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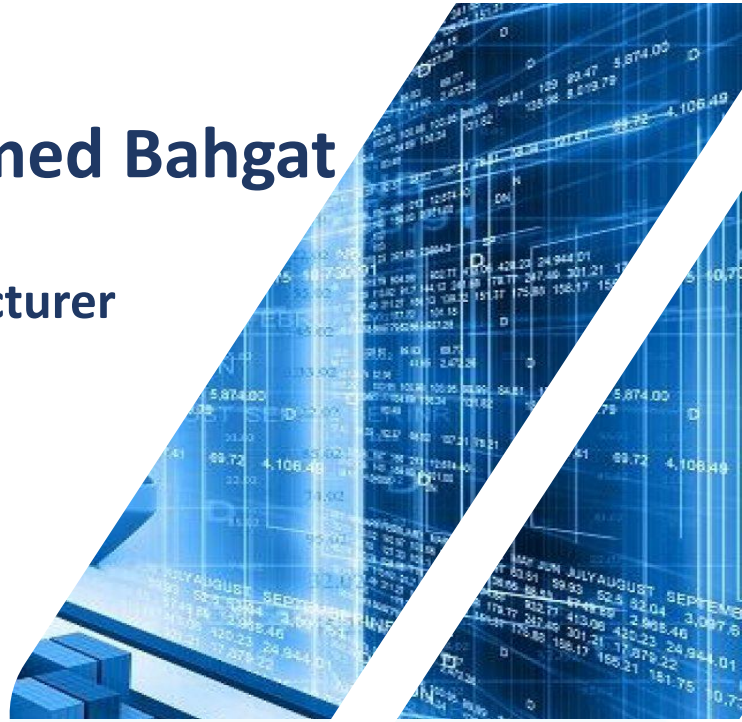

Incorporating Ship Green Recycling Regulations into the Design Early Stages

INTRODUCTION

- The ship recycling industry is a vigorous market which offers a huge profit to a range of stakeholders including ship owners, ship brokers and cash buyers from selling ships as scrap.
- The main aim of this research is to investigate the ship recycling challenges in light of Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009 and European Union Ship Recycling Regulations (EU SRR), 2013.

Statement of the problem

The implementation cost of international conventions requirements is high, and therefore this may lead to shipowners fleeing to scrap their ships outside the framework of the law, where the cost is lower.

Literature survey structure

A literature survey is carried out by using bibliometric analysis for thirty ship recycling legal published papers and for each the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, IMO resolutions and the European union ship recycling regulations in order to analyze the gap in the published papers and the convention articles and indicate the better insights in the convention, resolutions and regulations.

METHODOLOGY

A systematic literature review method study is carried out on a dataset of thirty papers pertaining to legal ship recycling subjects utilizing software : VOS viewer 1.6.19. The procedures used for papers analysis are as follows: first step, creating CSV file contain data for 30 research papers related to legal and regulatory aspects in ship recycling, this data comprises titles of papers, abstracts and author keywords which is the input file. The second stage involves importing the file twice into the program, depending on the type of analysis, as follows:

- For keyword analysis: “create a map based on bibliographic analysis” is chosen and then the input file is imported as a SCOPUS database.
- For title and abstract analysis : “create a map based on Text data” is the chosen option, next importing input file as a SCOPUS data base and set some options to analyze the data for title and abstract of all papers.
- Filtration happens to remove synonyms and irrelevant words in order not to appear in the network and affect the analysis.

Additionally, the procedures for conventions analysis are as follows:

1. All articles, regulations, and legal data are extracted from European convention, Hong Kong convention and MEPC Resolutions into CSV file to be ready for analysis.
2. “Create a map based on text data” is chosen to analyze these legal texts and get out with the most occurred keywords and their interrelations.

OVERVIEW OF HONG KONG CONVENTION

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, which was developed with input from IMO Member States and non-governmental organizations and in collaboration with the International Labor Organization and the Parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, was adopted at a diplomatic conference held in Hong Kong, China, in May 2009. It aims to handle ship recycling, hazardous materials such asbestos, heavy metals, hydrocarbons, ozone depleting compounds.

The Hong Kong Convention is used to improve ship safety, human health protection, and environmental protection throughout a ship's operational life and to prevent, reduce, minimize, eliminate accidents, injuries, and other adverse effects on human health and the environment caused by ship recycling. The new Convention includes regulations on ship design, construction, operation, and preparation that facilitate safe and environmentally sound recycling without affecting ship safety and operational efficiency, as well as on the safe and sustainable operation of ship recycling facilities and the establishment of an effective enforcement mechanism for ship recycling that includes certification and reporting requirements

THE EU SHIP RECYCLING REGULATION (NO 1257/2013)

- The EU Ship Recycling Regulation primarily consists of 32 articles, divided into 6 titles and 2 annexes that list hazardous materials and their associated control measures.

- The major goal of this regulation is to prevent, reduce, minimize, eliminate accidents, injuries, and other negative consequences on human health and the environment brought on by ship recycling.

BIBLIOMETRIC ANALYSIS

A dataset of thirty legal research publications in period range from 2012 to 2020 on ship recycling topics was subjected to bibliometric analysis in order to find gaps in the international conventions on ship recycling and to offer more in-depth understanding of the topics under investigation.

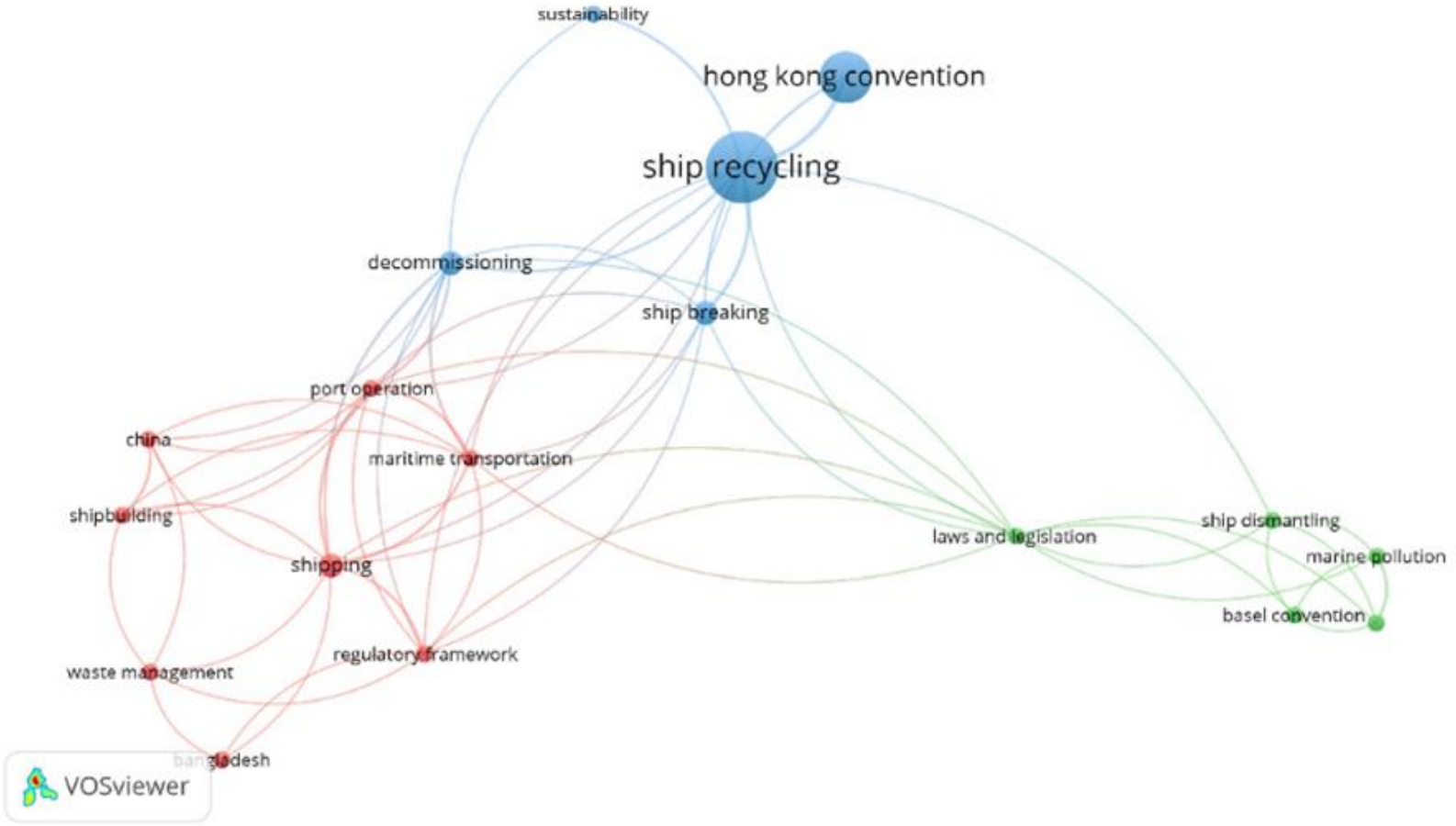

Fig.1 a bibliometric analysis chart for the key words of 30 legal ship recycling research papers

- Figure 1 shows the key words analysis in range of years through which most of the legal ship recycling research papers are published from 2012 to 2020. This chart indicates that in these research papers, the European Union ship recycling regulations and the IMO resolutions were not mentioned, but the focus was largely on the Hong Kong convention. The Basel Convention and marine pollution were also mentioned in the study. Moreover, the chart determine that China and Bangladesh are countries which are under spot in ship recycling within scope of regulatory frame work. Finally, these countries are related to the waste management which indicates that they don’t apply the safe manner of waste disposal through maritime transportation.

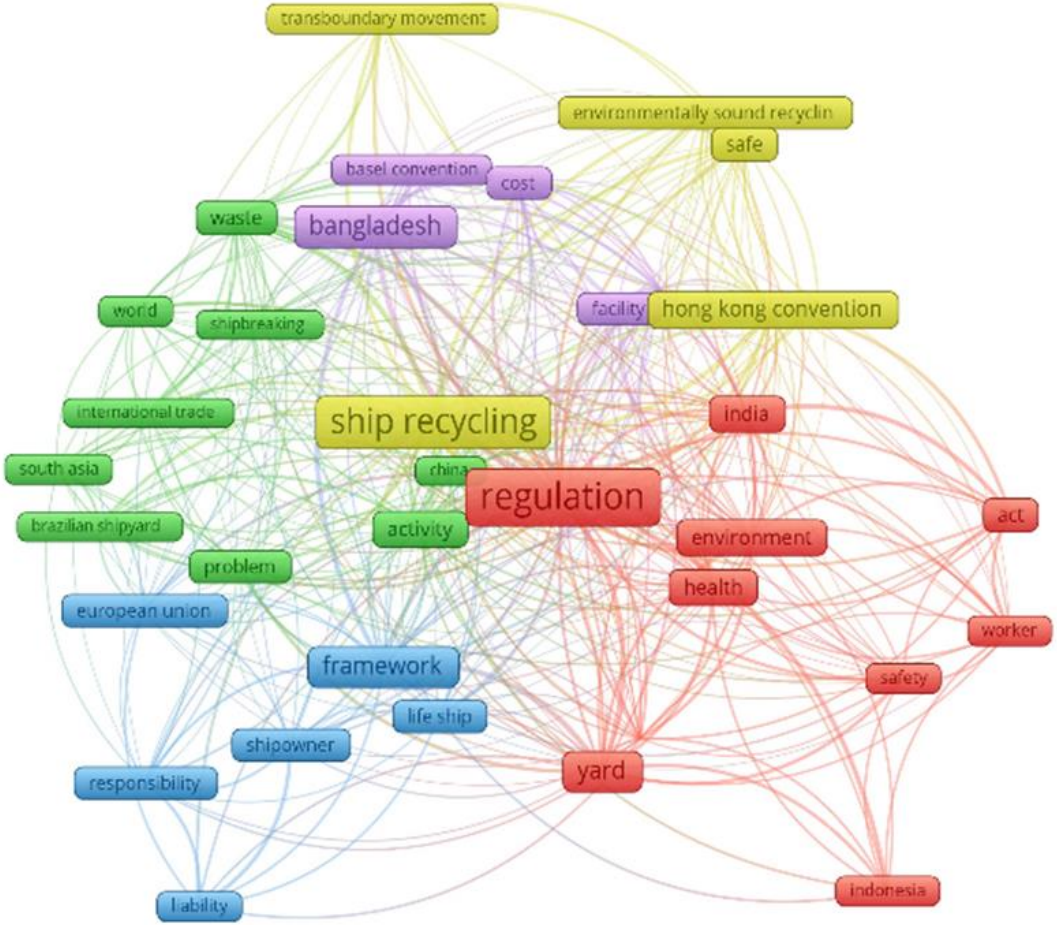

Fig.2 a bibliometric analysis chart for the title and abstract of 30 legal ship recycling research papers

the title and abstract analysis is shown in figure 2 which shows that the countries Indonesia, India, south Asia and Brazil appeared in addition to Bangladesh and China that indicates the problems faced these countries related to ship recycling process, safety of workers, health and environment. Also, there is a relationship between the transboundary movement, international trade and Basel convention which regulate this movement by applying its articles through implementation of inventory of hazardous materials. In addition, a few laws mentioned the state of Indonesia and addressed matters of health, safety, and the environment and its relation with the regulation which can be applied. Moreover, a relation between “Bangladesh, cost, facility” reflects the implementation of laws or case studies which was linked to the economic situation of the Bangladesh and appears in the form of facility. Lastly, a relationship between "European union and ship owner" demonstrates how stakeholders are taken into consideration by EU ship recycling legislation.

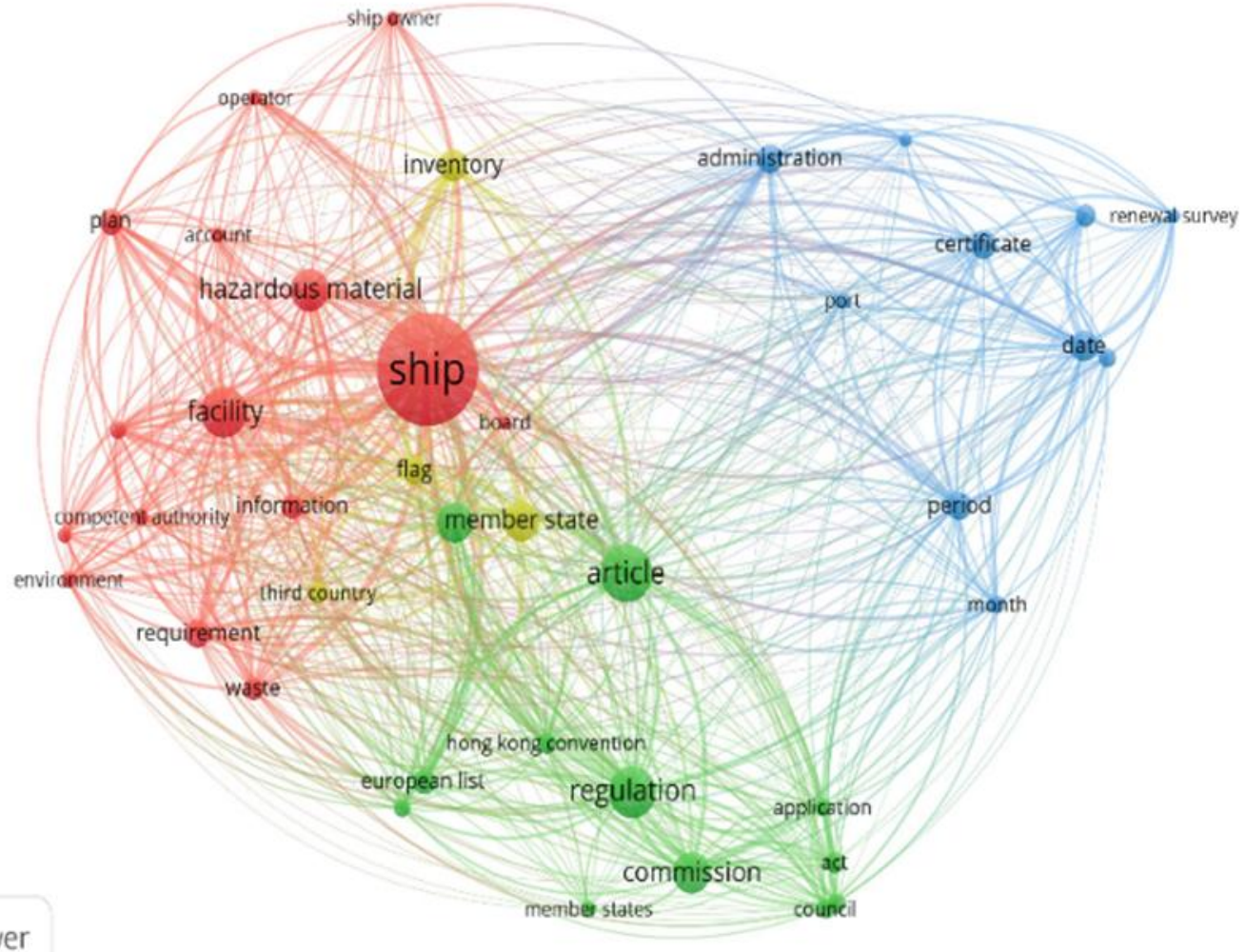

Fig.3 a bibliometric analysis chart for European union ship recycling regulations

Moreover, figure 3 shows the European union ship recycling regulations gap analysis via Software: VOS viewer which indicates the relationship between “ship, shipowner, information, facility, hazardous materials, requirements and plan” which means that it is required from the ship owner to provide the ship recycling facility with all ship’s information and inventory of hazardous materials in order to prepare the ship recycling plan. Further, the ship owner must supply ship recycling yard with a list of hazardous materials in order to protect the environment.

In addition, there is connection between “shipowner, operator, plan, facility, competent authority, requirements and waste” which indicates that the operator (ship crew) maintain the list of hazardous materials in order to be approved from the classification society on behalf of the competent authority.

Furthermore, the ship recycling facility prepare the ship recycling plan to approve it from the competent authority. Additionally, a number of joints between “member state, article, Hong Kong convention, European list, regulation and application” which determine that it is required from each member state to apply the articles and regulations of the Hong Kong convention after entered into force and the European list according to the convention includes the approved ship recycling facilities which apply safe and environmentally sound recycling of ships. Also, the connection between “inventory, flag, third country” which means that it is required from all flags of third countries to provide the ship recycling facility with the inventory of hazardous materials.

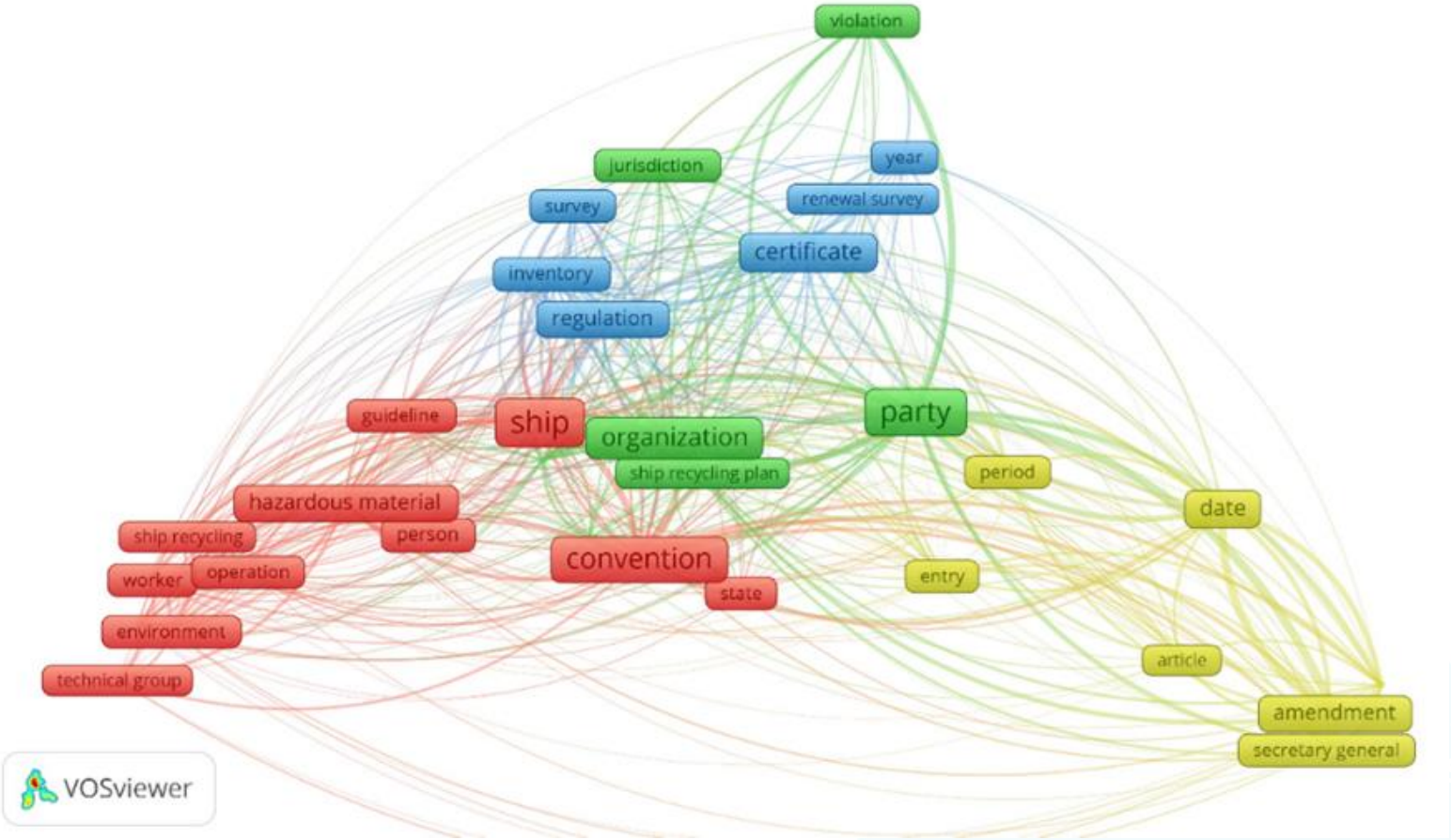

Fig.4 a bibliometric analysis chart for Hong Kong convention for safe and environmentally sound recycling of ships

In addition, figure 4 indicates Hong Kong convention for safe and environmentally sound recycling of ships gap analysis by using VOS viewer software. The first insight from chart is the connections between “ship, guidelines, hazardous materials, ship recycling, worker, operation, convention, environment and state” which determines that the ship recycling process and hazardous materials identification that applied on the ship must be according to IMO guidelines which the Hong Kong convention depends on it. Also, it is required from every state that signed on the convention to apply all articles which are focused on worker safety and environment.

Moreover, the second insight is the joints between “organization, party, ship recycling plan, jurisdiction and violation”. This means that the organization obligates every party should apply its jurisdiction on any violation occurs during implementation of ship recycling plan. Finally, the third insight contains the words “survey, inventory, year, renewal survey, certificate and regulation” which means that in order to maintain the ship’s certificate to be valid, a continuous survey should be carried out annually on the inventory of hazardous materials and it is required to make a renewal survey every five years according to the regulations.

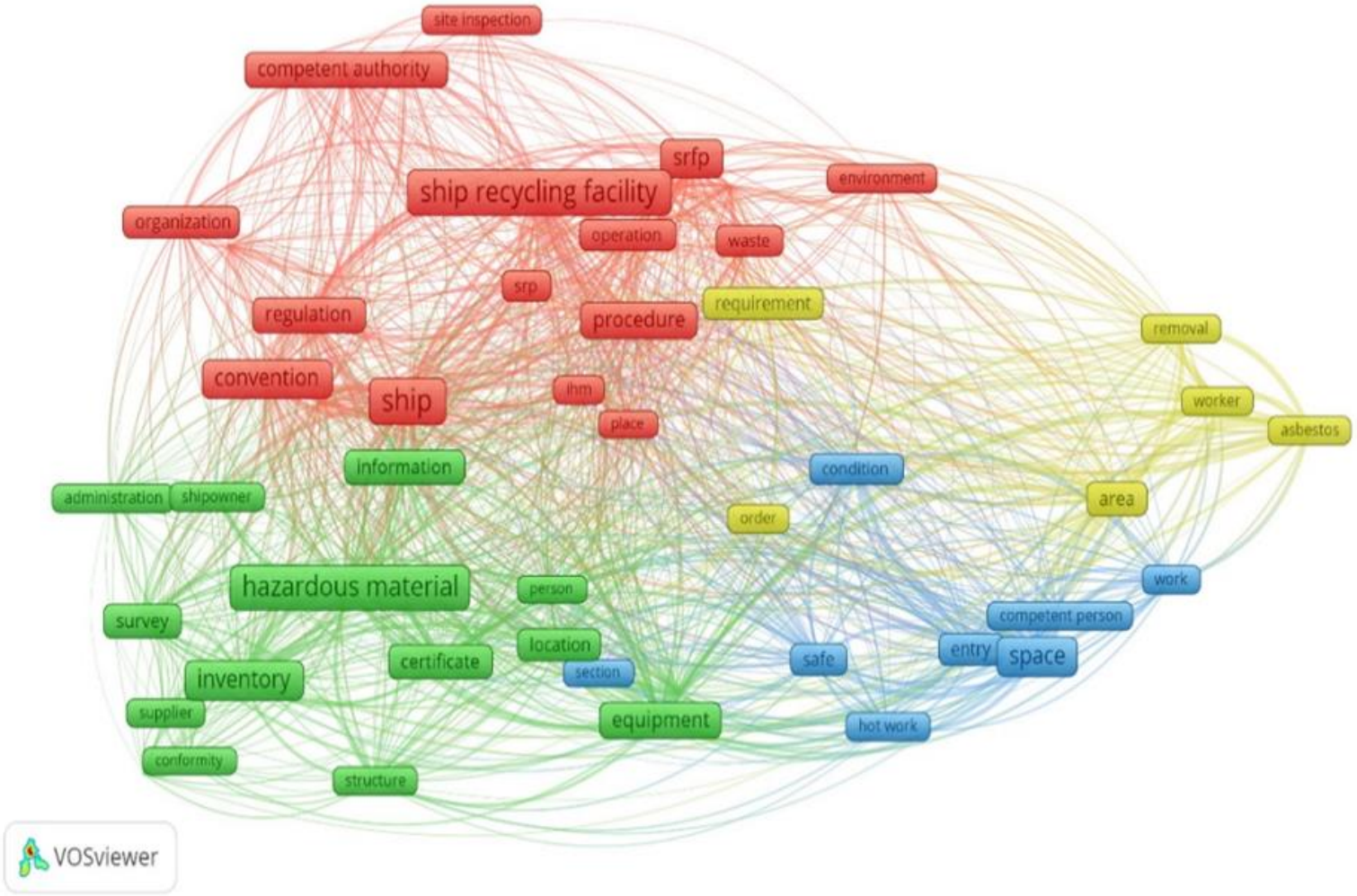

Fig.5 a bibliometric analysis chart for IMO guidelines resolutions

Figure 5 shows a bibliometric analysis chart for IMO resolutions which indicates the first insight regarded to “ship recycling facility, ship, ship recycling facility plan, competent authority, site inspection, procedure, operation and activity”. It means that the competent authority should approve the ship recycling facility site through inspection and follow the procedure, operation, activities which are applied during ship recycling process. The second insight determines a relation between “convention, competent authority, regulation, environment, inventory of hazardous materials (IHM), waste and ship recycling plan” that indicates the ship recycling plan should be applied according to the articles in the convention and approved from the competent authority.

Also, the competent authority should approve the inventory of hazardous materials for every ship send for scrapping in order to protect the environment from waste disposal. The third insight was regarded to “hazardous materials, inventory, certificate, administration shipowner, information, survey, location, structure and equipment” which means that regarding to IMO resolutions it is required, ship owner to provide the ship recycling facility with ship’s information that include inventory of hazardous materials and from the administration IHM certificate.

Moreover, a survey should be applied for the structure of the location and the ship recycling facility equipment. Finally, the fourth insight was regarded to “competent person, condition, work, entry, safe and hot work” which indicates that the competent person should inspect the condition of the ship recycling facility that apply all the precautions which include “safe for entry and safe for hot work”.

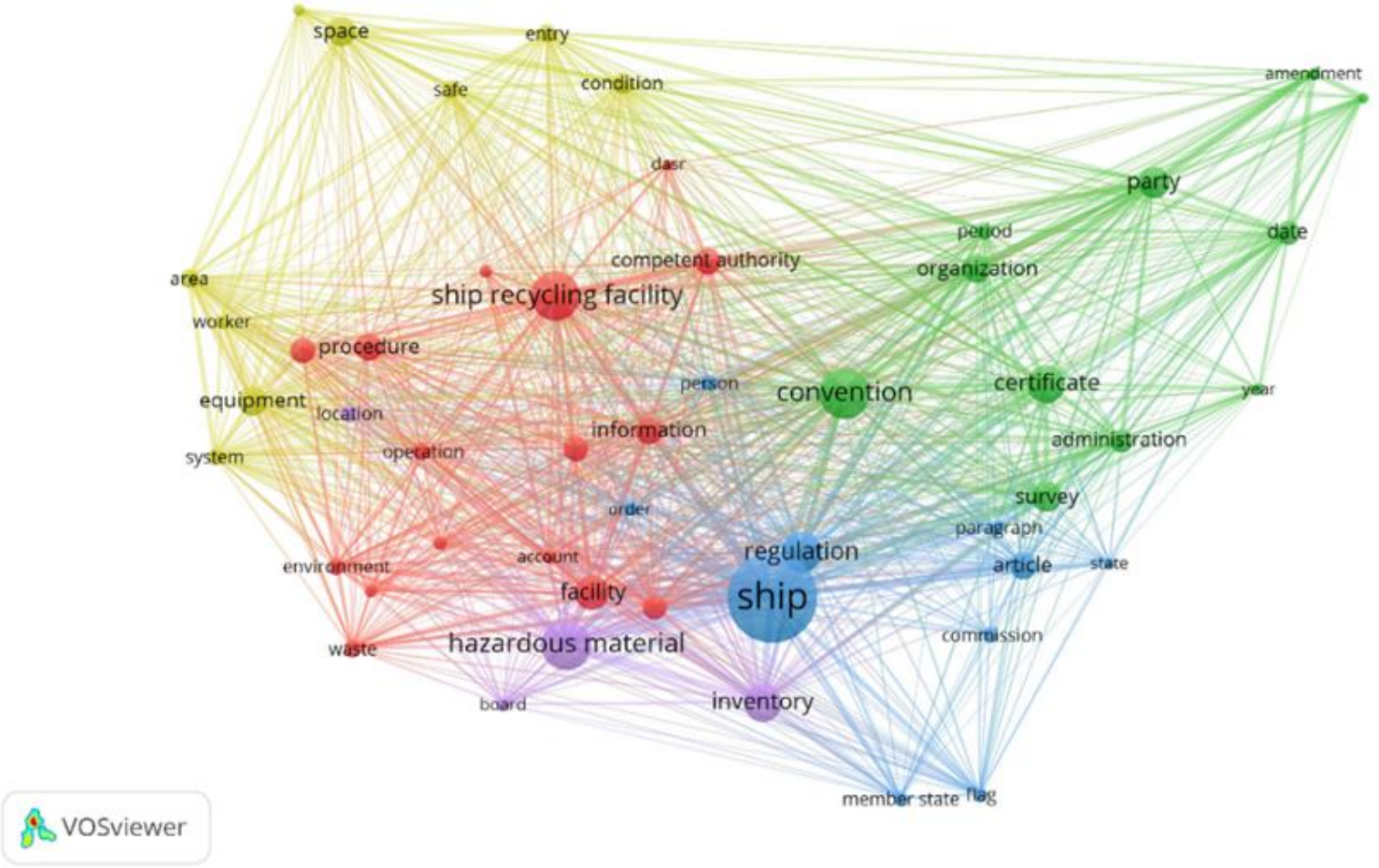

Fig.6 a bibliometric analysis chart for Hong Kong convention, European Union ship recycling regulations and IMO guidelines resolutions.

Furthermore, figure 6 indicates a bibliometric analysis chart for all ship recycling regulations including Hong Kong convention, European Union ship recycling regulations and IMO guidelines resolutions. So, by using this analysis it can be find the gap in all of it. The first insight regards to “ship recycling facility, competent authority, document of authorization for ship recycling (dasr), procedure, information, operation, waste, facility and environment” which indicates that the shipowner provides the ship recycling facility with all information about the recycled ship in order to prepare the procedure of ship recycling process. After checking ship recycling procedure, the competent authority will issue (dasr) taking into account the operation, waste disposal and environment.

The second insight shows the relation between “ship, regulation, article, state, commission, member state, flag, state and person”. So, it means that the regulations of EU ship recycling regulations and the articles of Hong Kong convention with referred to IMO resolutions should be applied to every recycled ship. Further, each state or member state should approve the ship recycling plan and issue the document of authorization for ship recycling (dasr) in order to start the ship recycling process. Additionally, the ship’s flag state should make a final survey to issue the ready for ship recycling certificate.

The third insight regards to “convention, certificate, year, date, party, amendment, period, organization, administration and survey” which determines that the survey should be applied to every recycled ship according IMO resolutions and Hong Kong convention and its amendments. Moreover, the administration of each party should issue a certificate to every recycled ship called international ready for ship recycling certificate. Finally, the fifth insight refers to the key words “space, safe, entry, condition, area, worker, equipment and system” while the key words safe and condition are joining with certificate. This indicates that there should be a system for checking the space and area which will be used for disposal of hazardous materials. Also, it should be a continuous inspection on the condition of ship recycling facility concerning safe for entry, safe for hot work, worker safety and safety of equipment used in ship recycling process. So, after approving all safety precautions mentioned, a certificate should be issued from the ship recycling state.

CONCLUSION

- It is clear from the previous discussion which is conducted in two areas, the first covers 30 research papers concerned with ship recycling laws and the second covers the European union regulations, Hong Kong convention and IMO resolutions.
- So, it is noticed that the research papers are not included the European union regulations and IMO resolutions while the focus on the Hong Kong convention. Also, it is found that China and Bangladesh just apply a regulatory frame work. In addition, these countries are related to the waste management which indicates that they don’t apply the safe manner of waste disposal through maritime transportation. On one hand, the countries Indonesia, India, south Asia and Brazil appeared in addition to Bangladesh and China, this indicates that there are problems faced these countries related to ship recycling process, safety of workers, health and environment.

- There is a relation between “Bangladesh, cost, facility” which reflects that the implementation of laws or case studies is linked to the economic situation of the Bangladesh that appears in the form of facility.
- There are a relationship between “ship recycling facility, competent authority, document of authorization for ship recycling (dasr), procedure, information, operation, waste, facility and environment” that determine the shipowner should provide the ship recycling facility with all information about the recycled ship in order to prepare the procedure of ship recycling process.
- After checking ship recycling procedure, the competent authority will issue (dasr) taking into account the operation, waste disposal and environment. Further, each state or member state should approve the ship recycling plan and issue the document of authorization for ship recycling (dasr) in order to start the ship recycling process. Additionally, the ship’s flag state should make a final survey to issue the ready for ship recycling certificate.

- Additionally, the key words “convention, certificate, year, date, party, amendment, period, organization, administration and survey” reflect that the survey should be applied to every recycled ship according IMO resolutions and Hong Kong convention and its amendments.
- Furthermore, the administration of each party should issue a certificate to every recycled ship called international ready for ship recycling certificate. This indicates that there should be a system for checking the space and area which will be used for disposal of hazardous materials.
- Also, it should be a continuous inspection on the condition of ship recycling facility concerning safe for entry, safe for hot work, worker safety and safety of equipment used in ship recycling process. So, after approving all safety precautions mentioned, a certificate should be issued from the ship recycling state.

- Finally, all research published in the field of study confirms that still there is a need to complete research efforts in order to attempt the gap between ideal laws and what is done in most countries that have the largest share in the ship recycling industry.
- In view of the laws, it is noticed that there is a gap in an important part of the ship's lifespan which is the recycling process and it is not taken into account at the early design stage. Therefore, a group of research should be conducted to try to fill the gap by concerning that the recycling stage is one of the initial design stages of ships.

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