them 4 times a decreased rate of

CO2 Emissions. Also, the use of Gasoil with higher quality and Biodegradable Oils that doesn't harm the environment.

Lastly, the mother company (Maersk) places the environment as one of its core values that should be kept and sustained. By this she invests in high advanced technologies when it comes to Equipment but tend to perform vessels with green methanol.

Adding to our analysis and discussions, that beside of a green strategy, a reverse logistics do exist at the terminal. A Leak area that covers any liquid escape may occur. The area is built with advanced tools to not let any harmful substance to spill such a:

- facility design that blocks the spread of the leak;
- Filtering the liquid and water separator;
- Evacuation by the sub-contractor concerned;

8. CONCLUSION

In a context of globalisation and exacerbated competition, in which technologies are evolving, commercial exchanges and travel demands are ever greater, further and faster, it is vital for a company to preserve its brand image by not being the victim of an accident or shipwreck, safety therefore represents a strategic and environmental dimension.

Within the ecological framework and the preservation against marine pollution, waste management is necessary in a hostile and changing environment, since ships are the main producers of this waste.

This Paper focuses on reviewing the topic of Sustainable development and its impact on the different phases of moving the Classic logistics into the green logistics within the maritime industry. It introduces the interaction of green logistics and reverse logistics and perceive it form different point of views by summarising various scholars' papers.

The main idea behind this link is to perceive the dependency between the two practices: Green and reverse. That was the aim of conducting a descriptive study and a qualitative approach based on a interview, in order to answer our research questions about the green challenges but also to respond to our interaction coexistent between green and reverse logistics.

Finally, this brief can inspire studies on waste management and performing sustainable operation within the digitization era.

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List of Annexes

Annexe1. Interview questions

- Can you present your company in a few lines?
- Can you describe the supply chain of your company?
- Do you have a sustainable policy? If yes, what does it consist of?
- Does this sustainable policy deal with logistics activities? If yes, which activity and how?
- How does sustainable development play a role in your company?

- Today, can you say that your company has reached an advanced level of maturity in the sustainable field? (Excellence in SD)
- Do you have any actions that help to decrease the impact of CO2 emissions or any related dangerous waste, on the environment?
- Is there any rate that the government has put in place to obligate businesses to be green or environmentally friendly?
- Do u use dashboard or any indicator to measure the emissions and track the rate of impact? Or do you have any green performance indicators? Are you thinking of having it in the future?
- Do you have a returns management chain? If so, is it profitable for your company? And how it costs to you?
- Could you describe your company's reverse process?
- Is quality management in a normal supply chain seems the same as in a reverse supply chain? If yes, how do you ensure quality in the reverse supply chain?
- How would convince/motivate the customer to return the product/service? Is it a financial/moral/environmental reason?
- How to ensure customer loyalty for reused/recycled products