

## Using Fuzzy DEMATEL for Study of Effective Factors on Speeding Sea Transportation

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Received: Nov. 2014 & Published: Jan. 2015

### Abstract

Doing international shipping and international moving is exciting, but it can also be difficult. Chances are good that you will do this only once in your life, and most people will never do it. Therefore I have written this guide to outline how the process works and to help you make informed choices, especially about how to prepare and how to choose an International Shipping Company. This is primarily written for people shipping from the United States, although it applies to anyone who is shipping goods abroad. Also, this is written for people shipping household goods for personal use. May you have a successful move. Conventionally, shipping companies have invested in large ships to achieve economies of scale. More recently, high speed ships have been proposed as a means of achieving timely service for customers and improving shipping performance. Yet another solution offered here is to boost the cargo handling speed at port allowing for a higher number of annual round trips. Both the cost efficiency and timeliness of shipping service can be improved. The economic trade-offs between the investments in cargo handling and ship propulsion technologies are formally analyzed by taking the round trip frequency as the key to performance. The theoretical analyses as well as the practical cases studied indicate that investments in cargo handling technology, such as automation of container terminal operations and hatch less self-loading ships, have indeed considerable profit-making potential for shipping companies. Other technology investment opportunities appear less promising: ship propulsion due to energy consumption and environmental concerns; and larger ships due to low customer responsiveness and risks of low capital productivity

**Keywords:** transportation, Pacific International Lines, Fuzzy DEMATEL

### 1. Introduction

Pacific International Lines (PIL) incorporated in 1967 has developed from a coastal ship-owner/operator in Singapore to become one of the largest ship owners in Asia. Today, it is ranked 19th amongst the top containership operators in the world. PIL has diversified into logistics related activities such as supply chain management, consolidation/distribution facilities, warehousing, container depot operations, trucking as well as having interest in ship-agencies worldwide, container manufacturing,

marine engineering and real estate. As of September 2010, PIL owns and operates a fleet of 133 vessels with a total capacity of about 247,159 TEUs. 6 new container vessels with a total capacity of 28,800 TEUs and including 8 new multi-purpose vessels and 2 bulk carriers which will be delivered by January 2013. PIL also owns and operates a fleet of more than 373,366 TEUs of marine containers.

PIL operates container liner services covering the whole of the Far East to Europe, Black Sea, Canada, the Indian sub-continent, Red Sea/Gulf,

East Africa, South/West Africa, Australia, New Zealand, East Coast of South America and West Coast of USA. It has a dedicated network of feeder services covering a comprehensive range of ports in South East Asia, the Bay of Bengal and the East Coast of India. Effective March 2010, PIL also re-launched its Multi-purpose Service between China and Africa offering customers direct link for project and break bulk cargo between China and Africa ports.

## 2. History

Pars Sama Kala International Freight Forwarding Co. LTD has generated its own niche in the freight forwarding industry through stable presentation in the market since last couple of decades. It is a global, professionally managed international freight forwarder well equipped to meet the ever changing and increasing needs & demands of the customers. Honored by having been in the business with more than 25 years of experience shared between the partners, we are known for our timely deliveries and quality services which provide our customers with both confidence and peace of mind. We have strong relationship with various sections of logistics trade and we placed ourselves in a position to provide our customers with quality & economic logistics solutions.

We have experienced personnel with expertise who have been successful in handling thousands of shipments each year, yet still provide one of the most professional services in logistics industry. Besides, we also would like to offer you the following wide range of services to meet the various needs of our clients.

- Sea and Air freight forwarding
- .Transportation and heavy equipment
- .Customs documentation and clearance
- .Packing and removal services
- .Container logistics and management
- .Storage and warehouse .

### Who is Involved in an International Shipment

Many people and companies are involved in an international shipment, and it will help if you understand who they are, what they do, and how they work together. You will likely have direct contact with only one or two of the companies involved and little or no contact with the others. However, all are discussed below.

#### The Shipper

This is you, the person doing the shipment. You are also the “Exporter” (the person exporting goods from the country of origin) and the “Importer” (the person importing goods into the destination country). It is very important that you understand that as the “Shipper” you are accepting responsibility for the legality of the goods that are being shipped, any import duties, supplying paperwork, and, most importantly, any charges that might arise in the event of some unusual occurrence like a port strike, a customs inspection, or an unusual delivery situation. Therefore you need to make sure that you know all of the rules for importing to the specific country to which you are shipping. You should also budget extra money in the event that it is needed.

#### The International Shipping Company (the Move Manager)

I use the term “Move Manager” to represent a function that can be performed by any of several people or companies. The International Shipping Company you choose will be your Move Manager. It is the company that will oversee your shipment, it is the company you will sign the contract (or agreement, or estimate) with, and it is the company that will be sending you your bill. It is the company you will turn to in the event of any claims for damages, updates on your shipment, and general questions about the process.

All of the other entities involved with your shipment will be “employees” or “subcontractors” of the International Shipping Company/Move Manager. Since your agreement will be with the Move Manager, any problems or concerns will need to be addressed to the Move

Manager, and any disputes will need to be settled with the Move Manager.

It is a very good idea to use an International Shipping Company/Move Manager that will also be performing one of the other functions discussed below (such as the Origin Agent, Freight Forwarder, or Destination Agent), for the following reasons:

- For ease of communication between the Move Manager and the involved parties
- So that the Move Manager will have more direct responsibility for your shipment
- So there will be less overhead (since the Move Manager will be making money performing some other function such as being the Origin or Destination Agent, the Move Manager won't need to add extra charges for handling the entire process)

### **The Origin Agent**

This is the local company that will do the visual survey, i.e. it will send someone to your home to see what is being shipped before quoting for the move, in order to give an accurate quote. The Origin Agent will also pack and load the shipment. The Origin Agent might also be the Freight Forwarder, the Consolidating Warehouse, and/or the Move Manager. See below for details on these other functions.

### **The Freight Forwarder**

This is the company that will arrange the ocean freight and do the export documentation (including a "House Bill of Lading", i.e. a document showing information specific to your shipment such as your name). This is also the company that will move your cargo from the pickup point to the port.

In many countries, including the United States, a Freight Forwarder is supposed to be licensed. You can easily check to see whether the Freight Forwarder you want to use is licensed at <http://www.fmc.gov/> (the website of the U.S.

Federal Maritime Commission, or FMC). Note that the Federal Maritime Commission makes a distinction between a Freight Forwarder (FF) and a Non-Vehicle Operating Common Carrier (NVOCC). However, for the typical customer doing international shipping, the difference doesn't matter, so when I say "Freight Forwarder", I mean either a Freight Forwarder or an NVOCC. For shipments originating from the United States, it is best to use either a licensed Freight Forwarder or what is known as an "authorized agent". (The local office of a major van line such as those listed at the end of this article will often be an "authorized agent". If in doubt, check with the FMC. )

You might also choose to work with a Freight Forwarder in the destination country. This can be particularly useful if you are moving to a country with unusual rules for import or if English is your second language and you are moving to a country where your native language is spoken. The Freight Forwarder may also function as the Origin Agent, the Consolidating Warehouse, and/or the Move Manager.

### **The Consolidating Warehouse**

If you do not have an exclusive container (an ocean container holding only your shipment), your goods will need to be loaded into a container with other cargo. The decision about whether to use an exclusive container will be made based on the volume of your shipment and the distance between the origin city and the port of embarkation. If your goods need to be consolidated, they will wait in a warehouse called a Consolidating Warehouse until there is enough cargo to fill a container. If you live near a port city, this will probably – but not necessarily – be the same warehouse as the warehouse of the Origin Agent. If you live far away from the port, your goods will be sent by truck to the Consolidating Warehouse. For the most part, this process will be "invisible" to you, although it is quite possible that goods will seem to move in the wrong direction before being loaded onto a ship. For example, cargo going from Cleveland, Ohio to London, England might be moved to Chicago, Illinois to be loaded into a container in

Chicago because it is less expensive to do it that way. The Consolidating Warehouse may also function as the Origin Agent, the Freight Forwarder, and/or the Move Manager.

### The Export Port

This is the actual port where the container is brought (already loaded and sealed) to be loaded onto the ship. For practical purposes this means nothing to you, as you won't be dealing with it in any way. The only important thing to know is whether the Origin Port Fees and Origin Terminal Handling Charges are included in your quote. They will usually be listed as "Origin Port Fees" or "OTHC" (Origin Terminal Handling Charges). For shipments going from the United States, these fees are regulated and relatively low and they are almost always included; however, it is worth checking to make sure. Under NO circumstances should you ask for, or accept, a price "From Port"! If you want to save some money by bringing the goods somewhere, ask for the price "From Warehouse". Nothing goes to the port that is not already loaded into a container, sealed, and cleared from Export Customs. (Clearance at origin is almost always done by computer.)

### The Ship Line

This is the company that owns the ship. It will issue the "Master Bill of Lading" or "Seaway Bill of Lading". For the most part, this will be invisible to you; however, it makes good sense to ask which ship line your goods will sail on, for two reasons:

To make sure the quote is based on actual rates, and is not just a "guess"

- To allow online tracking directly with the ship line

It is also a good idea to understand a little about international shipping and the "rules of the seas". International Shipping and Ship Lines are crucial to the world economy. Ship Lines move commercial cargo, military equipment, and anything else that needs to be moved from one

country to another. Because countries need Ship Lines, Ship Lines are given special allowances and privileges, including:

- Ship Lines have the right to overbook, and "roll" cargo to the next available ship. Any associated costs get passed on to the shipper (that's you!).
- Ship Lines have the right to declare "End of Voyage" in the event that the destination port is not available due to war, port strike, or other unforeseen event. Any extra charges get passed on to the shipper (that's you!).
- Ship Lines have the right to jettison cargo (throw it overboard) in the event that the ship gets damaged or might sink otherwise. If this happens, the Ship Line is not liable for the loss of cargo.
- Ship Lines can change schedules, routes, or almost anything else in the event that they need to (even if the need is strictly financial). You know who pays for this by now, right?
- Ship Lines are not responsible for any damages to cargo, or any related damages caused because of a late arrival or no arrival of the cargo.
- Ship Lines must get paid before they will release the cargo.

This is slightly simplified, but you get the idea. Ship Lines do have some rules and standards, as well as some obligations, but by and large, particularly for the one-time shipper, they are untouchable. So make sure you have some extra money on hand in case of a tidal wave or port strike. Usually 10%-20% of the total price quote will be enough to cover it, and these instances of extraordinary circumstances are rare and easily verifiable by asking the Ship Lines directly or by looking on the Ship Line bill.

### The Container Line

The Container Line is the company that owns and rents out the ocean container. This may or may not be the same as the Ship Line, but for all practical purposes it won't make a difference to you.

### **The Destination Port**

This is where the goods are finally unloaded in the country of destination. You will usually have no dealings with the port. However, you will owe them money! It is very important that you check your price quote to make sure that it includes Destination Port Fees and DTHC (Destination Terminal Handling Charges), or at least shows what they will be. Note – In giving quotes for international shipping, it is routine but almost always unacceptable to exclude Destination Port Fees. These fees are usually due in the currency of the destination country, and they will often be listed as “not included”. The quote you accept should include them or at least show what they will be. Even if they are not listed, you must pay them, regardless of the amount.

In some very rare instances (usually in third-world countries) it is impossible to know these fees in advance. However, you can always check with an International Shipping Company located in the destination country to see whether that company can tell you what those fees will be, and you can also arrange your shipment through that company. If you can't find out the amount of the Destination Port Fees in advance, expect them to be \$1,000-\$2,000 or more, no matter the size of your shipment.

### **The Customs Bonded Warehouse**

This is the destination warehouse where your goods will be held until they clear customs. How this is handled will vary from country to country. For example, in Canada the shipper must be present when the goods arrive. In the United States, an entire incoming container is cleared through customs at once, even if there are multiple shipments in the same container. In some other countries, however, containers with more than one shipment must be unloaded and each shipment cleared through customs individually. It is important to find out how this process works and how much time you have before storage and other charges start.

### **The Destination Agent**

This is the company in the destination country that will handle the customs clearing procedures, dealings with the port, and delivery to your residence. You can use the Destination Agent as your International Shipping Company/Move Manager to arrange for the entire shipment. Although it is standard to use a company in the country of origin, if you are moving to a country with unusual laws regarding personal imports, or to a country where your native language is spoken, it might make sense to do this.

It also makes sense to find out who the Destination Agent will be when getting your quote, for the following reasons:

- To make sure the quote is based on a real figure, and is not just a “guess”
- To check the reputation and references of the company that will be handling your goods at destination
- To ask the Destination Agent questions regarding import duties, restrictions, and exemptions
- To answer any location-specific concerns about access (Is there access for a 40-foot container in such and such a city? Do most residential buildings in that city have
- elevators big enough to fit my super-sized sofa?)
- 

### **The Broker**

A Broker is a Move Manager that does not do any of the other work. A Broker is not to be confused with a Freight Forwarder that might subcontract the Origin Agent and the Destination Agent, because the Freight Forwarder is doing something vital to the international shipping process even if you don't see it being done. Generally speaking, Brokers are unlicensed. In most countries, this is illegal, but since international shipping is done by such a (relatively) small segment of the general population, there is usually no enforcement until many, many complaints have been filed.

Since a Broker is not doing any of the actual required work, his price to manage the move will be higher than that quoted by any other company he uses, assuming that company would use the same set of services as the Broker. However, often Brokers will give seemingly lower prices than other companies because:

- They may not use the same set or quality of services that another company might choose.
- They may not check actual costs until after you have chosen to use their services, and then they may raise the prices through some loophole in their agreement.
- They do not pay any fees to be properly licensed.

Because of this, a Broker might give you what appears to be the lowest price, but either it ends up being more expensive than the original quote or you get a lower quality of service (more damages, more delays, more problems, more of your \$\$\$ to fix).

Most important, a Broker has no one checking his financial stability. If you pay a Broker and he doesn't pay the Ship Line, you don't get your goods! In contrast, the Federal Maritime Commission requires a bond from its licensees, and respected industry trade groups such as FIDI-FAIM check the financial stability of their member companies. Destination Port Fees and Terminal Handling Charges are routinely excluded from door-to-door quotes. Make sure your quote shows, in writing, what these fees will be! Never assume that one company will charge the same as another company for these fees.

Obviously, then, the International Shipping Company will need to use an outside Marine Insurance Company to cover against possible loss or damage. Since the value of a given volume of cargo can vary greatly, each shipper needs to purchase coverage for his own goods and

“Total Loss” means that you can make a claim only if your cargo is considered a “total loss”. In

simple terms, this means you don't get any of the cargo back, but you get a check.

Marine Insurance Companies generally include a clause requiring you to insure your goods for their full replacement value in the destination country. This is often called the “Co-Insurance Clause”. It's an odd name, but it's important, particularly in the case of damage. If you underinsure a piece and it needs to be repaired, the insurance company will pay out only proportionately. Here is an example:

You have a dining room table that is worth \$5,000. But you want to save some money, so you insure it for only \$2,000 (40% of its replacement value). The table arrives damaged and the repair will cost \$1,000. The insurance company will pay that claim at 40% (meaning \$400) based on the fact that you insured it for only 40% of what it is really worth. Last but not least, you will need to supply a list of what you are shipping and what it will cost to replace, as new, in the destination country. While all Marine Insurance Companies will have a different form to fill out, they will all want the same information, so get started on the list early. This is also where the group of people familiar with the destination country that you met online or in person can help – they can tell you the cost or availability of the items you want to ship. It might be that your dining room table will cost twice the original price to replace or isn't even available there.

Always add the cost of shipping to the value of insurance. If the truck arrives at your house and your goods are totaled, you not only have to buy new goods, you still owe (or more properly have already paid) the cost of shipping! So if your totaled goods are worth \$10,000 and it has cost you another \$3,000 to ship them to the destination country, you need to buy \$13,000 of coverage.

### **Full-Pack Service versus Partial-Pack Service versus Self Load**

One of the ways to reduce the cost of international shipping is to reduce the services

you require. Keep in mind, however, that this may not make a big difference in cost but it will make a big difference in the chance of damage and your ability to file a claim against damage. It might also increase your chance of a customs inspection and associated extra charges. The least expensive option is to load the container yourself. The reason for this lower cost should be obvious – you will be doing all of the hard work, supplying all of the packing materials, and assuming all of the risk of damage. Unless you have experience as a professional international packer, this is not a good option. Consider shipping fewer goods to save money instead.

### **The Problem with Quotes “To Port”**

Many International Shipping Companies will try to sell you services only “To Port” in the destination country. Their quote will be much less expensive than a door-to-door quote because it is not inclusive of all of the fees you will need to pay (even if you plan on hiring a truck to pick the goods up at port!). A quote “To Port” will never include any of the Destination Port Fees or Terminal Handling Charges that will be due! Also, many Ship Lines and/or Container Lines will not release a container to an individual without getting a large deposit. Lastly, ports often give people a very limited amount of time to clear the container from customs and remove the container before costly charges start. In short, if you don’t already do regular shipments to the destination country, if you don’t already employ a licensed customs clearer, and if you don’t already have agreements with the foreign port, Bonded Warehouses, and Ship Lines, do NOT take this option. If you want to save some money by not having delivery service, ask for a quote “To Warehouse, Customs Cleared”. Then you can have a truck pick the goods up at the Warehouse.

### **3. A Charges for Custom Fees (Duties)**

#### **Charges for Difficult Access**

Since the International Shipping Company usually doesn’t know the exact address where you will be moving, it will offer a price making

some assumptions. For example, it will assume that there will be room on the street for a relatively large truck, that the truck can park relatively close to the door of the house or apartment, and that the movers won’t have to carry the goods up more than one or two flights of steps. If those assumptions are wrong, there will be extra charges. If you don’t know where you will be moving, find out what these extra costs might be so you can keep them in mind when looking for a place to live (and you won’t be surprised by the bill).

#### **Charges to Transport Unusually Heavy or Bulky Items**

Items like safes or pianos require extra labor and/or special equipment to move. If the surveyor sees a piano when he comes to the house, the associated costs should be listed. Even if they do not appear on the quote, however, assume that there will be extra charges for such items.

#### **Charges for Customs Inspection or Quarantine**

In the event that Customs wants to check what is in the shipment (either on export from the origin country or on import into the destination country), there will be extra charges, and they will not be included in the quote. The shipper (you) will need to pay these charges.

#### **Charges Associated with Force Majeure**

This is a legal term, and it basically means “Anything that can’t be predicted or controlled”. Some examples would be a war, a port strike, or a natural disaster. The shipper will need to pay the extra charges associated with such events.

This is the process of turning over all of the paperwork to the customs officials in the destination country and dealing with whatever issues arise. The charge for this is usually relatively little and it should be a standard part of door-to-door services.

#### **An Update on Iran's Sanctioned State Shipping Line**

Nearly four years after the United States first sanctioned the Islamic Republic of Iran Shipping Lines (IRISL) and its fleet, the company appears to be struggling to stay afloat. In the latest sign that international pressure is having an impact, Irano Hind Shipping Company, a three-decade-old joint venture between IRISL and Shipping Corp of India, has been dissolved due to sanctions. And IRISL has been scrambling in recent months, setting up new front companies, dissolving others, swapping personnel, re-naming vessels, and re-flagging ships to increasingly unlikely locations.

The table below surveys the status of IRISL vessels blacklisted by the U.S. Treasury Department because of links to proliferation. It lists the current and previous names and flags for each of these 142 vessels, as well as their current

owners, managers, and operators. The table reveals that vessels are now being re-flagged to unusual locations, like Moldova, Sierra Leone, and Tanzania. A bill passed by the U.S. Congress on August 1 (which President Obama is expected to sign) should make it difficult for IRISL to obtain even these unlikely flags of convenience in the future. Among other things, the Iran Threat Reduction and Syria Human Rights Act penalizes any country that helps Iran evade sanctions by reflagging its vessels. This could put additional pressure on countries that have popped up in IRISL's latest round of ship re-flagging. Bolivia, which earlier this year briefly emerged as a flag of choice for IRISL vessels, has since de-flagged these ships. Malta too was once a popular flag of convenience for IRISL vessels; today none of the vessels on the blacklist are flying a Maltese flag.

IMO	Current Vessel Name	Previous Names	Current Flag	Previous Flags	Operator	Registered Owner	Ship Manager
8984484	AAJ	N/A	Iran	N/A	IRISL	Valfajre Eight Shipping Co	Valfajre Shipping Co
9405942	AALI	N/A	Moldova	Malta	Sapid Shipping Co.	Andulena Corp	Rahbaran Omid Darya Ship Mgmt
9051624	ABBA	Iran Matin	Iran	N/A	Sapid Shipping Co	Kalan Kish Shipping Co	Sapid Shipping Co
9051650	VALERIAN	Iran Brave, Margrave	Unknown	Bolivia, Cyprus, Malta, Iran	Hafiz Darya Shipping Co	Andulena Corp	Hafiz Darya Shipping Co
9270658	SHAMIM	Iran Bushehr, Silver Zone	Iran	Malta	Hafiz Darya Shipping Co	Bushehr Shipping Co Ltd	Hafiz Darya Shipping Co
8322076	IRAN CHARAK	N/A	Iran	N/A	IRISL Marine Services	IRISL Marine Services	IRISL Marine Services



9118551	IRAN DALEER	N/A	Iran	N/A	Khazar Sea Shipping Lines	Khazar Sea Shipping Lines	Khazar Sea Shipping Lines
9245304	TARADIS	Iran Darya	Iran	Cyprus	Khazar Sea Shipping Lines	Western Surge Shipping Co Ltd	Khazar Sea Shipping Lines
9283021	SALIS	Iran Fars, Sewak	Tanzania	Barbados, Isle of Man, Iran	Hafiz Darya Shipping Co	Andulena Corp	Hafiz Darya Shipping Co
9010723	VIANA	Iran Ghadeer	Iran	N/A	Khazar Sea Shipping Lines	Khazar Sea Shipping Lines	Khazar Sea Shipping Lines
9005596	IRAN HORMUZ 12	N/A	Iran	N/A	IRISL	Valfajre Eight Shipping Co	Valfajre Shipping Co
9020778	IRAN HORMUZ 14	N/A	Iran	N/A	IRISL	Valfajre Eight Shipping Co	Valfajre Shipping Co
8314263	DARYA 21	Iran Hormuz 21	Iran	N/A	Malaei S	Malaei S	Malaei S

Increasingly, countries appear to be revoking or refusing to flag vessels in which IRISL or its affiliates have an interest. As a result, IRISL may be operating vessels despite their flags having been revoked, according to guidance published on July 19 by the Treasury Department. The "Amin" is a good example. In late June, Sierra Leone revoked the flag for the Amin, an oil tanker which is operated by Irano Hind. That hasn't stopped the Amin from operating without a flag. On July 2 it called at Syria's Baniyas terminal. Syria has been a popular destination for IRISL vessels, for more than just oil. The United Nations has reported several incidents in recent years in which IRISL vessels were caught on their way to Syria loaded with arms and ammunition. Such arms exports, which came from entities linked to Iran's Ministry of Defense, are a violation of U.N. Security Council resolution 1747. While many countries appear to have cut IRISL off, there are a few outliers. The Hong Kong flag is still flying on about twenty of

IRISL's blacklisted vessels, and Hong Kong shell companies serve as the nominal owners of these vessels. Often, one or two IRISL vessels are the only assets held by these companies. IRISL's continued involvement is hardly a secret, as most of the vessels are operated and managed by well-known IRISL affiliates. All Hong Kong-flagged vessels are operated by Sapid Shipping Company and managed by Rahbaran Omid Darya. Both companies were created by IRISL in the wake of U.S. sanctions, to take over cargo and ship management operations, and both have been sanctioned by countries around the world. Today, these companies operate or manage about one third of IRISL's blacklisted vessels.

As new U.S. sanctions take effect, the ability of IRISL to operate should be further restricted. And the company will be forced to come up with increasingly deceptive ways to mask its presence. This is an indication that the sanctions applied by the European Union, the United States, and a

number of other countries are preventing Iran's national carrier from continuing business as usual.

**Fuel**

Short sea shipping is facing harder requirements on exhaust emissions in the coming years as stricter regulations are enforced in some regions of the world. In addition, shortage of conventional fuels as well as restrictions on greenhouse gas emissions makes the search for new fuels of interest. The objective of this article is to assess important characteristics to evaluate when selecting fuels for short sea shipping. The following four criteria are considered: (1) local and regional environmental impacts, (2) overall environmental impact, (3) infrastructure and (4) fuel cost and competition with other transport

modes. Special focus is put on environmental impact, and life cycle assessment is used for the environmental assessment. The fuels compared in this study are heavy fuel oil, marine gas oil, biomass-to-liquid fuel, rapeseed methyl ester, liquefied natural gas and liquefied biogas. This study shows that liquefied natural gas will reduce the local and regional environmental impacts more relative to the other fuels investigated here. Furthermore, liquefied biogas is found to be the most preferable if all environmental impact categories are considered. This study also highlights the importance to consider other impact categories for short sea shipping compared to deep sea shipping and shows that NO<sub>x</sub> emission is the dominant contributor to all assessed environmental impact categories with local and regional impacts.

Table 1- Criteria		
Number	Abbreviation	Title
1	C <sub>1</sub>	sanction
2	C <sub>2</sub>	Type of container
3	C <sub>3</sub>	Loading and offloading in ports
4	C <sub>4</sub>	Cross stuffing
5	C <sub>5</sub>	Transshipment
6	C <sub>6</sub>	Fuel Price
7	C <sub>7</sub>	Shipping line
8	C <sub>8</sub>	Free Zones

The criteria used for evaluation of 5 Chartered Certified Table 2 shows a comparison of each pair, in this matrix,  $x_{ij} = (l_{ij}, m_{ij}, u_{ij})$  are triangular fuzzy numbers and  $\neg x_{ii} = (i = 1,2, 3, \dots, n)$  as a fuzzy number (0,0,0) are considered.

Table 2 - paired comparisons of criteria by experts								
1	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C <sub>1</sub>	(0.000,0.000,0.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)

C <sub>2</sub>	(8.000,9.000,9.000)	(0.000,0.000,0.000)	(8.000,9.000,9.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(6.000,7.000,8.000)	(6.000,7.000,8.000)	(8.000,9.000,9.000)
C <sub>3</sub>	(6.000,7.000,8.000)	(8.000,9.000,9.000)	(0.000,0.000,0.000)	(1.000,1.000,1.000)	(1.000,1.000,1.000)	(8.000,9.000,9.000)	(8.000,9.000,9.000)	(6.000,7.000,8.000)
C <sub>4</sub>	(4.000,5.000,6.000)	(4.000,5.000,6.000)	(6.000,7.000,8.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(1.000,1.000,1.000)
C <sub>5</sub>	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(4.000,5.000,6.000)	(0.000,0.000,0.000)	(1.000,1.000,1.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)
C <sub>6</sub>	(4.000,5.000,6.000)	(6.000,7.000,8.000)	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(8.000,9.000,9.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(6.000,7.000,8.000)
C <sub>7</sub>	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(1.000,1.000,1.000)	(6.000,7.000,8.000)	(2.000,3.000,4.000)	(6.000,7.000,8.000)	(0.000,0.000,0.000)	(2.000,3.000,4.000)
C <sub>8</sub>	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(0.000,0.000,0.000)

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C <sub>1</sub>	(0.000,0.000,0.000)	(8.000,9.000,9.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(4.000,5.000,6.000)	(8.000,9.000,9.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)
C <sub>2</sub>	(1.000,1.000,1.000)	(0.000,0.000,0.000)	(1.000,1.000,1.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(1.000,1.000,1.000)	(4.000,5.000,6.000)
C <sub>3</sub>	(8.000,9.000,9.000)	(4.000,5.000,6.000)	(0.000,0.000,0.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(8.000,9.000,9.000)
C <sub>4</sub>	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(6.000,7.000,8.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)
C <sub>5</sub>	(4.000,5.000,6.000)	(8.000,9.000,9.000)	(4.000,5.000,6.000)	(8.000,9.000,9.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(8.000,9.000,9.000)	(8.000,9.000,9.000)

5	00,6.000)	00,9.000)	00,6.000)	00,9.000)	00,0.000)	00,8.000)	00,9.000)	00,9.000)
C 6	(1.000,1.0 00,1.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)	(6.000,7.0 00,8.000)	(8.000,9.0 00,9.000)	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)
C 7	(2.000,3.0 00,4.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)	(2.000,3.0 00,4.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)
C 8	(8.000,9.0 00,9.000)	(1.000,1.0 00,1.000)	(1.000,1.0 00,1.000)	(4.000,5.0 00,6.000)	(1.000,1.0 00,1.000)	(8.000,9.0 00,9.000)	(6.000,7.0 00,8.000)	(0.000,0.0 00,0.000)

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C 1	(0.000,0.0 00,0.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)	(4.000,5.0 00,6.000)	(2.000,3.0 00,4.000)	(4.000,5.0 00,6.000)	(4.000,5.0 00,6.000)	(1.000,1.0 00,1.000)
C 2	(2.000,3.0 00,4.000)	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)	(1.000,1.0 00,1.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)
C 3	(4.000,5.0 00,6.000)	(8.000,9.0 00,9.000)	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)	(6.000,7.0 00,8.000)	(2.000,3.0 00,4.000)	(2.000,3.0 00,4.000)	(6.000,7.0 00,8.000)
C 4	(1.000,1.0 00,1.000)	(4.000,5.0 00,6.000)	(2.000,3.0 00,4.000)	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)	(8.000,9.0 00,9.000)	(1.000,1.0 00,1.000)	(8.000,9.0 00,9.000)
C 5	(8.000,9.0 00,9.000)	(8.000,9.0 00,9.000)	(4.000,5.0 00,6.000)	(8.000,9.0 00,9.000)	(0.000,0.0 00,0.000)	(4.000,5.0 00,6.000)	(4.000,5.0 00,6.000)	(1.000,1.0 00,1.000)
C 6	(6.000,7.0 00,8.000)	(4.000,5.0 00,6.000)	(8.000,9.0 00,9.000)	(6.000,7.0 00,8.000)	(2.000,3.0 00,4.000)	(0.000,0.0 00,0.000)	(8.000,9.0 00,9.000)	(2.000,3.0 00,4.000)
C 7	(2.000,3.0 00,4.000)	(2.000,3.0 00,4.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)	(2.000,3.0 00,4.000)	(0.000,0.0 00,0.000)	(4.000,5.0 00,6.000)
C 8	(1.000,1.0 00,1.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)	(2.000,3.0 00,4.000)	(1.000,1.0 00,1.000)	(4.000,5.0 00,6.000)	(0.000,0.0 00,0.000)

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C 1	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)	(8.000,9.0 00,9.000)	(4.000,5.0 00,6.000)	(2.000,3.0 00,4.000)	(2.000,3.0 00,4.000)	(2.000,3.0 00,4.000)	(8.000,9.0 00,9.000)
C 2	(2.000,3.0 00,4.000)	(0.000,0.0 00,0.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)	(1.000,1.0 00,1.000)	(4.000,5.0 00,6.000)	(1.000,1.0 00,1.000)	(2.000,3.0 00,4.000)

C <sub>3</sub>	(6.000,7.000,8.000)	(2.000,3.000,4.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(6.000,7.000,8.000)	(1.000,1.000,1.000)	(6.000,7.000,8.000)	(1.000,1.000,1.000)
C <sub>4</sub>	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(0.000,0.000,0.000)	(4.000,5.000,6.000)	(6.000,7.000,8.000)	(4.000,5.000,6.000)	(4.000,5.000,6.000)
C <sub>5</sub>	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(0.000,0.000,0.000)	(4.000,5.000,6.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)
C <sub>6</sub>	(8.000,9.000,9.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(2.000,3.000,4.000)	(0.000,0.000,0.000)	(8.000,9.000,9.000)	(1.000,1.000,1.000)
C <sub>7</sub>	(6.000,7.000,8.000)	(6.000,7.000,8.000)	(4.000,5.000,6.000)	(4.000,5.000,6.000)	(1.000,1.000,1.000)	(8.000,9.000,9.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)
C <sub>8</sub>	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(1.000,1.000,1.000)	(8.000,9.000,9.000)	(4.000,5.000,6.000)	(4.000,5.000,6.000)	(0.000,0.000,0.000)

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C <sub>1</sub>	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(6.000,7.000,8.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)
C <sub>2</sub>	(1.000,1.000,1.000)	(0.000,0.000,0.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(8.000,9.000,9.000)	(2.000,3.000,4.000)	(6.000,7.000,8.000)
C <sub>3</sub>	(2.000,3.000,4.000)	(2.000,3.000,4.000)	(0.000,0.000,0.000)	(1.000,1.000,1.000)	(4.000,5.000,6.000)	(1.000,1.000,1.000)	(8.000,9.000,9.000)	(4.000,5.000,6.000)
C <sub>4</sub>	(4.000,5.000,6.000)	(1.000,1.000,1.000)	(1.000,1.000,1.000)	(0.000,0.000,0.000)	(8.000,9.000,9.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)
C <sub>5</sub>	(8.000,9.000,9.000)	(8.000,9.000,9.000)	(6.000,7.000,8.000)	(4.000,5.000,6.000)	(0.000,0.000,0.000)	(4.000,5.000,6.000)	(8.000,9.000,9.000)	(1.000,1.000,1.000)
C <sub>6</sub>	(6.000,7.000,8.000)	(4.000,5.000,6.000)	(2.000,3.000,4.000)	(8.000,9.000,9.000)	(4.000,5.000,6.000)	(0.000,0.000,0.000)	(6.000,7.000,8.000)	(8.000,9.000,9.000)
C <sub>7</sub>	(2.000,3.000,4.000)	(6.000,7.000,8.000)	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(2.000,3.000,4.000)	(1.000,1.000,1.000)	(0.000,0.000,0.000)	(8.000,9.000,9.000)
C <sub>8</sub>	(1.000,1.000,1.000)	(2.000,3.000,4.000)	(4.000,5.000,6.000)	(1.000,1.000,1.000)	(6.000,7.000,8.000)	(6.000,7.000,8.000)	(1.000,1.000,1.000)	(0.000,0.000,0.000)

For consideration by all the experts take the arithmetic mean of the formula 1.

Formula (1)  $z = (x^1 \oplus x^2 \oplus x^3 \oplus \dots \oplus x^p) / p$   
 In this formula, p the number of experts, and  $x^1, x^2, x^p$ , respectively, paired comparison matrix Expert 1, Expert 2 and Expert triangular fuzzy number p, and z as  $z_{ij} = (l_{ij}, m_{ij}, u_{ij})$  is.

Table 3 shows the mean of paired comparisons

Average of all candidates

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C <sub>1</sub>	(0.000,0.000,0.000)	(3.600,4.200,4.600)	(5.200,6.200,6.800)	(2.800,3.400,4.000)	(2.400,3.400,4.400)	(3.400,4.200,4.800)	(2.800,3.800,4.800)	(2.800,3.400,3.800)
C <sub>2</sub>	(2.800,3.400,3.800)	(0.000,0.000,0.000)	(2.600,3.000,3.200)	(2.400,3.400,4.400)	(3.200,3.800,4.200)	(4.600,5.400,6.000)	(2.200,2.600,3.000)	(4.400,5.400,6.200)
C <sub>3</sub>	(5.200,6.200,7.000)	(4.800,5.800,6.400)	(0.000,0.000,0.000)	(2.200,2.600,3.000)	(3.600,4.200,4.800)	(2.800,3.400,3.800)	(5.600,6.600,7.200)	(5.000,5.800,6.400)
C <sub>4</sub>	(2.200,2.600,3.000)	(2.600,3.400,4.200)	(4.600,5.400,6.000)	(0.000,0.000,0.000)	(5.000,5.800,6.400)	(3.800,4.600,5.200)	(2.000,2.600,3.200)	(3.400,4.200,4.800)
C <sub>5</sub>	(4.600,5.400,5.800)	(5.400,6.200,6.400)	(3.200,3.800,4.400)	(5.200,6.200,6.800)	(0.000,0.000,0.000)	(3.800,4.600,5.400)	(5.000,5.800,6.200)	(2.800,3.400,3.800)
C <sub>6</sub>	(5.000,5.800,6.400)	(3.800,4.600,5.400)	(3.200,4.200,5.000)	(7.200,8.200,8.600)	(4.800,5.800,6.400)	(0.000,0.000,0.000)	(5.800,6.600,7.000)	(3.800,4.600,5.200)
C <sub>7</sub>	(2.800,3.800,4.800)	(4.800,5.800,6.600)	(3.000,3.400,3.600)	(3.200,4.200,5.200)	(3.000,3.800,4.400)	(5.000,5.800,6.200)	(0.000,0.000,0.000)	(4.200,5.000,5.600)
C <sub>8</sub>	(3.600,4.200,4.600)	(1.600,2.200,2.800)	(3.800,4.600,5.200)	(3.200,3.800,4.200)	(4.200,5.000,5.600)	(4.200,5.000,5.600)	(4.600,5.400,6.000)	(0.000,0.000,0.000)

$$\tilde{H}_{ij} = \frac{\tilde{z}_{ij}}{r} = \left(\frac{l'_{ij}}{r}, \frac{m'_{ij}}{r}, \frac{u'_{ij}}{r}\right) = (l''_{ij}, m''_{ij}, u''_{ij})$$

$$r = \max_{1 \leq i \leq n} \left(\sum_{j=1}^n u_{ij}\right)$$

C <sub>1</sub>	(0.000,0.000,0.000)	(0.082,0.095,0.105)	(0.118,0.141,0.155)	(0.064,0.077,0.091)	(0.055,0.077,0.100)	(0.077,0.095,0.109)	(0.064,0.086,0.109)	(0.064,0.077,0.086)
C <sub>2</sub>	(0.064,0.077,0.086)	(0.000,0.000,0.000)	(0.059,0.068,0.073)	(0.055,0.077,0.100)	(0.073,0.086,0.095)	(0.105,0.123,0.136)	(0.050,0.059,0.068)	(0.100,0.123,0.141)
C <sub>3</sub>	(0.118,0.141,0.159)	(0.109,0.132,0.145)	(0.000,0.000,0.000)	(0.050,0.059,0.068)	(0.082,0.095,0.109)	(0.064,0.077,0.086)	(0.127,0.150,0.164)	(0.114,0.132,0.145)
C <sub>4</sub>	(0.050,0.059,0.068)	(0.059,0.077,0.095)	(0.105,0.123,0.136)	(0.000,0.000,0.000)	(0.114,0.132,0.145)	(0.086,0.105,0.118)	(0.045,0.059,0.073)	(0.077,0.095,0.109)
C <sub>5</sub>	(0.105,0.123,0.132)	(0.123,0.141,0.145)	(0.073,0.086,0.100)	(0.118,0.141,0.155)	(0.000,0.000,0.000)	(0.086,0.105,0.123)	(0.114,0.132,0.141)	(0.064,0.077,0.086)
C <sub>6</sub>	(0.114,0.132,0.145)	(0.086,0.105,0.123)	(0.073,0.095,0.114)	(0.164,0.186,0.195)	(0.109,0.132,0.145)	(0.000,0.000,0.000)	(0.132,0.150,0.159)	(0.086,0.105,0.118)

C <sub>7</sub>	(0.064,0.0 86,0.109)	(0.109,0.1 32,0.150)	(0.068,0.0 77,0.082)	(0.073,0.0 95,0.118)	(0.068,0.0 86,0.100)	(0.114,0.1 32,0.141)	(0.000,0.0 00,0.000)	(0.095,0.1 14,0.127)
C <sub>8</sub>	(0.082,0.0 95,0.105)	(0.036,0.0 50,0.064)	(0.086,0.1 05,0.118)	(0.073,0.0 86,0.095)	(0.095,0.1 14,0.127)	(0.095,0.1 14,0.127)	(0.105,0.1 23,0.136)	(0.000,0.0 00,0.000)

$$T = \lim_{k \rightarrow +\infty} (\mathcal{H}^1 \oplus \mathcal{H}^2 \oplus \dots \oplus \mathcal{H}^k)$$

$$\tilde{\mathcal{T}}_{ij} = (l_{ij}^t, m_{ij}^t, u_{ij}^t):$$

$$[l_{ij}^t] = H_l \times (I - H_l)^{-1}$$

$$[m_{ij}^t] = H_m \times (I - H_m)^{-1}$$

$$([u_{ij}^t] = H_u \times (I - H_u)^{-1}$$

Table 5 - Matrix of relations

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>
C <sub>1</sub>	(0.106,0.2 25,0.439)	(0.183,0.3 18,0.546)	(0.210,0.3 43,0.559)	(0.164,0.2 97,0.531)	(0.157,0.2 98,0.537)	(0.181,0.3 21,0.554)	(0.173,0.3 18,0.560)	(0.167,0.3 00,0.524)
C <sub>2</sub>	(0.163,0.2 85,0.488)	(0.103,0.2 16,0.417)	(0.156,0.2 72,0.465)	(0.157,0.2 91,0.513)	(0.171,0.2 97,0.507)	(0.203,0.3 33,0.548)	(0.159,0.2 83,0.495)	(0.194,0.3 25,0.537)
C <sub>3</sub>	(0.235,0.3 86,0.633)	(0.230,0.3 86,0.635)	(0.126,0.2 55,0.478)	(0.175,0.3 20,0.569)	(0.203,0.3 50,0.601)	(0.197,0.3 49,0.597)	(0.251,0.4 09,0.661)	(0.233,0.3 83,0.628)
C <sub>4</sub>	(0.159,0.2 85,0.502)	(0.168,0.3 04,0.535)	(0.201,0.3 30,0.542)	(0.111,0.2 31,0.448)	(0.213,0.3 47,0.574)	(0.193,0.3 30,0.559)	(0.163,0.2 99,0.528)	(0.181,0.3 16,0.538)
C <sub>5</sub>	(0.225,0.3 75,0.613)	(0.245,0.4 00,0.640)	(0.198,0.3 41,0.574)	(0.239,0.3 97,0.647)	(0.132,0.2 71,0.510)	(0.220,0.3 77,0.631)	(0.241,0.3 97,0.644)	(0.194,0.3 44,0.584)
C <sub>6</sub>	(0.248,0.4 14,0.683)	(0.229,0.4 01,0.683)	(0.214,0.3 81,0.645)	(0.294,0.4 67,0.741)	(0.247,0.4 21,0.699)	(0.156,0.3 15,0.584)	(0.272,0.4 45,0.722)	(0.227,0.3 97,0.669)
C <sub>7</sub>	(0.178,0.3 24,0.568)	(0.217,0.3 67,0.614)	(0.178,0.3 11,0.533)	(0.188,0.3 39,0.592)	(0.183,0.3 29,0.574)	(0.227,0.3 76,0.618)	(0.126,0.2 59,0.494)	(0.206,0.3 51,0.590)
C <sub>8</sub>	(0.192,0.3 26,0.547)	(0.155,0.2 94,0.526)	(0.193,0.3 26,0.542)	(0.186,0.3 23,0.551)	(0.203,0.3 43,0.574)	(0.208,0.3 51,0.583)	(0.220,0.3 63,0.596)	(0.116,0.2 39,0.455)

$$\mathcal{D} = (\mathcal{D}_i)_{n \times 1} = [\sum_{j=1}^n \tilde{\mathcal{T}}_{ij}]_{n \times 1}$$

$$(\tilde{\mathcal{R}} = (\tilde{\mathcal{R}}_i)_{1 \times n} = [\sum_{i=1}^n \tilde{\mathcal{T}}_{ij}]_{1 \times n}$$

Table 6 - criteria important (fuzzy numbers)

Criteria	$\tilde{D}_i + \tilde{R}_i$	$\tilde{D}_i - \tilde{R}_i$
C1	(2.848,5.041,8.723)	(-3.132,-0.201,2.742)
C2	(2.837,4.989,8.566)	(-3.290,-0.383,2.439)
C3	(3.126,5.398,9.139)	(-2.686,0.280,3.328)
C4	(2.905,5.108,8.818)	(-3.202,-0.223,2.711)
C5	(3.203,5.559,9.418)	(-2.881,0.246,3.333)
C6	(3.473,5.991,10.100)	(-2.786,0.488,3.841)
C7	(3.108,5.431,9.284)	(-3.197,-0.117,2.979)
C8	(2.992,5.219,8.898)	(-3.052,-0.090,2.853)

$$B = \frac{(a_1 + a_3 + 2 \times a_2)}{4}$$

$$B \tilde{A} = (a_1, a_2, a_3)..$$

Table 7 - criteria important (absolute numbers)

Criteria	$(\tilde{D}_i + \tilde{R}_i)^{def}$	$(\tilde{D}_i - \tilde{R}_i)^{def}$
C1	5.413	-0.198
C2	5.345	-0.404
C3	5.765	0.301
C4	5.484	-0.234
C5	5.935	0.236
C6	6.389	0.508
C7	5.814	-0.113
C8	5.582	-0.095

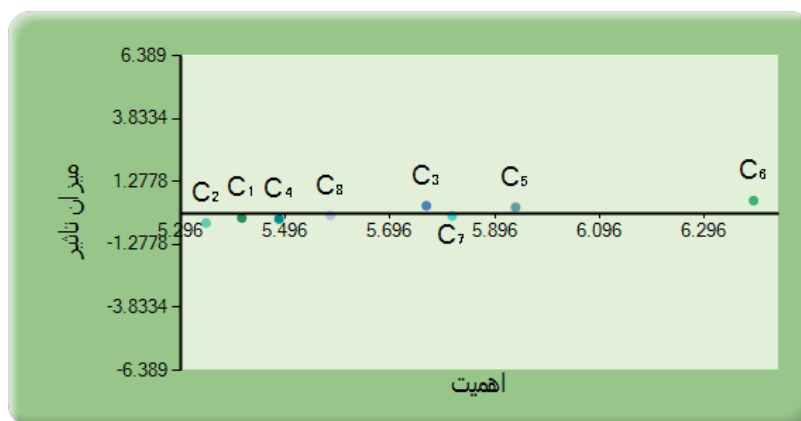


Chart 1 - relationships and the importance of standards



#### 4. Conclusion

Sea transport systems in today's shipping market have evolved into three separate but closely connected segments: bulk shipping, liner shipping and specialized shipping. Although these segments belong to the same industry, each carries out different tasks and has a very different character. Large homogeneous parcels such as iron ore, coal and grain are carried by the bulk shipping industry, small parcels of general cargo are carried by the liner shipping industry and specialized cargoes shipped in large volumes are transported by the specialized shipping industry. These three cargo streams create demand for bulk transport, liner transport and specialized transport. A major distinction is drawn between the fleets of ships owned by companies moving their own cargo in their own ships and the ships owned by independent ship owners and chartered to the cargo owners. The above discussed criteria's will affect on speeding sea transportation and need to be considered by all forwarders, ship owner, shippers and consignees to have good, fruitful, healthy and beneficial business.

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