Assessment of Interactions between Economic Factors and Freight Market in the LNG Sector

by

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Authentication

This is to certify that to the best of my knowledge, the content of this thesis is my own work, gathered and utilized especially to fulfil the purposes and objectives of this study, and has not been previously submitted to any other university for a higher degree. The assistance received in preparing this thesis and sources have been acknowledged.

Spyros Drakopoulos

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Abstract

In this dynamic era, world economy is never constant and the key role of energy source is played by natural gas. The share of natural gas is increasing day by day and being traded in form of LNG. Although the LNG is not as globalized compared to some of the other energy resources; however, it has surfaced as a rapidly growing market throughout the world. In the coming years, the demand for LNG is expected to grow at a high speed.

This study deals with the recognition of the factors that are likely to trigger and constrain the LNG market keeping in mind the rapid expansion in the LNG trade. The analysis focuses on the freight market in the LNG sector. The study also deals with the economic factors that have been affecting the LNG freight market.

The study reflects that the drastic fall in LNG prices is caused by the sudden changes in the demand and supply as well as the shift in the economic factors that affected the freight market of LNG. Moreover, the emerging nations such as Colombia, Indonesia, India, Kenya, Malaysia, Mexico and Poland have played and will play a vital role in influencing the demand and supply of the LNG by playing a crucial role of either an importer or exporter. It is also being reported that after the oil war the next big controversy is expected in the LNG sector where gas exporting countries will compete against each other to win LNG exports.

Key Words: LNG, Emerging Markets, LNG Freight Market

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Chapter 1 - Introduction

1.1 Background

In recent era, consumption of all kind of fuels has been increased and consequently it has expanded production also (Riddell, et al., 2010). Production and consumption reached record levels for all types of fuel except for coal and nuclear power respectively, with consumption having reached a 1.8 % increase on average during 2007 - 2016 (BP p.l.c, 2017). The data further indicates that the increase in emissions of CO_2 by 0,1 % globally over the years 2014 – 2016 globally was the lowest since 1981, despite the larger increase in energy consumption, indicating the shift from some oil and coal to other sources of energy.

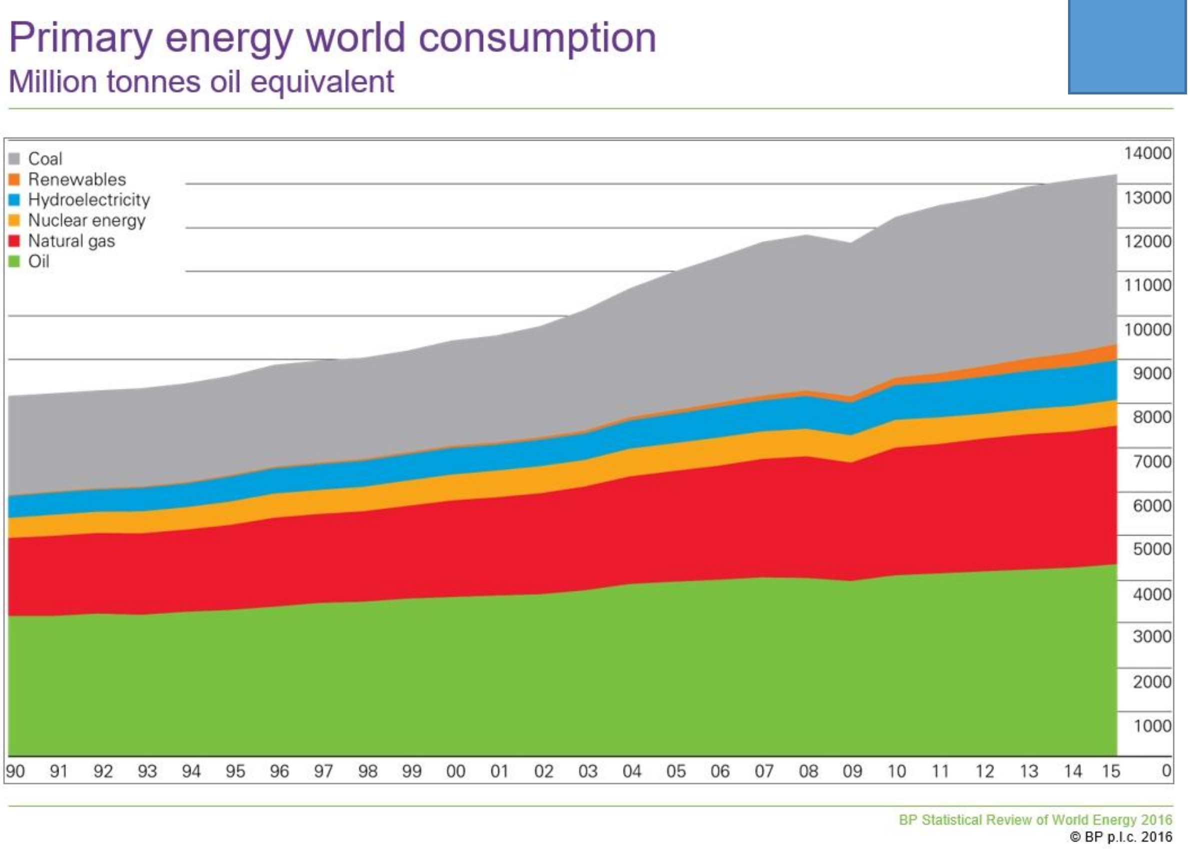

Figure 1: World Energy Consumption

Source: (BP, 2016)

Although in 2013 the consumption and production growth of nuclear power, oil and coal accelerated yet the worldwide growth stayed under 2.5%; the 10-year average. It has been observed that all types of fuels with the exception of nuclear power, oil and renewable in power generation developed at below-average rates. With 32.9% of international energy consumption, oil is still the leading fuel of the world. Except for North America, growth was below average for each and every region. (BP, 2014).

A prime factor for economic growth is the availability of energy. Globally there is a high demand of energy inputs for higher economic growth, despite the fact that present oil and gas production (mostly at domestic levels in different parts of the world) is not adequate enough to satiate the energy thirst of the world's economy (Adjaye, 2000). Hence, this affects the GDP growth of countries also. There is a wide assortment of factors along with this that plays an extremely imperative role in the low GDP growth of more than a few countries in the some of the previous years, for instance worldwide economic crises and energy shortages, pressures of war on terrorism, over population and many more. The gigantic rise in pricing of current energy resources has led the world to figure out new ways of fueling their needs. One such way is using the Liquefied Natural Gas. With the advent of the first commercial scale plant in 1964 the industry celebrated its 50th birthday in 2014 (Deutsche Bank, 2012).

Since 2000 there has been a growth of around 2.7% every year in the total demand of global natural gas; on the other hand, over the same period, the universal demand for LNG has augmented by around 7.6% every year making it approximately three times quicker. (Deutsche Bank, 2012). A regional perspective by Asia is the main driving force behind the strong demand growth of LNG, and from a broader perspective it is due to the robust, long standing, investible and politically charged themes (Sinton & Fridley, 2000). The International Energy Agency (IEA) in its 2012 annual World Energy Outlook predicted an emergent role for natural gas in the energy mix of the world, as the share of natural gas will grow to 25% in 2035 from 21% in 2010. It was further projected that natural gas is the single fossil fuel with a steadily growing share. The IEA is hopeful regarding the global natural gas demand augmenting at around 1.6% for every year till 2035, and expects it to be twofold of the probable growth rate for oil. A number of other forecasters and analysts have predicted even a higher growth rate for gas. Nevertheless, growth for demand of LNG is anticipated to be much stronger, predominantly throughout 2020 (IEA, 2012) Despite the fact that an ample variety of forecasts exist, an extensive consensus of industry observers and analysts predict an average 5% to 6% per year as annual growth. Even after 2020, most likely at a slightly slower pace the demand growth is projected to carry on, and as markets mature, there may be a shift in demand towards more price-sensitive purchasers. With massive consumption the universal demand for LNG by 2030 will, nonetheless, be approximately twice over that of the projected 2012 level of around 250 million metric tons (IEA, 2012).

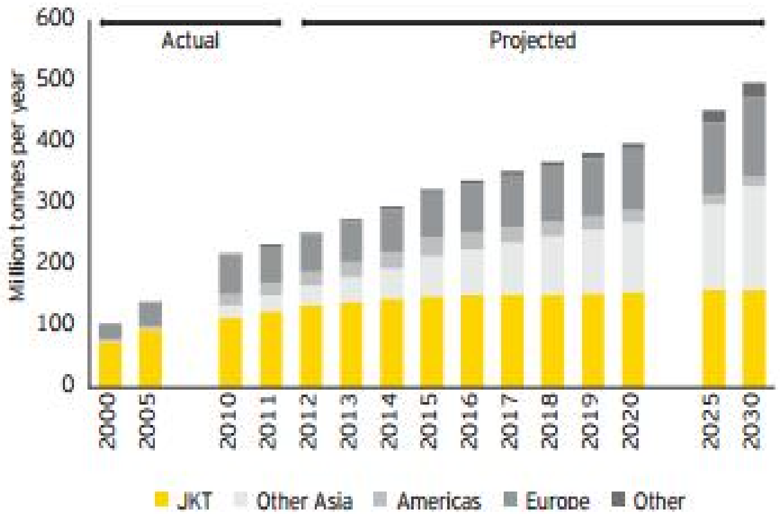

Fig. 2 Global Demand of LNG
(BP.2015)

With several countries as new players in the LNG market; more than 30 countries have decided to add or build LNG import and re-gasification capacity to meet the demand. With such steps being taken, the number of countries with import capacity by 2020 may double from 2011. The re-gasification capacity at present is of almost 600 mtpa that far exceeds the current and the estimated supply and demand and yet possibly will rise to the extent of 200 mtpa by 2020. (Ogfj.com, 2015).

1.1.1 Liquefied Natural Gas

LNG is the fluid type of the natural gas we use in our homes for cooking and warming our houses. Natural gas is likewise utilized as fuel for producing power. Common gas and its segments are utilized as crude material to fabricate a wide mixture of items, from plastics for healthcare, to fiber for dresses, decorations and computing (Shell, 2010).

Normal gas makes up around one-fourth of all energy expended in the United States every year (Manassas, 2016). The most well-known utilization of LNG in the U.S. is for "peakshaving." Peakshaving is a way, gas organizations or utility companies, store gas for future top demand that can't be met by means of their common pipeline sources. Peakshaving can happen amid the winter warming season or when more common gas is expected to produce electric force for aerating and cooling in the late spring months. The natural gas is liquefied by the utility companies when it is plenteous and accessible at off peak costs, or they buy LNG from import terminals supplied from liquefaction facilities abroad. At the point when gas interest expands, the stored LNG is changed over from its melted state back to its vaporous state, to supplement the utilities' pipeline supplies. LNG is likewise right now being utilized as an option transportation fuel in broad daylight travel and in vehicle armadas, for example, those worked by numerous neighborhood regular gas utilities organizations for crises and maintenance. Liquefied Natural gas (LNG) is regular gas that has been cooled to the point that it consolidates to a fluid, which happens at a temperature of more or less -

256oF (- 161oC) at air weight. Liquefaction lessens the volume of gas by give or take 600 times subsequently making it more temperate to store regular gas where different types of capacity don't exist, and to transport gas over long separations for which pipelines are excessively lavish or for which different imperatives exist. Liquefaction makes it conceivable to move common gas between different continents in uniquely designed boats. Along these lines, LNG innovation makes natural gas accessible all through the world (Manassas, 2016).

There are vast reserves of normal gas which exist far and wide in territories where there is no critical business, or where regular gas assets far surpass nearby or provincial interest, or where pipeline choices are restricted. Such hydrocarbon stores are "stranded" in North Africa, South America, West Africa, Caribbean, the Middle East, Malaysia, Indonesia, Alaska and Northwestern Australia. Such markets incorporate Korea, Taiwan, Japan, the U.S. and the Western Europe. Fundamentally, LNG offers more noteworthy trade adaptability than pipeline transport, and allows cargoes of normal gas to be conveyed where the need is most prominent and the business terms are very competitive (Martin , 2012).

1.1.1.1 Meeting Demand

As the countries of the world sought energy, push to reserves more remote and more distant from the mainland in their quest to satisfy the necessities of an industrialized world, but the innate issues connected with the creation of this energy, turn out to be more intricate. Travelling in the sea is longer, distances to shore longer and a hostile environment waits. (Argusmedia.com, 2014).

LNG is a prospective transport fuel, particularly in transportation and trucking, is creating a tremendous market. This is principally an impression of the price value position of LNG over oil based powers, particularly in the US where the revolution of shale gas has driven gas costs to record lows (Shell, 2010). In the marine division, the fortification of legal regulations on emissions will drive ship-proprietors to move to new technologies or fuels that are less contaminating and in such case LNG has various favorable aspects and an edge over other consistence arrangements, nevertheless, the advancement of LNG as a fuel for transport confronts various difficulties and will need to run as an inseparable unit with the improvement of infrastructure of fueling (Dorian, et al., 2006).

1.1.1.2 LNG as a fuel for the transport sector is growing

The best potential is found in road transport, where demand on yearly basis is anticipated to achieve 96 million tons for each year (mtpa) in 2035 while demand in the marine area could develop to an expected 77 mtpa. The rail division could add another 6 mtpa to worldwide interest (CEDIGAZ, 2014).

1.1.1.3 The development in trucking segment will be dependent on fuel cost differentials

In land transport, the utilization of LNG will be restricted to a great extent, specifically it will hit heavy duty vehicles (HDV) and this will happen because the distinction between the cost of diesel and that of LNG. Conversely with the marine segment, ecological enactment is unrealistic to assume a noteworthy part, however, the cost advantage of LNG in relation to diesel gives an edge to it. With the world's biggest inland merchandise transport market and an officially all around created LNG supply base, China has a colossal potential and is representing a large portion of the worldwide market by 2035. LNG will be carving out a gigantic share of the market in the Europe, US, and Asia. (Argusmedia.com, 2014).

1.1.1.4 Environmental legislation a focal point in the marine sector

There is little uncertainty that the utilization of LNG as a fuel will develop in the marine sector, however the rate and pace of development will be exceptionally subject to the timing and geological extent of outflows limitations set out in environmental arrangements. Compliance with the new emissions limits may need to change to cleaner yet more extravagant oil-based fuels, to execute expensive vent gas treatment innovations, or to shift to LNG. After considering every significant element the analysts shows LNG to be extremely appealing when contrasted with other fuels (Thomas & Tsiouplis , 2017).

1.1.1.5 LNG in rail will be utilized in only a few countries

In the transport sector the railways has a moderately low share of energy utilization. Furthermore, the potential for LNG in the rail area is liable to be most obvious in nations with long routes of heavy cargo and low level of electric fueling footing in the freight division, conversely such conditions are found in generally a couple of nations.

In general, given the high demand from Asia-Pacific, the United States will turn out to be one of the major suppliers of LNG. Australia on the other hand, will be giving new and different supply choices to LNG purchasers (Economics and Industry Standing Committee, 2014). During the last decade, the world has seen Qatar to emerge as the leading liquefied natural gas (LNG) exporter of the world (Tamimi, 2015). Tamimi in his working paper for the Brookings Doha Forum (2015), believes that if GCC states prevail over their political differences and consent to a combined and cooperative and a suitable price mechanism, Qatar will meet almost all of the anticipated gas demand in the Oman, UAE, Kuwait, and may even reach further to Saudi Arabia by means of its Dolphin pipeline. In addition to this the Qatar officials are also hopeful to increase LNG exports from Doha to the EU, particularly if the European Commission reduces its dependence on Russian gas, which they are planning to do. With such scenarios the accessibility of overabundance LNG will make the business sectors a purchaser’s place, where customers will have the upside of contracting LNG at the most reduced cost. In a purchasers market, buyers will need to move far from unrefined petroleum connected LNG costs, which will impact the LNG valuing instrument.

1.1.2 Pricing

Despite the fact that natural gas is a worldwide commodity, the strategy for its handling and dealing differs significantly between nations, based basically upon the system for delivery. By large, especially all through the United States, Europe, and Australia, natural gas is distributed in vaporous structure by means of pipeline. Where physical pipelines are unrealistic or unthinkable, LNG permits gas to be transported by means of what is frequently portrayed as a 'virtual pipeline.' (Morales Udaeta, Oliveira Bernal, Ribeiro Galvao & Baesso Grimoni, 2012). With natural gas turning into an undeniably vital worldwide fuel source, it is essential to admire that pricing of natural gas relies on a scope of complex elements. There are various common measures for units of regular gas including British Thermal Unit (BTU), or the joule. In Australia, the normal unit is the gigajoule (GJ), which is one billion joules. LNG contracts are using this unit. (Economics and Industry Standing Committee, 2014). Crude oil has high market liquidity, with oil for the most part sold specifically or by implication through worldwide markets at focused costs. There are various worldwide oil value reference benchmarks, including the West Texas Intermediate value, the Dubai Crude value, and the Brent Crude cost each of which alludes to a particular sort of raw petroleum at a particular location of delivery. The West Texas Intermediate cost, for instance, alludes to the cost for a sort of oil that has a particular arrangement of characteristics, sold at the exchanging center in Cushing, Oklahoma. All oil exchanged in the United States of America (US) is "benchmarked" against this worth. As natural gas is harder to transport than oil, regular gas costs are controlled by winning nearby elements, with gas transportation framework and the valuing of option powers, for example, diesel or coal maybe being the most critical of these (Martin , 2012).

In future, there will be a hybrid pricing model of LNG with a blend of crude oil-linked contracts and Henry Hub gas-connected contracts. The remaining contracts are also prone to be connected to Henry Hub gas costs. Having more supply alternatives won't just lower LNG price, however, this will likewise make the surplus LNG accessible on a spot basis of pricing.

1.2 Significance of the Study

In emerging countries, the supply and demand of LNG solely depends upon economic factors and freight market. In recent era, it has become one of the most developed phenomenon in export field, because of dynamic changes in globalization. One of the studies indicates that, the shipping industry is not exempt from an economic recession. However, this fact was confirmed from the global financial and economic crisis of 2008, which had a strong impact on the shipping market (Kalgora & Christian, 2016). Meanwhile, the contemporary research work is investigating the relationship between economic factors and the freight market in the LNG sector. Moreover, the research is discussing the effect of fluctuation in prices on shipping of LNG around the world and its impact on supply and demand specifically in emerging countries. Most importantly, this study is unveiling major economic factors that affect freight market, which are altogether related to demand and supply in the LNG sector. Finally, the importance of the study is based upon comparative techniques to see how freight market shipping prices of LNG effect demand and supply in emerging countries.

1.3 Problem Statement

Since the 2008 financial crisis, the area has seen both freight rates and qualities for vessels decline, as it attempted to absorb the immense number of new ships requested during the boom phase of 2006-2008. However, the slight pick-up in 2010 in oil and gas demand growth, steadied the market quickly. Somehow, in the later part of 2010 it ended up with evidence that volume increments were not adequate to balance the supply and demand imbalance in tonnage. Currently, LNG sector is facing imbalance between supply and demand specifically in emerging countries.

1.4 Aim of the Study

Aim of the study is to attempt an assessment of interactions between economic factors and the freight market in the LNG sector. With this broader perspective, the report aims to understand the effect of changes in economic factors and the balance of LNG's supply and demand in the LNG freights and vice versa.

1.5 Research Questions

- How economic factors and freight market are associated?
- What are the possible effects of economic factors on the freight market of the LNG sector?

1.6 Delimitation of the Study

The current study is focusing on broader perspective of economic factors and freight market link. Therefore, this study is solely based upon secondary sources. Overall, this study is limited towards emerging countries data, and examining interactions between economic factors and the freight market in the LNG sector.

Chapter 2 - Literature Review

The objective of this chapter is to review some past studies that describe the interactions between the economic factors and the freight market in the LNG sector. Plenty literature of literature exists on the shipping market; however, current literature is focusing on the freight market in the LNG shipping sector as described in the title. The analysis in this chapter is based on "Econometric Modeling of World Shipping" a model constructed by (Beenstock & Vergottis, 1993). The authors of this model have given a general theory that forecast shipping markets of the world where freight rate is one of the major variables. Therefore, the mentioned model will be the focal point as it investigates the applications to the LNG market (Beenstock & Vergottis, 1993).

A study by (Mazighi, 2003) and (Jensen, 2004) is also considered along with the global outlook, economic and other factors affected by the LNG markets. Finally, in this study the use of LNG facilities by the emerging countries has been discussed.

2.1 Beenstock and Vergottis's Econometric Modeling of World Shipping

This model has been developed by (Beenstock & Vergottis, 1993). In this model freight rate includes spot and time charter as an endogenous variable. Fundamentally, this model represents not just demand and supply but also the equilibrium conditions in the shipping markets. Econometric Modeling of World Shipping mainly concerned the freight rate, time charter rates, prices, speed, ship building and scrapping as different factors linked directly to freight rates or the ship markets (UNO, 2013). These elements also include the freight demand, prices of the fuel, operating, ship building and lay up costs. (UNO, 2013).

The ships are taken as capital assets and their demands alter with the return expected on other assets. It also regards the objectives and restraints that the participants in the market have to face and examines responses to the change taking place in the environment; this is done through the methodological approach (Magirou , et al., 1992). Furthermore, the response of the shipping market to predictable and unpredictable changes in the external factors has been studied. For instance, prices, freight rate, ship building, scrapping are likely to exceed their equilibrium value to meet up the demand and bunker price shocks. It reflects that the market may respond to the predictable and unpredictable shocks which has similar effects in the long run but has different response in the short term (Beenstock & Vergottis, 1993).

2.1.1 The theoretical explanation of the model structure

Basically, the theoretical explanation involves only one ship type, but the model itself provides a differentiation of the tanker and dry sector. The insignificant particulars are omitted so that the essential interactions between these markets can give rise to the fluctuations and co-movements in ships rates, prices, fleet and the other aforementioned factors.

2.2 Lowering Prices of LNG Transportation

A study by (Jensen, 2004), recognizes the conditions that are relevant to the existence of the LNG market worldwide. A study reflects not just the possible similarities between oil and natural gas market but also considers the different ways towards global LNG market sets up and functions. Moreover, that study identifies that the main reason, that prevents the LNG market to be as flexible, is the market of transportation. Hence, if there is an excess in capacity of liquefactions and LNG tankers only then LNG can be competitive. Over the last few years, it has been noticed that liquefaction cost and transportation cost are correlated. If liquefaction cost falls down then it also decreases the LNG transportation costs (Wilson, 2015).

The study also states that LNG can be competitive just like the gas markets in South America and United Kingdom after the deregulation of the market, because of the durable obligations of infrastructure of LNG trade in both regions (Jensen, 2004). North America and Europe are like to emerge as the largest LNG importers whereas, Middle East along with Africa will remain the major suppliers; and Egypt and Bolivia hope to join them (Praiwan, 2017). The study analyzes that the Northeast Asian market and Pacific Basin trade will not be very crucial in the future because the growth is likely to move to the Atlantic basin (Jensen, 2004).

The below four conditions have been recognized by (Mazighi, 2003) as necessary for the globalization of LNG market:

1. The natural conditions: They involve the presence of surplus and deficits in gas supply.
2. The economic conditions: They refer to the cost reduction of liquefactions cost.
3. The technical conditions: They refer to the development and modernization in LNG tankers design.
4. The institutional conditions: These are related to the readiness of gas producers to put up for sale in a non-contracted basis

Therefore, an organized market with high liquidity can be created through these four conditions. It can also contribute to the division among the physical and financial area of LNG trade but this process is likely to be a long term process and could take up to ten years. Further, the major differentiation between the oil trade and gas trade is that the oil share is around 45% in the market whereas in the LNG trade it is up to only 6% which means that the probability for the LNG tanker to load in one area and unload in another area is only 6% whereas, for oil trade it is 45% (Mazighi, 2003).

2.3 Future Inclinations

A report issued by the Energy Information Administration (Eia.doe.gov, 2003) for LNG market states the following details:

- Over the last 10 years the cost of liquefaction has reduced by 35-50% that is from $500/ton to $200/ton annually.
- In the late 80s, the prices of LNG newly build tankers have been reduced to $280 million to $155 million in 2003 and in 2004 around $160 million.
- There also has been a crucial reduction in the regasification terminal gas.

Fundamentally, the analysis of liquefaction costs, shipping costs and LNG project cost make it easy to predict the improvement levels. Hence, the development in these areas may decrease the extra cost problems and could boost the LNG shipping markets towards the globalization of LNG trade.

2.4 F**reight market**

The freight market is there, where transport via sea is traded. It is the quantity of money that the charterers have to spend to the ship owners for the transportation services provided by them. In a time charter the ship is “rented” for the freight for a specific time and the charterer has to pay the cost of that voyage (Daly , et al., 2004-2005).

Moreover, charterers are groups or persons who want to transport a cargo from one place to another place and for that purpose they hire a ship. Basically, the brokers provide information about the ships and cargoes that are available along with the prices, in this case, owners and charterers approach to the ships and cargoes management (FONASBA, 2015). However, the carriers of LNG are usually chartered for long term agreements of 10 to 20 years or so. The ship owners are not accountable for the instability of freight rates in the market because the freights are already agreed.

The freight level in bulk shipping is mainly determined by the supply level and demand at any time. If there is a lack of ship availability in the market the rates are like to rise up and if the ships are more than the cargoes the rates tend to decrease (Dretakis, 2005).

2.5 Ship owners and LNG fleet

(Poten and Partners, Inc., 2004), the ship owners can be sorted in to five categories that are as follows:

1. LNG suppliers: They are the ship owners and transporters for sales based on Delivered Ex-ship terms (DES). According to the DES method the vessels to discharged ports are provided by the sellers and specified by the buyers.
2. LNG buyers: They are ship owners who transport LNG that is purchased free on board terms (FOB). According to the FOB method the vessels and property and risk passes are provided by the buyers to buyers at loading port.
3. Independent ship owners: They have a long term contracts with the LNG buyers and suppliers transport committed LNG volumes.
4. LNG project participants: They either have LNG supply access through shareholding, participation, control or sharing terminal capacity.
5. Independent ship owners: They are not committed for long-term employment; however, they give ships to buyers and suppliers of LNG on a speculative basis.

The LNG fleet at the end of 2016 consists of 439 ships with the average LNG storage capacity for newbuilds delivered being around 168.000cm up from 153.000cm the previous year. An important factor for the growing average capacity of LNG carriers is considered the expansion of the Panama Canal in mid-2016. Almost 56% (i.e. 235) of the ships are younger than 10 years and only 6% older than 30 indicating the massive investments in the industry during the last years. Out of the 121 vessels in the orderbook, 67% are associated with longer than one year charters and 20% of them are tied to LNG producers, while LNG buyers reach up to 38% of orders (International Gas Union, 2017).

2.6 The effect of LNG fleet to freight rates

As per the model presented by (Beenstock & Vergottis, 1993), the freight services supply is related to the quantity of trading ships multiplied by the average speed. The complete fleet rate supply is proportional to the fleet size and positively relates to the freight rate but negatively relates to the bunker price. It is very important to differentiate between the long and medium/short term shipping contracts to examine the implementation of the model to LNG shipping freight market. This differentiation is helpful in understanding the effect of LNG supply chain on the changes in LNG shipping agreement in the past few years (Beenstock & Vergottis, 1993).

2.7 Long-term contracts

A research by (Poten and Partners, Inc., 2004) indicates that the structure of LNG freight rate is based on two factors

1. The capital factor: This element is dependent on the rate of the construction of a new ship and the financing rate of the ship.
2. The operating factor: The operation element is based on the cost of the transportation.

Fundamentally, the LNG project agreements between the buyers and suppliers, reflects the long-term contracts of LNG ships working under long-term contracts (Hartley, 2005) However, the ship owner has to maintain a time charter contract that has all the specifications related to the destination, consumption, fuel and the speed. The amount of trading ships is the major factor that affects the freight rate; however, it is dependent exclusively on the LNG projects that are related to the world economy and the LNG projects that take place on an individual basis (Wallis, 2015).

In order to meet the long term shipping demands new ships will be prepared to serve the relevant LNG trade contracts, however, with the expansion of GSPA the shipping contracts are also like to extend (Aronietis, et al., 2016).

Moreover, because of the predetermined nature of the ship supply, the long term contract of freight rates should not be affected, fundamentally, freight rate is likely to increase only when the growth of LNG trade causes the demand for shipping capacity to exceed the ship building capability of shipyards (Sea Europe, 2017).

2.8 Medium term and short term contracts

The trading ships are used more competently with the increase of freight rates in healthy competitive circumstances. The model presented by (Beenstock & Vergottis, 1993) deals with time charter contract as an important component, because the charterer gives a payment to the ship owner over a decided period to assume the control of the ship. Meanwhile, as compared to the long-term the short term freight rates are more complicated because in short term the freight rates are characterized by the demand and supply of the shipping that is dependent on the amount of LNG available (Hellenic Shipping News, 2007). For short term agreements, the supply of ships is dependent on the spare capacity of the ships present under the long term charter and the ships that are not committed. Whereas, the competitiveness is dependent on the age and their technical components (Hellenic Shipping News, 2007).

Somehow, the long term shipping contracts make it difficult to use ships trading in alternative routes but if there is an extra capacity, then the ships are more likely to charter for short term contracts. This means that the LNG tanker business is like the oil tanker business but this reflects a recognized LNG market where supply of LNG demand is balanced by freight rates (Neuhoff & Hirschhausen, 2006). Moreover, as compared to the oil tankers the LNG ships are more intensive in terms of the capital (Wilson, 2015). If the prices are raised, the ship owners who have spare capacity to deliver spot trade are likely to gain profit. However, these would be the bigger companies with several resources and terminal outlets and in case of a weaker market, they have the potential to uphold spare capacity and channel.

In oil tanker business the tentative owners enter the market and compete by offering low prices, whereas in LNG business the tentative owners have to deal with massive financial pressures and ambiguity as the risk and costs linked is greater (Brennan, 2015) In the case of presence of large uncommitted ships there is a spare capacity for short term rented ships. In this case there would be an over-supply of shipping capacity and the freight rate will be inclined to decrease. Likewise, an unpredictable raise in demand would cause an instant raise in freight rates in case of full utilization of the fleet (Poten and Partners, Inc., 2004).

2.9 Transportation Costs

The transportation LNG cost is divided into two segments:

1. The operation costs: It is the non-trading cost that incurs irrespective of commitments of trading ships. This include costs of manning, repairs, maintenance and insurance and are fixed in nature.

2. The voyage costs: It includes the cost of the bunker, port and canal. These costs are related to trade route and have fixed loading and discharge ports. The main cost Bunker includes the rate of boil off; that is, the quantity of boil off gas produced because of heat leaks. The boil off gas is utilized for propulsion systems and its value alters from 0.1% to 0.15% of the entire content in a day (Mazaheri, et al., 2010).

2.10 How LNG Contracts affect the Freight rates

Countries with no original pipeline system are solely dependent on LNG and safety of supply; basically, this process is more significant than the price. This is the major reason why CIF contracts control Pacific region (Stern, 2002). Nonetheless, many buyers choose to buy FOB now, and this process of buying reflects the large number of uncommitted ships under construction. In case, when buyer takes delivery of LNG on FOB basis, that flexibility associate ship preparation that go by the buyer choice. In such a case, the potential exchange or resale of LNG cargoes will be managed by the suppliers and will allow re-routing cargoes to its original alternative terminals (Shepherd & Ball, 2004). The importers, in this way can lower LNG cost by organizing LNG transport themselves. This also means that the buyer will bear the cost of shipbuilding or ship purchasing and fleet management with the risk of ships laid up if there is a supply shortage or a noteworthy decline in shipping freights (Jonesday.com, 2015).

2.11 The effect of lowering LNG prices on the Emerging countries

The lower oil prices have opened up the LNG market in key emerging economies and encourage efforts to decrease costs. These expansions have provided the industry to be strong and durable.

The very initial impact of the lowering oil price is obviously the lowering price of LNG, as discussed earlier in literature that LNG is sold under long term contracts and the prices of these contracts are linked with the prices of the oil (Liu & Ma, 2016). Therefore, if the oil prices are low the LNG prices will also be lower after some months' lag and as previously mentioned.

It was predicted that the prices would drop more in the year 2015. The benefit by the lowering price of LNG would be that the new customers will be brought to the LNG market. The oil indexed have been too expensive for the buyers in the past few years and so now producers can give the same oil indexed agreements as before and also provide customers with lower LNG prices. This also suggests that the negotiation gap between the buyers and the sellers has also decreased and now new customers specifically from the emerging market can be brought forward (Brennan, 2015). The emerging countries are very sensitive to prices of LNG. The main targeted market includes many countries like Pakistan, Bangladesh, Panama and others, along with the existing market in India (Neumann, 2009). In order to support buyers from the emerging countries the LNG developers also may require investing in downstream infrastructure and providing credit support.

It is noted that in spite of the present low oil prices the LNG projects, most of them, over the long term as still economically robust. For instance, a Greenfield project in East Africa or Western Canada needs a FOB (free on board) price of approximately $10 to $12 per MMBtu. A project like this will need oil prices in the range of $70-82/ barrel to break even (Ledesma, et al., 2014). This is in the range of expected long term oil prices. The developers must decrease the cost of LNG in order to take benefit of the present opportunity and encourage long term competitiveness. This can be done through various strategies for example;

- Promoting miniaturization that is, small scale project to get lower unite cost and decrease the complexity of the project.
- Modularization that is, fabricating the components in low cost regions and on site assembling. This can take place with large scale projects that are made up of smaller units.
- Standardization as a tool to cut costs in exploration of oil and its production.
- Reducing the local content needed by resource holding government to save costs.

2.12 The Future of the LNG market

The risk to new LNG projects is more financial than economical because the short term price fluctuations must not have strong influence on the new investments that will need around 10 years to come online but the currents matter a lot (Kumar, et al., 2011).

The present weak market reflects that any agreement made today will engage weaker terms for seller because the LNG contracts reflect the market status at the time of negotiation and not at the time of delivery. Therefore, the companies may find it complex to invest alongside the present cycle, particularly when capital budgets are slashed. Nevertheless, some of the large companies of the world may invest alongside this cycle. For example, Gorgon LNG’s go ahead decision taken in 2009 even after the 2008 financial crisis of oil price crash. The partners of Gorgons were financially strong and looked beyond the present prospects (Stoppard, 2016).

The NOCs (Nations Oil Companies) of countries that import like India, Japan, China and Thailand will have a chance to develop LNG at striking terms for their market domestically. They may partially be able to seal the gap produced by decreasing activities from IOCs (International Oil Companies). The NOCs have to encounter many challenges like the lack of critical operating experience (Kumar, et al., 2011). Still, it is predicted that despite the present challenges the LNG market will play a major role in the future because of the powerful incentives and necessity to make sure the growth of LNG. LNG will also persist to provide clean energy source (Mazighi, 2003).

2.13 Factors integrated with LNG Facility

LNG is relatively a cheap and less polluting fuel therefore, it can achieve greater savings for small and medium power generators, which are struggling to offer uninterrupted and affordable electricity. Nonetheless, despite of the benefits endowed by LNG the power generators have constantly been reluctant to move on with conversion. Fuel cost savings can only benefit if the LNG infrastructure linking them with the LNG markets globally is put in place (Riddell, et al., 2010) The small scale power generators lack the experience and knowledge and also require the capital that is needed to support the growth of the LNG infrastructure that is demanded. This is not the case with large buyers. Moreover, there is a lack of economies that exist in smaller markets which makes it unfeasible and too costly for the power generators to justify the large infrastructure investments needed to supply the markets (Du & Paltsev, 2014).

Recently on the other hand, it is expected that LNG exports from United States will give cheap fuels including the fuel oil, diesel and LNG. In the present section we will discuss the benefits that are provided by LNG. The macro-economic, environmental, commercial and geostrategic advantages of using LNG in small and medium scale are as follows (Marcke, 2013).

1. **Macro-economic and Environmental Factors**

   The International Energy Agency (IEA) in the 2012 World Energy Outlook has estimated that natural gas reserves at current production rates are enough for more than 230 years. Moreover, the economic and environmental advantages of replacing the fuels that are petroleum based with natural gas are important. It is a clean burning fossil fuel. The EIA (US Energy Information Administration) calculates that the total carbon-dioxide, sulphur-oxide, nitrogen and other elements emissions are lower for natural gas as compared to the petroleum alternatives. The low emissions and the less opacity of natural gas are important for the recent global environmental and economical regulations (Jensen, 2004) Furthermore, the economies that are highly dependent on tourism stand to provide benefit considerably from the lowering in pollution as a result of the change to natural gas in industry and power generation (Dorian, et al., 2006).

2. **Commercial Factors**

   The small scale power generators are interested in LNG mainly because of the anticipated cost saving chances it provides. These savings can be achieved as the large price spreads among the fuel oil and natural gas that is expected to be permanent fixture of the energy markets internationally. By switching to natural gas 15% to 35% of cost savings of fuels can be attained. In addition, this switching can help power generator turn away the risks natural in fuel oil markets (Reference).

3. **Geostrategic Factors**

   Countries are likely to accomplish more diverse and secure energy portfolio on geostrategic level. Moreover, the LNG development can provide many positive externalities. LNG can pave way and be adopted by industrial users and integrated into local transportation system (Manassas, 2016).

2.14 Present Global Demand and Distribution to emerging countries

At present, 21% of energy demand worldwide is fulfilled by natural gas (IEA, 2013). In the year 2013, 118 trillion cubic feet (Tcf) natural gas was consumed in the world with 2.7% of Compound average growth rate (CAGR) (BP, 2014). In that year only the LNG trade was 11.5 Tcf which makes up tp 10% of the entire natural gas being consumed. Therefore, the rest of the total gas production globally was transported; around 21% was transported through pipelines and 69% approximately was domestically consumed (BP, 2014).

There are certain regions where the demand for LNG is heavily concentrated. Asia Pacific utilizes LNG already for 36% (or more) of its demand. There are 11 main importers of LNG that account for around 88% of LNG demand globally (Kumar, et al., 2011). Figure 3 portrays a clear picture of the regions that rely on LNG to fulfill their heavy gas demands.

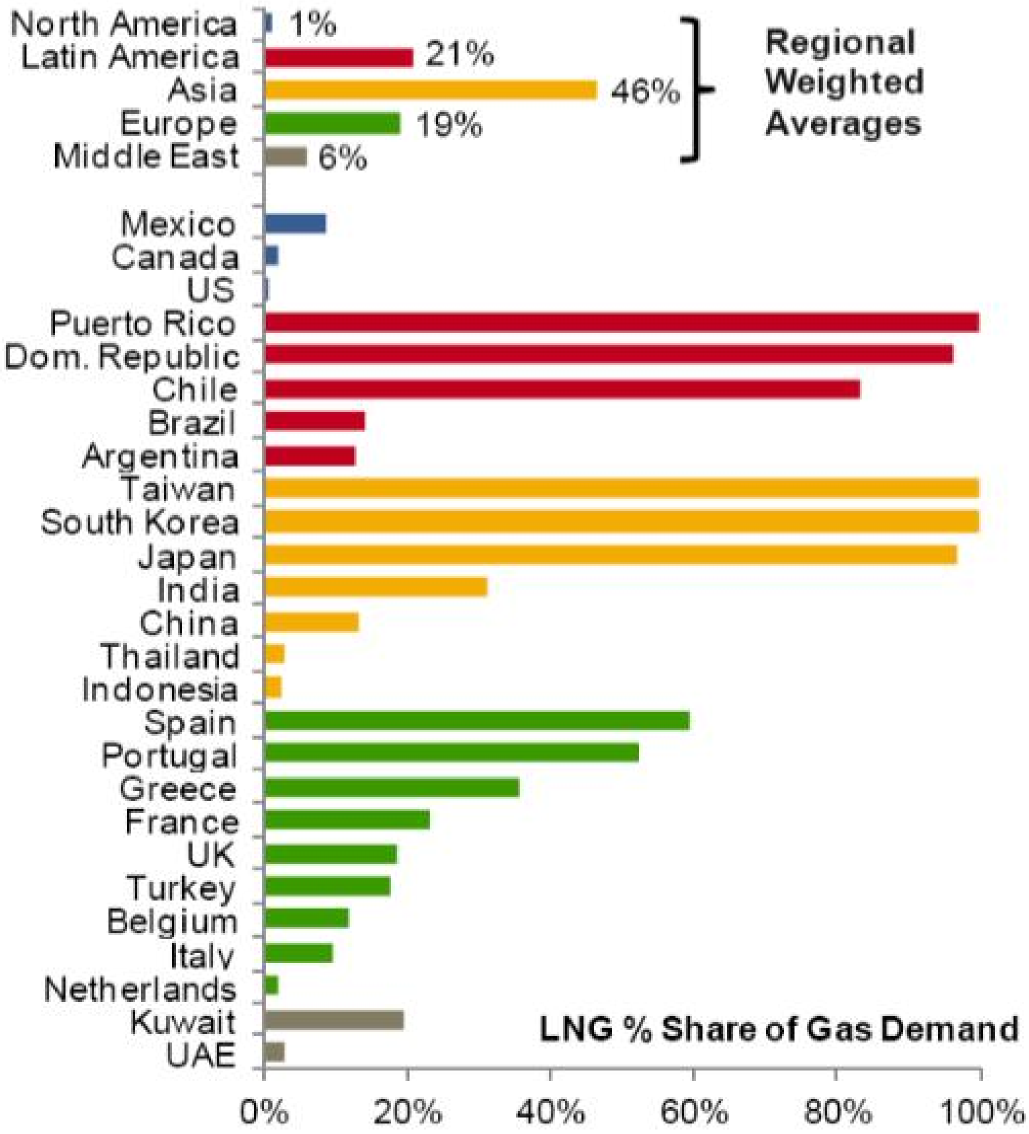

Figure 3: The LNG role in gas markets in the year 2012. (International Gas Union, 2013).

It is expected that the market for natural gas is going to grow extensively. Moreover, it is estimated that there will be a rise in the demand of the present 120 Tcf to 140 Tcf by the year 2020 and more to around 180 Tcf by the end of 2035. (IEA, 2013; BP, 2014).

Economic growth is one of the major factors that drive the demand of LNG, along with the cost of fossil fuel, energy supply, and environmental situation and slow down of nuclear power growth (Adjaye, 2000).

LNG market is growing at an unexpected rate. However, the economic, technical, political and transportation costs related in the LNG value chain make it an undesirable move for shorter distances and proves to be only profitable if LNG is being transported to 8000 km distance or more (Dorian, et al., 2006). (Beenstock & Vergottis, 1993), have explained the concept of freight market demand and supply by claiming that the ship market operates as the monopoly in LNG sector. If the demand of LG is expected to increase globally, the ship owners increase their charter rates and manning rates as per the international demand which ultimately causes the LNG rates to inflate. Similarly, any changes in the operating costs or fuel prices also make the equilibrium point unstable (Taylor, 2015). As the LNG market is relatively new as compared to the petroleum demand and supply statistics therefore the limited capacity of LNG storage causes another major barrier and therefore the rise in costs have been mainly associated to the lack of storage ports and limited number of transportation vessels (Daly , et al., 2004-2005). The LNG market can only be competitive and successful if there is surplus amount of LNG available with an unlimited supply of the freight vessels (Jensen, 2004). LNG liquefaction costs have another major role to play in determining the LNG costs internationally. It has been observed that the liquefaction costs have reduced by 30% to 35% in the last ten years which has visibly decreased the production costs. Similarly, the ship making costs have also been reduced; which is another contributing factor in decreasing the operating costs related to the LNG (Hartley, 2005). Experts have also argued that it is time that ship manufacturing companies consider adding more space and start building bigger vessels knowing the future trends of the LNG market, which will automatically help in decreasing the freight costs. Analysis of many years have proved that bigger vessels had reduced the transportation, operational and fuel costs to a greater extent (Pirog, 2004).

In the recent years the trends of LNG demand and supply in the emerging markets have been of great interest to the scholars. In 1981, Antoine W. van Agtmael introduced the term "emerging markets" to the World Bank by explaining that how many of the developing countries transitional economies are becoming open economies by being more open towards easing up the trading regulations and building allies with other nations for trading purposes. Such emerging markets showed a phenomenon of increasing GDP and encouraged forging investments to boost their respective economies (Shell, 2010). The IMF has introduced a list of 150 countries marked as the Emerging countries which also includes, Colombia, India, Indonesia, Kenya, Malaysia, Mexico and Poland (International Gas Union, 2013). However, the FTSE group has introduced further two categories of Emerging markets as 'Advanced Emerging Countries' and 'Secondary Emerging Counties' where only Mexico and Poland succeeded in making place in the Advanced Emerging Countries and the latter category accommodates Colombia, Indonesia, India, and Malaysia (Petroleum Economist, 2015).

With the rise in the demand of LNG, the emerging countries are likely to gain benefit. Following are some the emerging countries that have recently planned LNG shipping:

1. **Kenya**

   In the near future, Kenya plans to construct 38 billion of offshore LNG importing and storage. The officials of Energy ministry have declared that the government has outsourced United Kingdom to prepare tender docs for 170 000 cubic meter facility. This will be made through a public and private partnership. The investors will fund, build and operate the

LNG facilities for the next 30 years before it is handed over to government. This facility will boost Kenya's Electricity Generating Company and also planning to construct 500MW LNG power plants (Theeastafrican.co.ke, 2015).

2. Poland

Poland has been negotiating with different LNG producers since the year 2006, to allow diversification of gas supply and reduction of Russian gas reliance. Poland's annual demand for gas in 2009 was around 16.4 billion cubic meters. Domestic production reports for five billion cubic meters and the rest is given by Russian imports. A new terminal is anticipated to primarily receive 2.5 billion cubic meters of LNG a year as part of the strategy by Poland in order to limit its reliance on imports from Russia. The capacity will be improved in following expansion phases of the project which depends on demand to 5 billion cubic meters and then by 2017 or 2018 to 7.5 billion cubic meters (Hydrocarbons-technology.com, 2015).

3. Indonesia and Malaysia

Japan is the largest LNG consumer in the world and its LNG suppliers are mainly Indonesia and Malaysia. This means that Indonesia is now the world's fifth largest LNG exporter, and accounts for approximately 7% of the total LNG exports globally. The greater part of Indonesia's LNG is imported by Japan; however, the smaller volumes go to Taiwan and South Korea. Malaysia is the third largest LNG exporter in the world; and the ships mainly go to Japan, with smaller volumes to Taiwan and South Korea (US Department of Energy DOE, 2013)

4. India

After US, China and Russia, India is the 4th largest energy consumer. Between 1990 and 2011 energy consumption of India has doubled. The Indian gas market is one of the fastest growing in the world and as (IEA, 2013) predicts the gas demand will rise at 5.4% per annum reaching 132 billion cubic meters by the year 2030. In the year 2004 India began to import the liquefied natural gas from Qatar and heavily relies on imports to fulfill the gas demand gaps domestically. India was the 6th largest LNG importer in the year 2011 with 5.3 % of the global imports. The country' natural gas demand is driven by the power and the fertilizer sectors (US Department of Energy DOE, 2013)

5. Colombia

The El Department de Cordoba project is an LNG project located in Colombia. This project includes the growth of a 360,000 GPD LNG plant to provide the area of the Uraba Antioqueno and other regions of the Atlantic coast of Colombia that are away from the pipeline infrastructure. Also it supplies by means of Cryogenic ISO containers the nearby countries in Central America, South America and the Caribbean. The LNG will be traded to the distributors who will further sell it from a centralized regasification location to the end users. The distributors will buy LNG and a third party LNG transportation company will deliver it to the regasification stations for each client (Altenesol.com, 2015).

6. Mexico

One of the potential Atlantic Basin LNG importer is Mexico, Gulf Gateway, Gulf of Mexico. It is owned by the Accelerate Energy, the sub-sea Gulf Gateway Energy Bridge that is around one hundred and sixteen miles off the Louisiana coast. This energy bridge began the operations in year 2005 and is considered to the world's first offshore receiving port. It has the facility of base load capacity of 183 Bcf per year and utilizes converted LNG carriers in order to regasify LNG through deck-mounted vaporizer (US Department of Energy DOE, 2013).

Chapter 3 - Research Methodology

The purpose of this research methodology was to give a rigorous assessment based on data and evidence. Subsequently, the target sample group was comprised of emerging countries including India, China, Brazil, South Africa. Meanwhile, the collected information additionally was nearly examined in the enlightenment of distinguished authentic sources. The research methodology in this evidence based survey is comprised of qualitative data which are assessing economic factors and freight market of LNG sector specifically in emerging countries that are mentioned above. However, after analyzing extensive data, the significance of economic factors and freight market on LNG sector has been discussed in the findings section. Additionally, the reviews that did not assess these measurements, have been excluded. Somehow, the scope of this review is certain, as it focused on emerging countries data.

Laura Tyson, an ex- chair of the US President's Council of Economic Advisers, states in her recent article that over the past year, worldwide economic environment altered noticeably, also in unanticipated manners. Even the growth in China accounting for almost 40% of the growth of the entire global market has fallen to its lowest possible rates ever since 1996, although its stock market rocketed to untenable heights. The European Union and the United States continually amassed economic sanctions on Russia as a reaction to military excursions in Ukraine, stressing the geopolitical risks linked with investments done across the border. In addition to this; exchange rates have been swaying by and large, fueled by genuine or projected modifications in monetary policy like in the case of the Federal Reserve.

The universal financial markets got rattled and investors got frightened due to such rapid changes which furthermore reduced the investor’s desire for risk. This has become a cautious attitude that that is being reflected in the emerging markets. Even with such inert conditions; (Bremmer, 2015);

says that ALL are giants at the present. Last year GDP in India was more than $2 trillion. China's economy second in power only to the U.S.'s has an output which is five times more. Albeit several hiccup; there was a great rise in growth in Brazil to 7.5% in 2010 from 4.3% in 2000 and in the same decade, middle class in Russia also grew twice its size. However, in the same article Bremmer quickly shifts his point of view and states that it is changing again. China's economy is grinding into a lower gear, growing in 2014 at the slowest pace (7.4%) in nearly a quarter-century. Scandal-plagued Brazil stands on the edge of recession. A cliff dives for oil prices, sanctions, and the poor political choices of its leaders have Russia reeling, its economy on track to contract 3.5% this year. (Bremmer, 2015), suggests 7 new countries as the emerging markets including:

1. India
2. Malaysia
3. Indonesia
4. Mexico
5. Colombia
6. Poland
7. Kenya

Consequently, the selection of emerging countries was made carefully, ensuring that each country data have profound comprehension about economic factors and the freight market in the LNG sector not simply by assessing daily papers or articles but rather through personal analysis. However, the following represented case study is exploring the past, present and future of the shipping in LNG sector in these emerging markets.

The case Study

The LNG boom has been an unexpected one which changed the entire dynamics of the energy industry. LNG has become one of the most significant energy alternatives in the recent years since the oil crisis (Brennan, 2015). The need for energy diversification caused uproar among the fuel users and LNG was seen as the most suitable alternative by many due to its varied application options from domestic use to industrial usage. The LNG sector has seen a huge variation in the pricing strategy which peaked in years 2012 and 2013 and a sudden fall was reported afterwards (IGU World LNG Report, 2013). Experts and analysts believed that this drastic fall in LNG prices is caused by the sudden changes in the demand and supply as well as the shift in the economic factors that affected the freight market of LNG. Alongside, the emerging nations such as Colombia, Indonesia, India, Kenya, Malaysia, Mexico and Poland have played a vital role in influencing the demand and supply of the LNG by playing a crucial role of either an importer or exporter. It is also being reported that after the oil war the next big controversy is expected in the LNG sector where gas exporting countries will compete against each other to win the LNG export bids (Du & Paltsev, 2014).

Liquefied Natural Gas (LNG) is one of the most demanded fuel alternatives after the petroleum crisis happened globally because of the war in Afghanistan and Iraq in the Middle East, this global oil jolt generated a need for diversification in the fuel resources at economical rates. In 1970's the demand for LNG was insignificantly low at only 3 billion cubic meter whereas, this trend of alternative energy grew to 243 billion cubic meter by 2009, this rate of increase in only 39 years is mindboggling high (Wilson, 1974). This strong global demand for LNG has increased at an exceptional rate of 7.6% in contrast to the projected rate of 2.7% in the year 2000 (Vivoda, 2014). LNG is formed at -162C/ -260F temperatures when gas is converted into odorless and colorless liquid, and is transported to countries mainly through ships (Timera Energy, 2014). LNG is being widely used for household purposes as well as in the transportation sector, and with each passing year the demand is rising at an exceptionally higher rate, and at the same time experts believes it to exceed the demand of petroleum in the near future (Daly , et al., 2004-2005) Experts believe that the demand and supply is highly affected by the economic factors as well as the freight market pricing strategy globally. In 2004 there were only 140 LNG ships which made a monopoly in the world market of LNG freight market supply (Smead, 2015). The emerging markets of the globe are playing a critical role in the import and export of the LNG, depending on the domestic and international demand.

Facts and Figures

- LNG is basically gas which is cooled at -160 degree Celsius to give it a liquid state
- LNG has half of the weight of water.
- LNG is colorless and odorless; however, Tetra hydrothiophene, or THT, is added to give it an odor to suspect any leakages.
- LNG is considered to be a green alternative because its burning does not add Nitrous oxide and Sulphur dioxide emissions in the air.
- Japan is the only country which depends on 100% LNG imports.
- Currently there are 30 countries importing LNG.
- LNG has a variety of usage options however; currently it is being used to generate electricity, fuel for transportation, feed for fertilizer industry and domestic cooking.
- In the last 45 years, since the commercialization of LNG, 63000 voyages have been made without a single accident or mishandling reported.
- It costs $ 1 million to build LNG fuel storage house.

However, the literature confirmed that the body structure of our research has diverse perspectives. Therefore, quantitative data has increased the theoretical support of our research.

Meanwhile, this review is exclusively comprised of past, present and forecasted quantitative data.

3.1 Research design

The current study is consisted of past, present and forecasted qualitative data method approach. This study is focusing on economic factors and freight market in the LNG sector. This is cross-sectional study. The key data resources were selected from the emerging countries LNG initiatives and consumption methods and graphs. Additionally, to qualitative review, this research concentrated on following research plans including: critical data analysis and consumption forecast. Fundamentally, critical data analysis is an efficient data aggregation approach. Consumption forecast of LNG setting incorporates, long-term plans in economic factors. Therefore, reports and graphs provide an opportunity to get descriptive data about the effect of economic factors and the freight market in LNG sector. Finally, the data has been analyzed in next chapter of this report.

3.2 Population

The population of contemporary research is comprising of emerging countries including India, China, Brazil, South Africa. However, Malaysia, Indonesia, Mexico, Colombia, Poland and Kenya data has been extensively focused. In the following section, emerging countries data regarding LNG has been discussed.

LNG in Emerging Countries

There is no doubt that the LNG is the next best alternative to the oil and many countries. LNG already have started replacing oil based systems with compatible solutions in order to overcome any obstacles (Mazighi, 2003)The governing bodies have started an increased emphasis on the contingency planning of LNG reserves as it holds the future of energy needs. The emerging countries have been always on the watch list of the global economic forms, which has the manufacturing as well as services hubs to these nations in order to combat higher operating costs of developed nations (Vivoda, 2014).

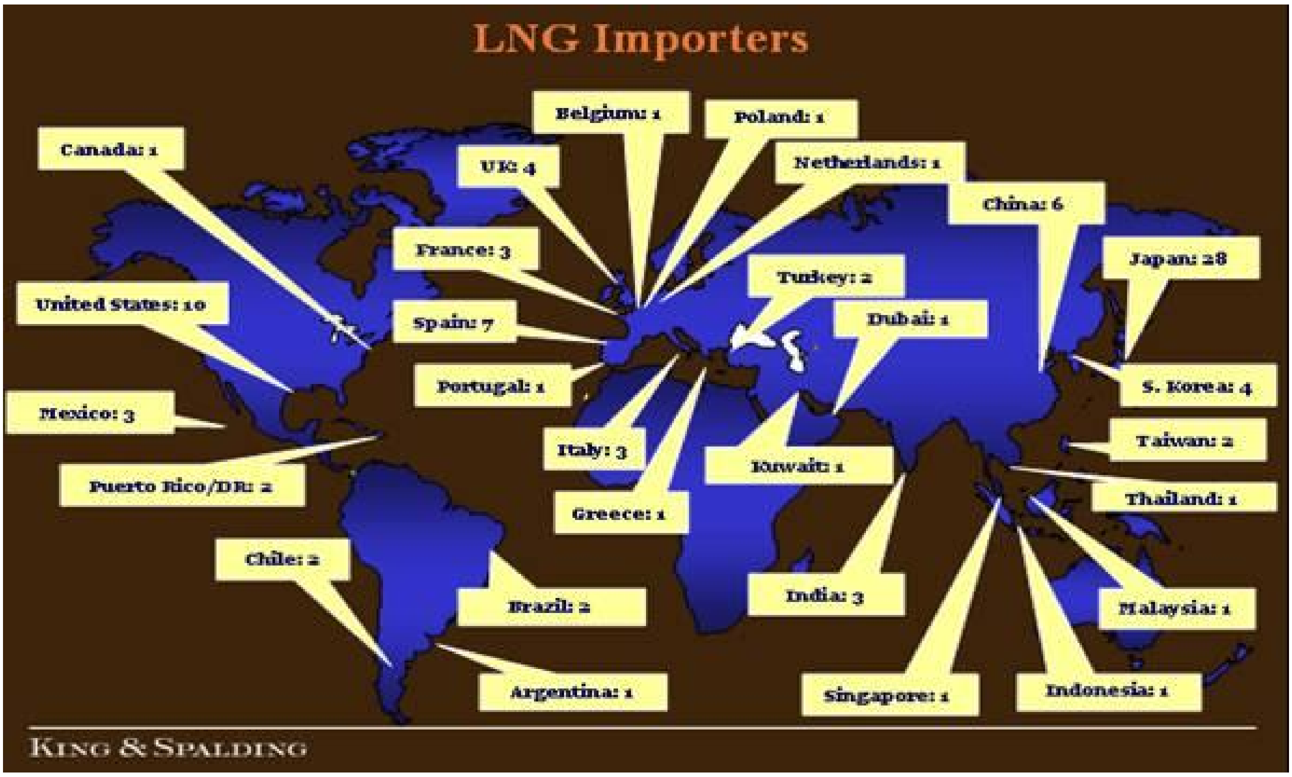

Figure 8: LNG Imports

India

India is being one of the developing countries that is witnessing one of the rapid growing economies in the Asia. Currently, India ranks at the 4th position in terms of its energy needs due to the booming economy and a major chunk of gas needs. Especially, LNG is demanded by the refineries operating in India. Currently, India has enough gas resources to cater the country's need for LNG and other related outlets. However, this demand is going to increase at a massive rate in the near future which will call for LNG import from other countries through liquefaction terminals or pipeline projects (Vivoda, 2014) The Turkmenistan- Afghanistan- Pakistan and India gas pipeline project is a future hope for India in terms of fulfilling its gas needs, however, the project seems to be in jeopardy because of the political unrest between the involved countries and this situation calls for another suitable alternative (Lai and Cheng, 2004).

Experts believe that the LNG demands of this country are ever rising by keeping in view its population demands versus the economy trends. However, the analysts believe that if the assumption of successful gas pipeline project is considered then in all probabilities, India will be the major buyer of LNG in the region followed by Japan (Adjaye, 2000). The ministry of Petroleum and Gas has already rolled out project plans to increase the liquefaction capacities at its terminals for storage purposes. Experts also believe that it is high time that India should consider in signing long term contracts for LNG to benefit from the LNG freight rates as compared to short term contracts which is both, pricy and risky (Gas and Power, 2015).

India's LNG Import Data

Country	Imports (MMTPA)	% share
Algeria	0.4	3%
Egypt	0.6	4%
Nigeria	1.4	10%
Qatar	10.9	80%
Yemen	0.4	3%
Total	**13.7**	**100%**

Table 1 Source: (Barden, Pepper and Aggarwal, 2009)

Malaysia

Malaysia is one of the smallest countries on the globe but with a huge potential in LNG export market. It has been reported that Malaysia is the biggest exporter of LNG after Qatar. Meanwhile, in near future it may overtake the position and could become the world's leading LNG exporting country. Much of the LNG supply and demand in the Asia is managed by the Malaysian companies operating in the LNG sector. Having abundant natural resources of gas, Malaysia has not only been self-sufficient in meeting the country's demand itself but have had an abundant production capacity resulting in net exports.

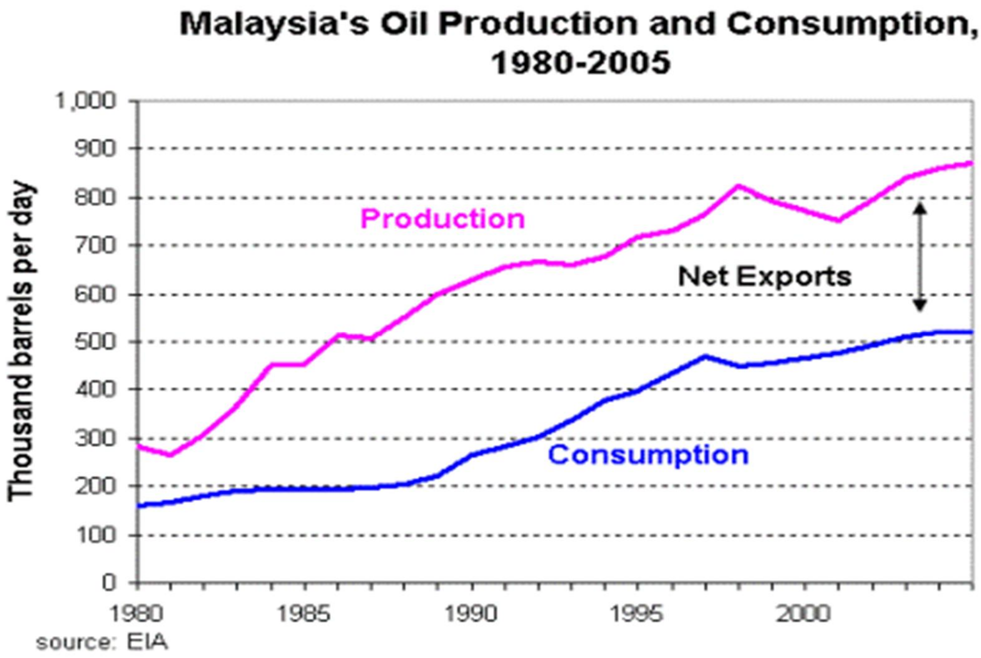

Figure 9 Source: (IEA, 2013)

Malaysia exports the largest volume of LNG to Japan followed by South Korea, Taiwan and China, and have signed long term and medium term contracts with these countries. Petronas is a Malaysian company which has been contracted with the spot LNG and is currently the supplier of LNG, besides this the company also has major shares in the Bintulu LNG complex which is one of the largest manufacturer of LNG in the country. (Barden, Pepper and Aggarwal, 2009)

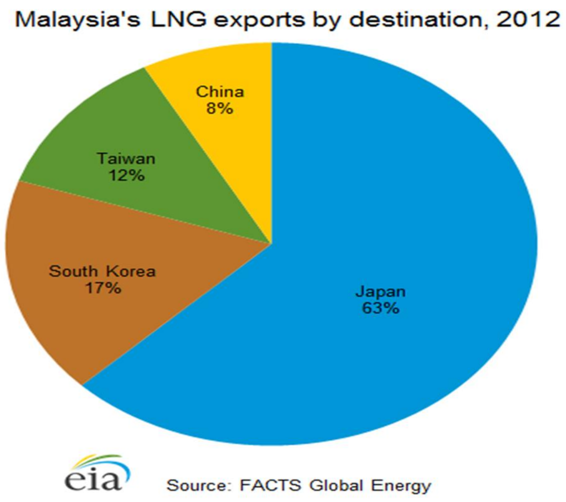

Figure 10 Source: **Global Energy**

With the growing demand of Malaysian LNG in the world and mainly in the Asia, Petronas have also suggested investing into two floating liquefaction plants for increasing the supply and demand of LNG. This increase in capacity is going to make Malaysia one of the dominant leaders in determining the LNG prices internationally, whereas, at the same time it is important to consider the fact that so far the oil prices in Malaysia have been regulated by the Control of Supplies Act 1961, whereas, no such regulation authority is controlling the LNG terms and conditions or the price (Liu & Ma, 2016).

With the fall in demand of LNG during the previous years, Malaysia has seen a slowdown in the shipping sector which worried the ship owners. According to a research, it is estimated the around 30 to 40 LNG tankers were docked without any contract and a huge number of LNG vessels was not in use. The LNG freight owners were losing $60,000 per day which they could have earned otherwise as per day charter (Zhu & Maxwell, 2008).

Indonesia

Indonesia is the fifth largest exporter of LNG in the world followed by Algeria, Russia and Trinidad. Until the 1990's Indonesia was one of the major contributors in the global LNG market until the domestic demand for energy rose and the political influence increased in the LNG industry (Shell, 2010). High regulation policies were designed and all the LNG exporters had to allocate 25% of LNG production capacity for the domestic use which decreased the export quantity. The following graph explains the production capacity along with its share in the international market.

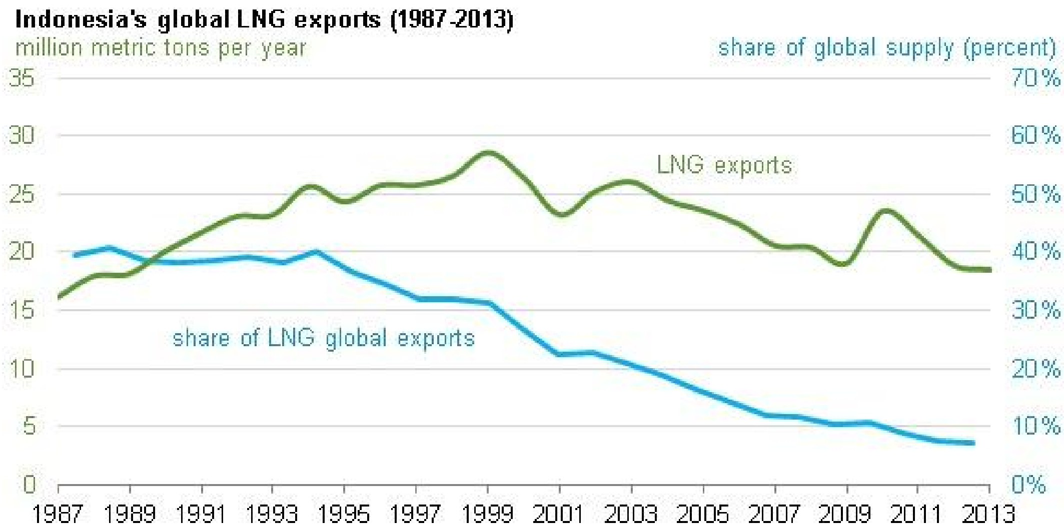

Figure 11 Source: Maritime Connector

According to experts, Indonesia has abundant sources of natural gas, which it needs to utilize in maintaining its international share in the LNG market. However, with only three liquefaction plants operating in the islands of Sumatra, Kalimantan, and Papua, a need of increasing the regasification capacity has been advised so that the country could maintain its domestic demands as well as the international supply (Zhu & Maxwell, 2008). Currently, a huge percentage of LNG is being exported to Japan followed by South Korea, China and Taiwan, whereas, approximately only 1% is being exported to Mexico, which is merely an insignificant ratio (EY Report, 2015).

Figure 12 Source: U.S. Energy Information Administration, PFC Energy

Colombia

Colombia, located in the Latin America, is one of the emerging countries which have recently observed a regional boost in the economy. The country engaged in both, the import and export of LNG which makes Colombia's strategy for managing the LNG as one of its kind (US Department of Energy DOE, 2013). It has also been reported by the government agencies that Colombia is heading towards a gas deficit which will adversely affect the energy needs of the country. Therefore, gas exploration projects need to be speeded. At the same time, Colombia has launched a floating liquefaction plant which is drawing gas, about 3 km away at the sea. The demand of LNG is ever increasing in Colombia where it is expected to exceed the supply by 2021 and can cause a crisis for energy needs.

Currently, Gazprom has signed a contract with the Pacific Rubiales, the LNG producing company of Colombo, to purchase 100% of the LNG, however, the experts believe that due to a fall in the international oil pricings early in the 2015 caused the project to face some delays which is a visible indicator that a fall of oil prices is closely linked to the demand of LNG globally and the turmoil in the oil industry will have drastic effects on LNG demand and supply (EY Report, 2015).

As the Pacific Rubiales is maintaining the export ledgers of LNG, at the same time, Colombia is signing a contract for regasification plant which will be used for LNG imports in the country. Many experts believe the government of Colombia should place a ban on the export of LNG and should consider keeping the reserves for domestic energy needs (Dorian, et al., 2006). At the same time, World Bank's move to finance the liquefaction plant has been criticized because of the country's economic boost.

Poland

Poland is one of the eastern European countries which have been highly dependent on Russia for its gas needs. Suffering the lowest temperatures in the winters, the Russian gas pipeline fails to meet the Poland demand for natural gas due to low gas pressures. As per the statistics generated by the (BP, 2014), Poland has enough gas reserves for the country to last for 27 years at straight, assuming the demand remains the same. However, if it is seen in the long term that Poland does not have huge gas reserves and it is soon running out of gas resource. In the recent years, the LNG demand of the country has increased at a rate of 2.6% whereas 80% of the gas imports were from Russia and rest from Germany (EY Report, 2015). Gas is considered as one of the most scares resources in Poland and the energy insecurities are high. The LNG industry is bound to maintain a gas reserve for 30 days minimum in case of any major breakdowns or catastrophes.

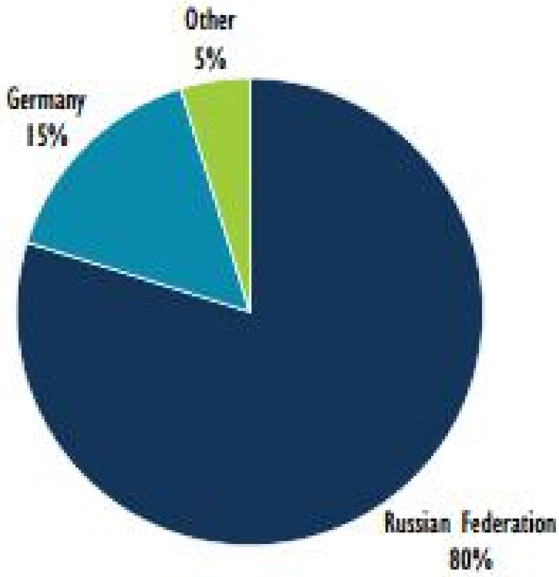

Figure 13

Poland had announced the construction of liquefaction facility at its port with a capacity for storing LNG equal to half of the country's gas requirement. At the same time Poland is also looking for diversification options by developing shale gas terminals' derived from the sea. On the other hand, Poland and Croatia are in the process of signing mutually beneficial contracts to build LNG terminals to cut down the monopoly of Russia's gas in the region. As per the former U.S. Vice President, Joe Biden, the Poland-Croatia LNG energy terminal can have a lasting impact on the European Union's energy source (US Department of Energy DOE, 2013). This coalition can make the respective countries the energy hub of the European Union and can change the dynamics of the energy sector in the EU (Stern, 2002).

The country's dependence for gas on other countries and significantly high demand for LNG calls for a need for diversification. Poland's efforts in becoming self-sufficient in LNG needs by exploration in the sea as well as collaborating with other countries to establish LNG terminal's is a move towards controlling the supply which will automatically balance the LNG prices in the region. If Poland and Croatia succeeds in creating the liquefaction terminal, then in near future it might be exporting LNG to countries like Bulgaria and will become a key player in determining the LNG rates in the region.

Source: (IEA, 2013)

	1990	2000	2005	2010	2011	2012*	2018**
Production (mcm/y)	4 095	5 224	6 057	6 079	6 247	6 193	5 684
Demand (mcm/y)	12 096	13 346	16 231	17 155	17 178	18 112	18 512
Transformation	833	947	2 076	2 059	2 127	0	-
Industry	6 060	5 517	6 381	6 292	6 662	0	-
Residential	3 995	4 083	4 280	4 690	4 312	0	-
Others	1 208	2 799	3 494	4 114	4 077	0	-
Net imports (mcm/y)	8 001	8 122	10 174	11 076	10 931	11 919	12 828
Import dependency (%)	66.1	60.9	62.7	64.6	63.6	65.8	69
Natural gas in TPES (%)	9	11	13	13	13	14	-

Table 2 Poland's Gas Data

Kenya

Kenya was one of the country's which has agreed on buying the LNG from Qatar, however, with the recent explorations, it has been discovered that the Kenya has its own two blocks of the natural gas reserves in the off shores. This discovery has made the officials thinking again and is causing a delay in signing LNG contracts. In case of LNG import Kenya would have to invest $500 million in the construction of regasification plants (Theeastafrican.co.ke, 2015). The experts believe that natural gas reserves are extremely important for the country however, it is high time to delay the contracts of imports because Kenya has to find its own market of LNG exports and the project plan needs a reversal strategy (International Gas Union, 2013).

Mexico

Mexico has emerged as one of the fastest developing countries of the world and holding a huge percentage of LNG spot market because of its ever rising energy demands. Currently Mexico has only two regasification terminals and does not have any liquefaction plant. By 2020, Japan has showed interest in purchasing LNG from Mexico if it constructions a liquefaction facility. The country's current production of gas is less than the average consumption and this is calling for a need to invest in diversification of LNG plants. Currently, Nigeria followed by Qatar and Peru are the biggest exports of LNG to Mexico (UNO, 2013).

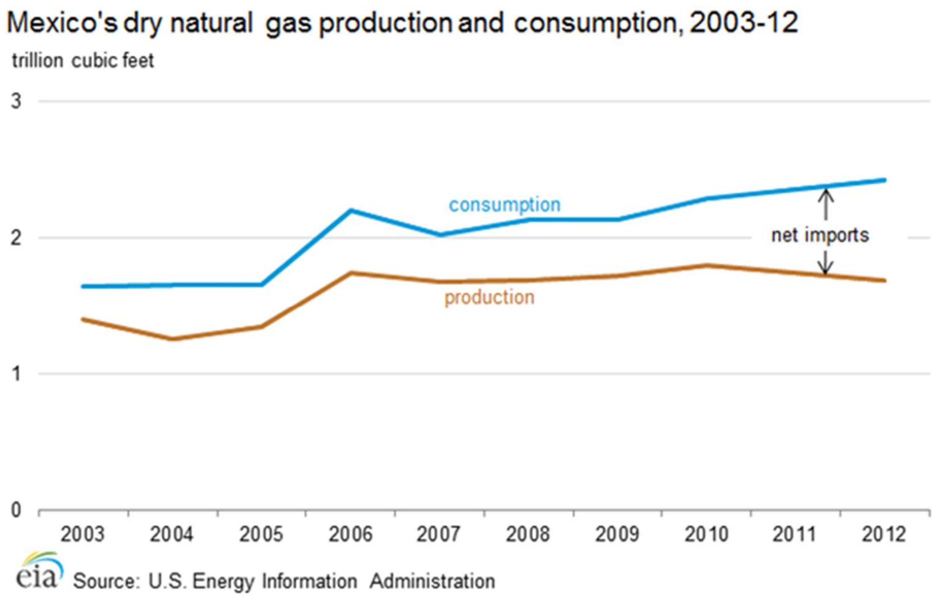

Figure 14 Source: US Energy Information Administration

At the same time, Mexico has a well-developed gas pipeline with the US and 60% of the gas is being imported from the USA. CFE is a national organization of Mexico which has purchased eight LNG cargo ships to cover the demand gap of LNG in the country (Adjaye, 2000). Earlier, this purchase move was designed to purchase thirteen LNG cargo ships, however, the rapid fall in international oil prices made CFE uncertain about huge investment and therefore the quota was reduced. Experts believe the CFE has been smart enough to reduce the amount of LNG ships because the LNG industry is highly affected by the international oil prices (Bremmer, 2015)

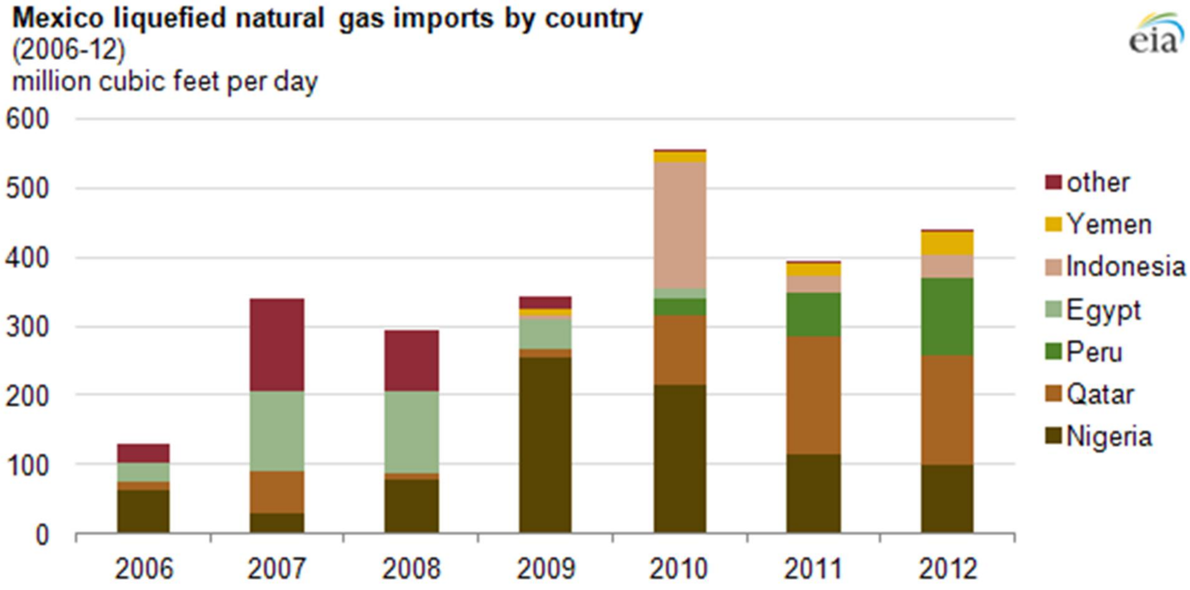

Figure 15 Source: (EY Report, 2015).

3.3 Instrument measurement

In this area, each question for searching data was taken from general to specific stream. Meanwhile, on the basis of following research questions information has been collected. Hence, these questions have been followed after critically analyzing research objectives. Moreover, these questions go further to inspect elements with more concentration and focuses economic factors and the freight market in the LNG sector. In more extensive sense research questions resemble the following:

Research Question no. 1: What are the possible effects of economic factors and freight market in the LNG sector?

Research Question no. 2: How economic factors and freight market are associated?

3.4 Sampling strategy

This research work is consisted of purposive based sampling strategy. Moreover, research is being conducted in emerging countries including India, China, Brazil, South Africa. However, Malaysia, Indonesia, Mexico, Colombia, Poland and Kenya data has been extensively focused. Moreover, purposive sampling method has been used as a sampling strategy. Fundamentally, Purposive sampling technique is one of the most common sampling strategies, groups participants according to pre-selected criteria relevant to a particular research question. Purposive sample sizes have been determined on the basis of theoretical saturation. Purposive sampling is therefore, most successful in case of economic factors and the freight market in the LNG Sector of emerging countries.

3.5 Unit of analysis

Unit of analysis for the contemporary research is consisted of emerging countries data.

3.6 Data collection method

The data collection process involved secondary research. Therefore, online data of emerging countries, authentic source information, academic researches, market research and LNG consumption models have been considered.

However, it was difficult to arrange information systematically of more than 5 emerging countries data. Therefore, our study is consisted of very carefully shortlisted data. Further, the collected data has been described following.

Economic Factors

The LNG market has been highly influenced by the economic factors of demand and supply. It is evident from the previous studies that the freight charges add to the eventual LNG market price and therefore the pricing strategies have been extremely variant as compared to the petroleum industry. The global switch to LNG mainly happened due to the global oil hit which generated a need rather a demand for fuel diversification and LNG was introduced as one of the cost effective options. However, knowing the potential LNG market holds the growth rate was exceptionally high, although the costs could have been controlled to a greater extent if the economic factors were evaluated well in time with possible solutions. Studies have revealed that the following economic factors have played a major role in developing the LNG market where it stands today.

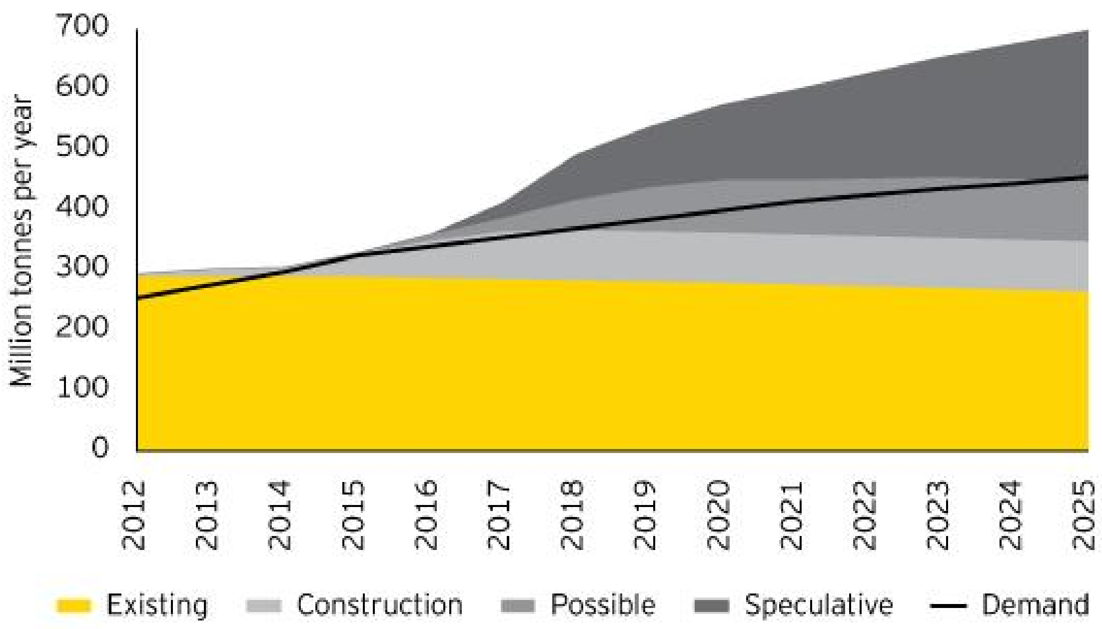

Figure: 4 Source: (EY Report, 2015)

Demand

The LNG market has few simple key players which have been determining the demand of LNG globally. Throughout the research, it is evident that the oil crisis was one of the contributing factors which made LNG popular among the suitable alternatives worldwide. However, it is important to keep in mind the role of other key players in a lasting impact on the demand of LNG (Beenstock & Vergottis, 1993). Firstly, gas is abundant and relatively cheaper as compared to the oil prices, however, LNG comes with its limitation of the importer's capacity for storage or regasification at the liquefaction terminals. If there will not be any spare capacity, the LNG demand will automatically fall. Apart from this, the local and international policies on the pricing and development strategies of LNG alternatives such as solar, coal and etc., also affects the demand of LNG to a greater extend (Hartley, 2005).

Supply

It has been argued that in order to achieve equilibrium and stability, it is very important for the supply and demand curve to maintain its balance, however, as the stated position is the most desirable but unfortunately it is very rare that it happens in reality. In recent years the oil and gas industry had been facing drastic shifts. The supply of LNG is dependent on number of factors which further determine to which extent the global need with be met. Any country which is exporting LNG needs to first analyze its gas production capacity versus the domestic usage. In case of less domestic use, the country qualifies for export of LNG. Secondly, LNG requires liquefaction terminals and the capacity of liquefaction further affects the supply. On the other hand, it is also to consider the government policies and focus on the LNG export strategies as many countries have abundant natural gas resources but they have not considered its exploration.

Investment in Transportation freights

First LNG transportation freight started off in 1959 from UK, since then LNG has been made commercial for industrial and domestic use, and the scope heightened in the 1960's. The freight market played a monopoly and a vital role in determining the eventual sale price of the LNG in the market. The ships with LNG vessels were limited in quantity and high in terms of charter rates. However, with the increase in scope of LNG market globally and reduced demand of oil with surplus supply made the ship owners reconsider their asset options and many moved towards the construction of LNG vessel ships which automatically increased the supply of LNG. The LNG freight rates were highest in years 2012 and 2013 but the charter rates halved to $70,000 per day after the inclusion of 119 LNG vessels in the freight (Goodridge, 2015).

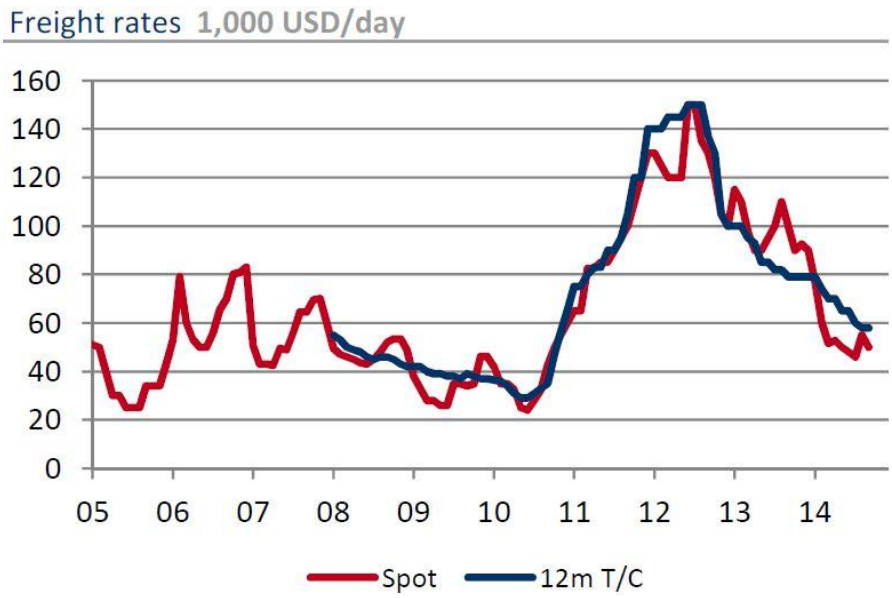

Figure 5: Source: (Timera Energy, 2014)

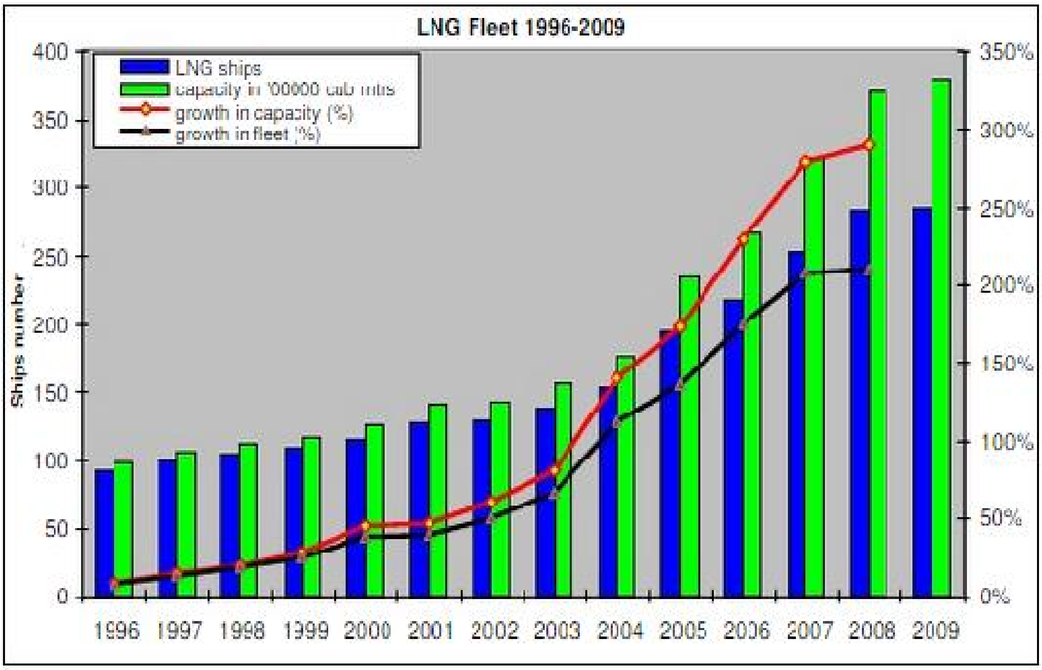

Figure 5 Source: *Combined data from Clarksons SIN and Maritime Business Strategies*

The falling oil prices globally were already a depressing indicator for the freight industry, and the glowing LNG profits were the only hope for the vessel owners. This shift in trends to make profits and survival possible in oil and gas shipping industry resulted in excess supply of vessels. Hence, reducing the average cost of charter per day. Shipping costs makes a huge chuck of the total LNG price followed by the fuel and port costs. The LNG shipping capacity increased to a greater extends which exceeded the expected demand and therefore, a fall in LNG rates was evident globally (Dorian, et al., 2006). The increase in competition in the freight market due to additional capacity reduced the profit marines and therefore investments in the freight did not turn out to be as fruitful as the investors expected (Dretakis, 2005).

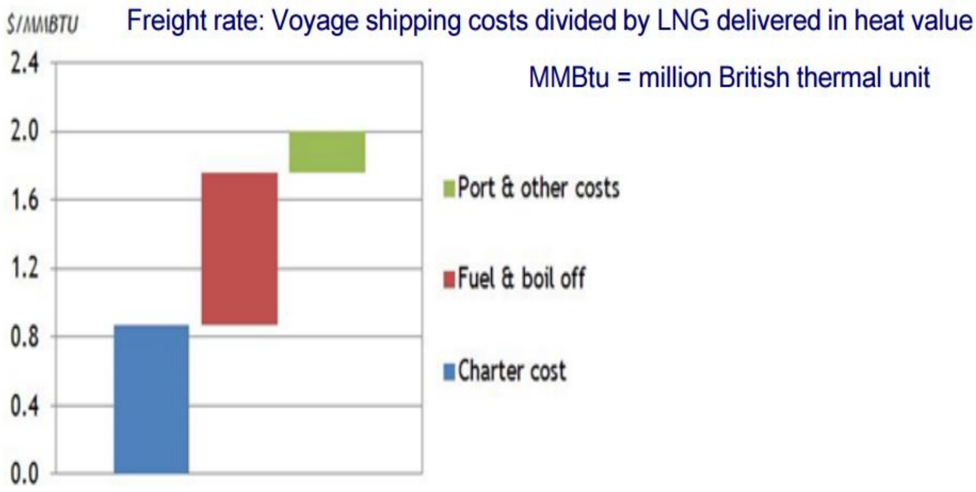

Figure 6: Source: Gas Fund Australia

Investment in the Infrastructure

LNG industry cannot operate in isolation as it is sensitive to the production hubs, freight industry and the storage centers. In order to understand the process of LNG from extraction till it reaches the final customer, the value chain process needs to be understood first. Investment in the LNG sector was extremely high and the most affecting factors were the liquefaction costs and the shipping costs (Hartley, 2005). Over the years, the cost of liquefaction also fell to a greater extent with the construction of more LNG ports causing an increase in the number of LNG exporters around the globe; this factor ultimately affected the global price of LNG. Besides this, the LNG owners knew that they can further reduce the cost of liquefaction by moving the onshore facility centers to floating facilities which was another added strategy to reduce the liquefaction costs (Sea Europe, 2017).

Another factor, as discussed earlier, which reduced the cost, was an increase in supply and reduction in demand at a global level. The booming charter rates were no longer applicable due to an increase in the global fleet of LNG vessels and a stagnant demand especially in the Asia where Japan is the biggest importer (Liu & Ma, 2016).

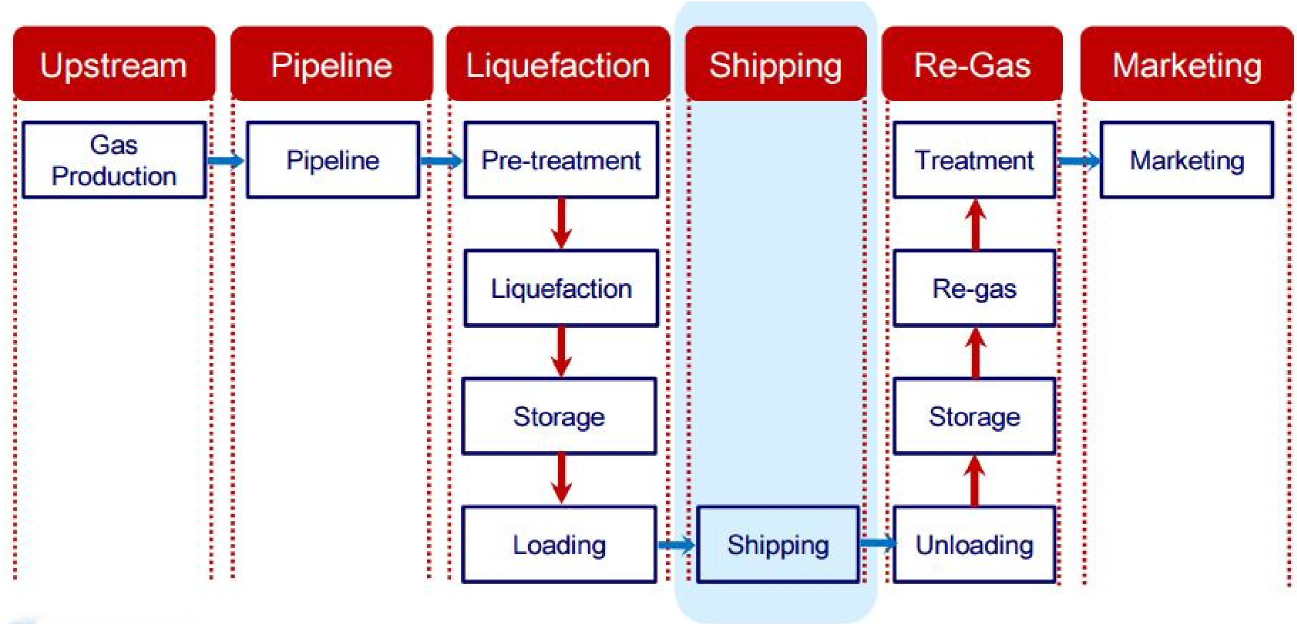

Figure 7: Source: Gas Fund Australia

Investment in LNG alternative production methods

The global oil crisis caused an urge in the diversification of energy sources. As LNG was being imported through chartered vessels, the excessive demand caused for other alternatives of LNG supply as well. The introduction of pipeline projects by LNG exporting countries to its neighboring countries. Iran-Pakistan gas pipeline project is an evident example where other competitors such as Russia have also shown major interest in investing (Adjaye, 2000). Besides this, the creation of LNG through the use of biogas at small scales helped in reducing the dependence on LNG which was previously being shipped through vessels. At the same time, the recent switch to nuclear energy also affected the projected demand of LNG globally as Japan reactivated its nuclear reactors after the devastating Tsunami hit the country in 2011.

Contract options

With the growth of the LNG fleet market, new forms of contracts have been established to allow for flexibility. Initially only long term contracts were common between the exporting and importing countries, however, with the change in the economic dynamics, short term and spot contracts have come into existence (Vivoda, 2014). The supply and demand of LNG highly influences the charter cost of the LNG fleet.

Long term contracts are considered to be ideal for the LNG producers as the company engages in a fixed rate contract and the fleet owner of LNG vessel ships is obliged to maintain all the essential documentations regarding the fuel consumption and port operating costs along with manning. A fixed rate is determined which cannot be changed during the term of the contract. The charter rate may adjust for inflates each year but all such terms are settled prior to the contract.

At the same time, in the recent years a trend of short contract has gained a rapid pace because of the fluctuations in the forecasted supply and demand of different countries. Since, the freight vessels are limited in quantity therefore, the short term contracts are highly dependent on the availability of the freight and the timings are also critical in such cases. It is also significant to note that short term contracts are relatively high in charter rates as compared to the long term contacts.

With the sudden shifts in the LNG demand, especially in countries like India and China, spot contracts have been introduced which are signed off with companies who can instantly provide the demand needs in the shortest possible time span. Countries have been relatively better off with this option because the purchase rate is the current rate of LNG floating in the market. However, it is the riskiest as the supply is limited and it becomes difficult in finding the suppliers with the required amount. It is evident that the ship owners draw maximum benefit from spot contracts if the LNG prices are high (Sinton & Fridley, 2000).

Social, economic and environmental Impact of LNG

Studies have revealed that the LNG prices are not only affected by the supply and demand, rather there are other factors which contributes to the price fluctuations as well. The recent trend of green alternatives made LNG as one of the desired solutions as compared to the petroleum. This encouragement towards the green alternatives automatically pushed the demand curve high and LNG prices were seen as more stable with the increase in demand. It is rather safe to say that LNG industry emerged to its fullest with the increase in need which is further project to increase in the coming years. Experiments have proven that LNG carbon emissions are 50% less than that of the oil and petroleum emissions (Biello, 2015). Therefore, LNG is adding less to the carbon footprints.

Industries which were previously operating on oil as fuel for energy, have seen a drastic fall in operating costs after switching to LNG and this has helped in not only decreasing the operating costs but also helped in boosting the economies as well by creating more employment opportunities and reduced cost of living. The economies of scale have been utilized to the fullest after the switch to LNG (Goodridge, 2015). With the increased global warming and water becoming scares, multiple issues have occurred in the electricity generation especially in the developing countries which is home of one third of the world’s manufacturing industries. LNG is introduced in making electricity as one of the alternatives to produce it at a relatively cheaper cost.

Freight Industry

An understanding of the LNG shipping vessels is one of the important pre-requisites. At the end of March 2014, 397 LNG shipping vessels were recorded to be present and operational around the seas routes engaged in long, short and spot contract terms. Many experts believe that the LNG freight is extremely low, keeping in mind, the future demand patterns and the heavy reliance on LNG in the near future. Charter rates are based on per day and long term contracts which have been considered as the most secure for the investors in the shipping industry. LNG shipping freight's life is estimated to be 35 years on average.

Construction of an LNG vessel is extremely costly which accumulated to $200 million dollar which is one of the reasons that the ship owners are reluctant in investing as already the industry has already witnessed a slump in charter rates when the LNG fleet were extend in 2012. There are two widely used LNG storage vessels known as the Moss and Membrane System. The Moss system is also known as Dinosaur Egg vessel because of its shape which consists of four enormous sized dome shaped containers for storing the LNG. Whereas; in the Membrane system the LNG is stored in the haul of the ship and this is considered to be the most efficient method of utilizing space. Currently most of the LNG ships are built using the Membrane technique (Goodridge, 2015).

3.7 Data sources

The data collection resources have been selected carefully. However, to maintain internal and external validity the essential data was gathered from sources including: IMF, World Bank and other databases.

3.8 Ethical consideration

The collected information from emerging countries data Researcher will critically analyze the collected information from emerging countries data which are also based upon extensive researches, who have put their contributions in studying economic factors, freight markets and LNG sector.

Chapter 4 - Analysis

4.1 Data Analysis

With the immense growth of the world population, the need for energy has increased more than ever. Oil, gas, coal, solar and all other forms of natural resources are being utilized to fill in the demand and supply gaps. The decrease in the oil reserves and change in the environmental policies have made the experts believe that it is time for the governments to invest in energy diversification programs (Bremmer, 2015). Developing as well as underdeveloped countries have all highlighted their ever increasing demand for energy and many emerging countries have held the battle front in fulfilling the global LNG demand. Currently, Russia is the leading country with the world’s largest reserves of Natural Gas, however, its main focus on exporting is through pipelines to countries in the Eastern Europe where countries like Poland are highly dependent on gas imports. At the same time, Japan has emerged as one of the major importers of LNG market (Economy Watch, 2015).

Throughout in this research, it has been evident that LNG industry has some crucial economic factors which are constantly affecting the global LNG rates. The LNG freight market also has a major role in price determination as well as it controls the supply capacities. However, other energy alternatives and government policies have long been affecting the demand of LNG and with the sudden trend of LNG, the demand pull investment in LNG ships has left many shipowners disappointed as it leads to a drop in the per day charter rates which was not forecasted well in time. The LNG industry witnessed an all-time high demand in the years 2012 and 2013 because of rising oil prices as well as limited supply of gas internationally. However, the prices fell to a greater extent with the fall in oil prices and energy diversification plans of countries such as Japan which is one of the biggest buyers of LNG. However, with its plans to restart the nuclear reactors after the Tsunami, caused a reduction in the LNG demand (BP p.l.c, 2017). Besides this, countries are also for environmental friendly options to reduce carbon footage and LNG does give promising reduction in carbon footprints. However expert do not believe it to be a 100% green alternative. The agreements of gas pipelines have also negatively affected the charter rates of LNG cargo vessels and have further made the LNG rates very competitive. Countries like Iran and Russia are joining agreements with neighboring countries especially like China and Pakistan for gas pipeline contracts which has been critically observed at international levels (Determeyer, 1997).

A number of LNG compatible ships have a direct impact on the supply of LNG worldwide, whereas liquefaction plants are extremely essential to maintain and increase the supply levels. At the same time regasification plans and global dependence on natural gas maintains the demand. Other uncontrollable factors which are continuously affecting the energy demand are the world population, extreme weather conditions and political involvement. Out of the seven emerging countries discussed in this research, only Malaysia and Indonesia are actively participating at global level in exporting LNG and therefore, it is considered as one of the key players in determining the LNG prices globally as the supply is more manageable. At the same time, countries like Poland and Mexico are highly reliant on gas imports for sustainability (Dorian, et al., 2006).

4.2 Statistical hypothesis testing

According to statistics, regression analysis is a process of examining the relationship among predictor and depending variables. Further, it determines that whether predictor variables have positive or negative impact on depending variable. Regression analysis measures the effect of independent variable on depending variable. In other words, regression reveals that how much change in depending variable can be occurred due to independent variables. In this study, simple linear regression is performed to examine the effect of different price levels on freight of LNG across different countries. Beta coefficient value in regression analysis depicts that how much change in dependent variable is due to predictor variable. Though beta coefficient is of great importance, its significance also matters as it determines whether this beta coefficient value is significant or not significant. If a beta coefficient value is positive and significant represents that predictor variable has positive impact on depending variable. However, if beta coefficient value is negative and significant represents that predictor variable has negative impact on depending variable.

Aim of this study is to examine the effect of economic factors on freight of LNG across different countries. Fluctuations in price LNG plays a key role in its demand and consequently its supply also. Therefore, examination of price on freight of LNG is of great importance. 143 observations were accessed to examine the effect of price on freight of LNG. In current study, economic factor in this study is price of LNG. To examine the effect of price on shipment of LNG across different countries, price is regressed on freight to measure its impact respectively. Table 3 below summarizes regression information.

Model	UnStd		
	B	Std. Er.	T
(Constant)	984.07***	349.70	2.814
Variable 1 - International Reserve Assets	1.146	2.659	0.430

USD (Advanced Economies)			
Variable 2 - Fund Accounts Outstanding GRA USD	5.982	5.585	1.071
Variable 3 - International Reserve Assets USD (World)	-1.764	1.564	-1.127
Variable 4 - Dubai Crude	51.240	23.505	2.179
Variable 5 - LNG Asia	167.972***	29.595	5.676
Variable 6 - APSP crude oil index	62.751***	15.157	4.140
Variable 7 - All index	0	0	655
Variable 8 - Non-Fuel index	6.995	3.611	1.937
Variable 9 - Energy index	-97.655	14.554	-6.710

*** p < 0.001 ** p < 0.01 * p < 0.05 † p < 0.1

N = 143, R = 0.889, R square = 0.790, Adjusted R square = 0.770, F-stat = 63.27

Dependent Variable: Freight of LNG

Table 3 *Regression analysis*

This regression analysis was an attempt to measure the effect on Price on freight of LNG. When Price was regressed on freight of LNG, R square value is 0.790, which means that change in freight of LNG due to price is around 79 percent. Moreover, model fitness is stated by f value which is 63.27 which is greater than 5 and highly significant too at p = <.000. Moving next, beta coefficient of variable 1 is 1.146. This beta coefficient shows that if Price is manipulated by 1 unit, there will be 1.146 changes in freight of LNG. Beta value is not significant as the t value is 0.430 which is less than 2 and not significant. Therefore, this confirmed that Price 1 does not effect freight of LNG. Similar is the case with variable 2, 3 and 4 as their beta coefficient values are not significant as their t values are less than 2 and not significant as well.

However variable 5 and 6 beta coefficient values are highly significant as their t-values are greater than 2 and significant at $p < 0.001$. This significance of variable 5 and 6 confirms that these 2 price levels have significant impact on freight of LNG. Further, variable 7,8 and 9 do not have impact on freight of LNG. Although their beta confidents values can be observed in Table 1 but these values are not significant as their t-values are less than 2 and not significant.

4.3 Future Trends

With a sudden boost in the LNG sector, the gas rich countries started investing heavily in the construction of LNG liquefaction plants whereas the freight owners began investing in the LNG cargo ships (CEDIGAZ, 2014). The shipping industry has already faced the burnt in shape of excess supply as compared to demand of LNG and the fall in per day rates of charter is an evident example itself. Experts believe that with the excess in the liquefaction plants the supply has become ample and it is causing the LNG sellers to indulge in competitive price wars which will further reduce the rates in near future (Dretakis, 2005).

Analysts also believe that the potential future of LNG business lies in the Asian markets where countries like JAPAN, South Korea and China are heavily dependent on gas for industrial processes. However, countries like Qatar and other Middle Eastern nationals have abundant gas resources and are the major players along with Malaysia and Indonesia (Liu & Ma, 2016). Many developing countries like India and Pakistan have shown a high increase in domestic energy demands and a huge proportion is related to the industrial needs. The export and import of natural gas is a capital intensive industry and the recent fluctuations in the oil market are giving daunting indicators to the investors of LNG (LNG Consumer Conference, 2017).

LNG experts believe that in near future the demand of LNG is going to be mainly seasonal due to the high demand patterns observed in peak winters of Europe, Asia and North America. One cannot deny that still a major use of LNG is for heating purposes whereas in developing countries a switch towards using LNG as alternative fuel has been emerged (Jensen, 2004). However, the supply needs to be controlled at the same time because an oversupply can reduce the profit margins to half and the LNG industry can lose a lot of profits over the night. Analysts also believe that long term and short term contracts are the safest bet for now and investors should be worried about indulging in spot contracts which can provide a lot of benefit to the freight owners as well as the buyers and the investors will have to compromise on reduced profit margins. Never to forget the experts' belief that it is very rare that LNG market profits would disappoint you (Manassas, 2016).

Chapter 5 - Results and Discussion

The data analysis of the study presented a comprehensive view of the LNG structure and industry along with the estimation of the long term and short term developments that are to be expected. Nonetheless, there is a general environment of secrecy in the LNG industry that is causing the lack of vital and timely information which is likely to vague our comprehension of the market activities. This section deals with some major factors that have been the result of our understanding along with the discussion that can alter our present expectations for the LNG market and are likely to take place within a few years.

5.1 The Growing Global Demand

The market analysts have agreed to the fact that the rate of the global demand is likely to slow down in the long term that is, after the year 2020. There are certain factors that are attributed to the expectations for instance, the higher energy efficiency, slower growth of the economy and liberty provided to the emerging energy markets. Nonetheless, there are signs that show that demand rate might be lower than the expected growth (5-6%) even to 2020 (Du & Paltsev, 2014).

It is noteworthy that China is seen by many as one of the most important new LNG markets in the world. China makes a good use of natural gas and utilizes it as a good potential substitute for coal and oil in its attempt to reduce air pollution and emission of carbon. Still, China has been facing challenges regarding the movement to natural gas. Firstly, due to the slowdown of the economic growth the annualized seasonal GDP growth rate has decreased from the highest point of 12.1% to the present 7.4%, and there is a chance for this trend to continue (Kang, 2014). In China, the manufacturing and constructions markets are leading energy consumers; therefore, the slow growth implies a less than expected energy demand overall. Furthermore, it is a chance that the end users will become more sensitive to energy price increase that is transmitted to the fuel selection process. Recent natural gas reform also raised domestic natural gas prices for all users, which may affect demand. Many experts have interpreted this obligation as a strong signal of support for LNG imports.

It is obvious that the uncertainties in the demand are present in other regions too. For example, the speed at which governments deregulate and eliminate subsidy from gas markets is left to be seen in many developing nations. At present the governments supply natural gas at a much lower price than spot LNG cargos. This practice is also responsible for rapid gasification in some areas. But this pattern may not carry on. There has been a gradual increase in the domestic price of some countries like China, Malaysia, India and Argentina to reflect higher LNG import prices. The growth rate of LNG demand will slow down further if this trend continues. The recent efforts by Japan to restart its nuclear plants also add up to the ambiguity of the LNG demand. In the beginning of the year 2012, Japan imported 18.6% more LNG cargos than a year before but at a cost increased by 49.2%. Japan's competitiveness and economic development are being hampered by the high energy prices; yet, the lack of confidence in the nuclear industry and its regulators have made the restart of nuclear generation challenging (BP p.l.c, 2017). As a result, Japan is trying to restart from its regions with least resistance. Whether, some of the most secure plants can get approval to restart may have limited influence on short-term market dynamics, but can have important implications on long-term expectations of nuclear energy's return to Japan.

These numbers should be considered more as guidelines than strict policies as the final results depends on the determination of the policy makers and the particular situations in the global and domestic market. It is more important to note that the overall ratio target was replaced by a domestic production target and that this target can be translated into new LNG demand if the production target is not met. Lastly, the goal is to develop a reliable market structure, which in the end could encourage domestic gas production. The figure given below reflects the worldwide growth in LNG since 1970.

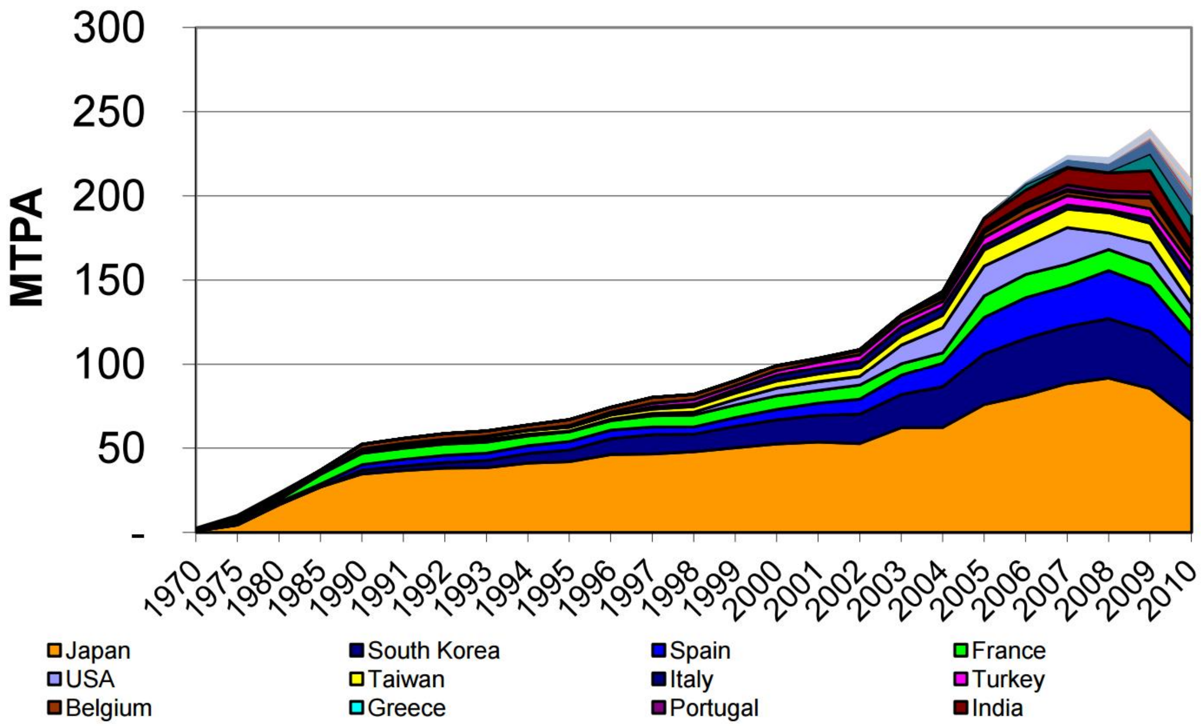

Figure 17: Worldwide development of LNG since 1970 (Foss, 2012)**.**

In the late 2000s strong U.S. natural gas price signals supported a wave of import terminal projects. These price signals supported activities such as drilling and were a success as new supplies were proved up. In the year 2011 U.S. export proposals and Canadian domestic production emerged in as supply. They also included new production from shale basins which exceeded domestic demand. In 2012 one LNG export facility in the U.S. was approved, five additional U.S. sights were proposed and two projects were proposed in western Canada. Moreover, several potential projects are still under consideration (FERC, 2015). Natural gas development and utilization of LNG in the United States, North America and worldwide look dynamic and changing (Foss, 2012).

5.2 Development in Technology

The boundaries of technology have been pushed by the LNG industry. The improvements made with regards to safety and efficiency has significantly contributed to the popularity of this natural gas. Nevertheless, there are some uncertainties that can be caused due to the emerging technology. Out of the most recent technological enhancements taken place in the LNG value chain, analysis reflects that floating LNG is a technological improvement that has a substantial impact on the industry if proven feasible.

The floating LNGs are the vessels that process and liquefy natural gas. This technology is better than the traditional land based liquefaction in many ways. First of all, it enables indoor construction and gives a comparatively more controlled atmosphere. Many complexities that traditional developers have to handle no longer remain relevant and it also avoids many long regulatory procedures related to land use. Moreover, the local landscape apprehensions and protests are also decreased. As a result, the risk associated with safety, cost and schedule will be decreased. Secondly, the time for construction is expected to be only two thirds of the onshore plant as this feature can give companies with more temporal compensations to adjust to the fast altering market trends. Thirdly, the opportunities to monetize stranded resources are provided by the flexibility of FLNG. The smaller and far away offshore fields can also be tapped by FLNGs. As the size of new gas discoveries is reducing this feature is especially significant for the LNG industry. The vessels can move on to another target as soon as a production field is exhausted. Lastly, FLNG presents the chance to decrease the greenhouse gas emissions by reducing gas flaring and re-injection in offshore oil fields.

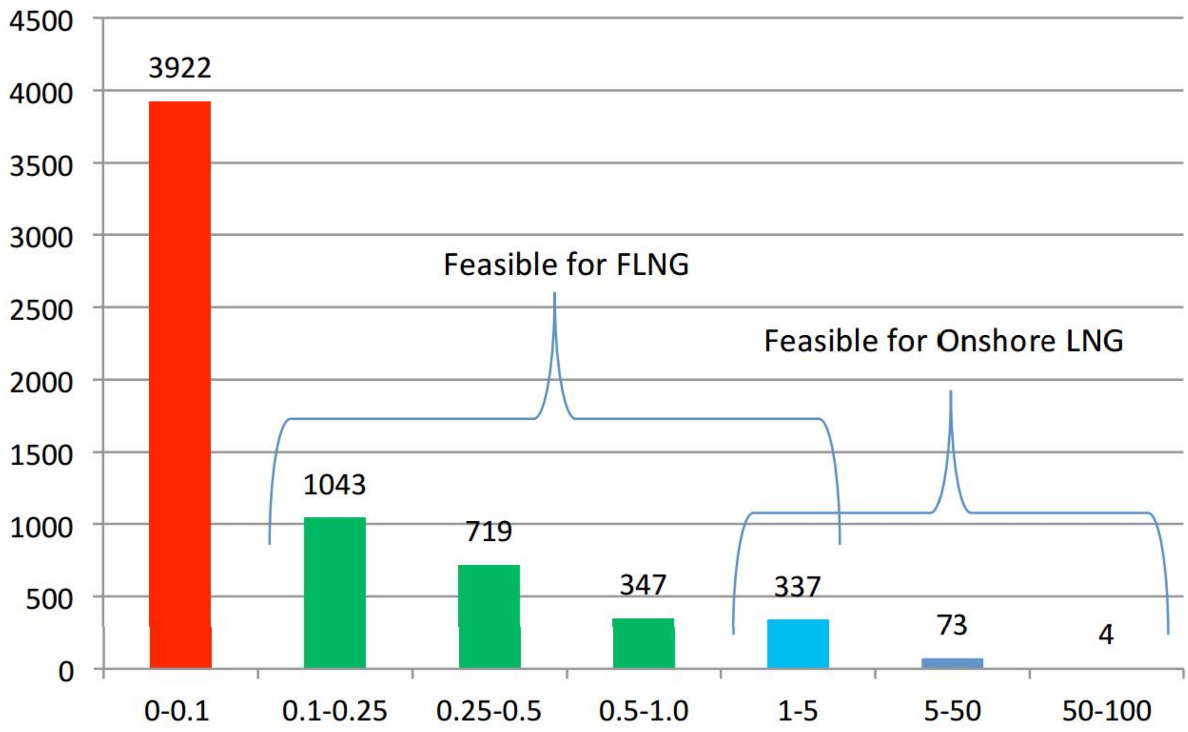

Figure 18: Presenting gas fields of various sizes (Lucas, 2013).

If proven viable the FLNG can have non-negligible impact on the LNG industry landscape (Jensen, 2004). As presented in the graph above there are many small to medium natural gas fields that contain large amount of resources. According to the report by (Attanasi & Freeman, 2013), the latest estimation is that of 1400 Tcf natural gas resources that are stranded in offshore oil fields as well as gas fields and report for more than one third of the offshore natural gas reserves. Furthermore, the producers also are likely to have more choices if given wider geographical distributions and therefore be less restricted by the political upheavals. Nonetheless, up till now the FLNG is still considered to be an unproven paradigm. Throughout the world, the critics are apprehensive about the capital investment and the high operating costs and this has put the commercial viability of FLNG as risk. Although, the vessels are made to endure the harsh atmosphere on the oceans; still, if these vessels will be influenced by the extreme weather on real production is a question that is to be answered yet. Reports suggests that right now more than 120 Mt FLNG capacities have been considered and distributed among 30 floating liquefaction projects; however, many of these capacities are still tentative (Yep, 2015). Investors as well as critics are apprehensive about the performance of the pioneering projects but still are hopeful that definitive outcomes will soon be available. On April 2017, the world's first floating liquefied natural gas facility, PFLNG SATU, has achieved a new milestone with the successful loading of its first cargo at the Kanowit gas field, offshore Bintulu, Sarawak.

Country	Project	Project sponsors	Project status	Capacity (MT pa)	On stream
Australia	Prelude LNG	RD Shell 100%	Under development	3.5	2017
	Bonaparte LNG	GDF Suez 60%, Santos 40%	Under review – FID 2014	2.0	2019
	Cash Maple FLNG	PTTEP (50%), PTT (50%) **	Under review – FID 2012	3.6	2017
Australia / East Timor	Sunrise FLNG *	Woodside 33.44%, RD Shell 26.56%, ConocoPhillips 30.0%, Osaka Gas 10.0%	Under review	3.6	2018
Brazil	Santos FLNG	Petrobras 51.1%, BG 16.3%, Repsol 16.3%, GALP 16.3%	Under review – FID 2013	2.7	2018
Indonesia	Abadi FLNG	Inpex Masela 60%, RD Shell 30%, PT Energi Mega Persada 10% (PT EMP)	Under review – FID 2013-14	2.5	2019
Iraq	Khawr al-Amaya FLNG	RD Shell 50%, Mitsubishi 50%	Under review – FID 2013-14	2.0	2017
Malaysia	Sarawak FLNG	Petronas 100%	Under review – FID 2012	1.0	2016
	SK 205 FLNG	Petronas 50%, Petrovietnam 50% *	Under review	3.0	2019
Nigeria	Progress FLNG	Mitsubishi, Peak Petroleum *	Under review	1.5	2017
Papua New Guinea	Gulf FLNG	Liquid Niguini Gas (InterOil 52.5% + Pacific LNG Operations 47.5%), Flex LNG **	Under review – FID 2012	2.0	2017
	TBC	Hoegh LNG, DSME, Petromin **	Under review	3.0	2019
			Total potential capacity	**30.4**	

Table 3: Showing the potential FLNG plans (Lucas 2013)

5.3 The Swing of Social and Political Suppliers

Due to the political and social uncertainties throughout the world there are significant implications for the LNG future competitive landscape and pricing. These expensive efforts put countries under threat of unsuccessful growth of LNG projects. There are issues that may even rise in economies with mature market establishments. For instance, how such uncertainties can unfold in US where the shale gas revolution turned the US in to a major exporter from a net importer suddenly. Reduced wholesale prices and tense international markets are forcing the companies to produce

LNG plants to grab these opportunities. In addition to this, the existing extended infrastructure and investment in regasification gives the companies some extra benefits related to the upfront investment cost. Nonetheless, the influence of the LNG exports has been a notorious and sensitive topic politically. The domestic companies who benefit from lower gas prices are concerned about the loss of competition if the export is materialized. Apprehensions related to excessive shale gas production and local disturbances are also worrying the companies and so. Although the economists support the option of export and improvement of social welfare, there are strong retaliations regarding local employments and environmental protection. This retaliation and pressure from the political side is directed through the process of licensing. In order to export LNG from the United States, it is necessary to get the approvals of the DOE (the Department of Energy) as well as the FERC (the Federal Energy Regulatory Commission). Both these departments focus on impacts and safety of the environment related to the liquefaction facilities which is expensive and time consuming. Through a DOE license the exported are given a permission to export LNG with or without free trade, whereas the Natural Gas Act ensures that the export is applied without delay or modification. DOE also concludes the impact of such activities on the public interest in the non-FTA situations. The DOE is expected to be very careful about decision making in order to avoid confusions and disagreements. For instance, in Indonesia the export of LNG is a sensitive topic politically mainly because of the competitiveness of the domestic gas demand (Determeyer, 1997). The growing demand of energy in the region is encouraged and supported by the investments and economics growths. However, the regulatory obstacles are delaying the increase in production to meet the demands. Moreover, price control and corruption are likely to slow down the foreign as well as domestic investments on infrastructure and production. The investors are further apprehensive due to the latest decisions by the Constitutional Court to dissolve the oil and gas regulator. Consequently, there have been preferences for the Indonesian companies to purchase the LNG cargo in order to honor the export contracts.

In order to meet the domestic demands Indonesia will need to import LNG and force companies to stop exporting LNG. The Ministry of Energy Mineral Resources recently announced its consideration of a moratorium on gas exports. Domestic supply is also likely to affect other exporters. For example, Tanzania waits for more proven resources before authorizing export projects to ensure first the domestic supply. Moreover, Qatar has also stopped construction of new capacities temporarily after the last LNG plan came online back in the year 2011. Domestic, political and economic reservations may also bring uncertainties in the gas export plan. In Mozambique where recent gas discoveries have been made, more than half of the population lives under the poverty line (World Bank, 2015). Apprehensions over security have amplified, which may holdup the investment construction procedures. These concerns along with other regional risks can be a threat to the operation and transportation practices. Also in Nigeria, the conflicts between local and central government on profit sharing has hampered its oil exports and consequently affected the LNG industry. In addition, according to reports by (Ellis & Heyning, 2016) for emerging countries the sheer size of a potential LNG project can be challenging as the calculated capital expenditure for a 10 Mt LNG project is more than $27 billion in the East African region including both upstream production and liquefaction, but in 2012, the GDP of Mozambique was $14.6 billion and for Tanzania only $28 billion. So, these nations must depend on huge investment from international corporations. How their governments balance the attracting foreign investors and sharing the profit of the project is still to be seen.

Finally, new projects in Iran have rendered international tensions. The Comprehensive Iran Sanctions, Accountability and Divestment Act (CISADA) have postponed the expansion of some large gas fields in the Persian Gulf. Although, there are signals that the Iranian government is making progress on reducing the pressures, there are still uncertainties the pace and efforts that can alleviate the export restrictions.

5.4 Competition from LNG Substitutes

There are a number of substitutes of LNG; for example, the renewable energy, oil, coal etc. The fluctuations in the prices and technical development have crucial long and short term influence on the global demand of the LNG. For example, due to the Shale gas revolution in America the lowering rate of American coal has reflected a crowd out effect on the LNG market. We will focus on the two optional sources of natural gas that directly compete with LNG. They are as follows:

Pipeline Gas: The LNG vessels are predated by the transportation of pipeline gas. But, it faces constraints like geological and political factors in cross border trade. The pipelines linking the European countries are identified as major source of threat for the regional and global trade of LNG.

Domestic Gas Production: The new gas resources, like shale gas and deep sea gas fields are recognized as opportunities by LNG exporting nations. However, they can reduce the global demand of LNG in case crucial domestic production materializes in present importers. The table given below showed an even distribution of shale gas in the world. The reports estimate that technically recoverable resources of China are 67% that is higher than the US unconventional gas resources. If China successfully overcomes the hurdles regarding the shale gas development it may become a net gas exporter by the middle of the century (Du & Paltsev, 2014).

		Resource Estimates (Tcf)	
Rank	**Country**	**EIA**	**ARI**
1	China	1115	
2	Argentina	802	
3	Algeria	707	
4	U.S.	665	1161
5	Canada	573	
6	Mexico	545	
7	Australia	437	
8	South Africa	390	
9	Russia	285	
10	Brazil	245	
	World Total	**7299**	**7795**

Table 4: Showing the estimated technically recoverable shale gas resources (EY Report, 2015)**.**

5.5 Fluctuating Prices of Oil and Gas

Since June 2014 the prices of oil have fallen almost 50% that is from around $115 per barrel to $60 after a stability of 5 years. The prices of oils are determined by the supply and demand along with the expectations. Due to the weak economic activities the demand for oil has become low whereas, the increase in the efficiency has led to switching away from oil towards other energy resources and fuels. The companies of Saudi Arabia have decided that they will not sacrifice their market share in order to restore the prices of oil. Therefore, the impact of lowering price of oil has resounded on LNG and the natural gas market (Hartley, 2005).

5.6 The Natural Gas Market

Gas prices will respond to the prices of oil that is constantly falling. This is because most gas prices are indexed to oil especially in the Asian region. Natural gas is holding constant or even rising in the middle of a high-profile price slide of crude oil. These gains are mostly seasonal and the price generally retreats with the demands of winter heating; however, since June other factors also are helping natural gas move away the pressures that have hammered about 50 % from the price of crude oil.

Some experts believe that the fall in the prices of crude oil could send gas higher. The reason being, that the natural gas often comes from wells that are drilled to produce oil. It's by product is known as associated gas. Some of this by product is burned off whereas some of it reaches the markets. If due to the lowering prices the production of oil falls down, then the supply that is associated with gas in the market will shrink. This gives a boost to the prices of natural gas.

The prices of natural gas characteristically symbolize an unstable mix of rates of production, storage inventories and demands that are more or less seasonal. As compared to crude oil it is difficult to transport and store. This implies that some of the local markets have a smaller amount flexibility to import gas from other areas or from storage. Therefore, the prices for gas traded concurrently at various locations can spike rapidly.

5.7 LNG Market in 2015

Due to the revolutionary changes taking place in the world of energy, the prices of liquefied natural gas have created cheaper source of gas for the European countries. The worldwide market for LNG has had drastic changes in the year 2015. The Asian LNG prices are likely to fall by 30% in the year 2015 due to the oversupply and impact of low oil prices (Determeyer, 1997). This expansive growth of LNG consumption in the recent year has cause Asian economies to cool down with resumption of nuclear energy and in some markets causing greater use of coal.

At the same time, new LNG production has come on stream, leading to tight supply conditions that had been expected to prevail until the end of the decade are finishing even more quickly.

LNG price have more than halved since the start of the year to below $10 per million British thermal units (mmBtu). In Japan the average import prices, one of the world's top buyer, are expected to fall to about $11 per mmBtu in 2015, down from an estimated $15.50 in 2014 and $16.45 in 2013. The benchmark for LNG in Asia is Japanese prices, a region which accounts for about 70 % of global trade (Petroleum Economist, 2015).

The demand for energy is at the peak during the northern hemisphere's winter months in Asia. Therefore, long term contract that are linked to oil have a time lag of months before the prices are declared. Moreover, the current decline in the prices of oil has only kicked in around the mid of 2015. The connections with the prices of oil are really strong which means that in spite of the rise in the share of spot volumes the average LNG prices are still integrated with the prices of crude oil.

The investors and buyers of LNG have been seeking to grow a feasible spot market for LNG to de-couple from the oil market. In Asia, the first sea-borne exports of US shale gas are expected by the end of the year 2015, whereas a wave of Australian output is also coming online over the next 4 years. This has given a boost to spot buyers by growing the supply.

If the predictions regarding the LNG market are proven accurate then LNG flood could have a powerful effect on politics. This will give Europe a source of mass supply and can undercut the pipeline gas from the state of Russia. The EU has enough LNG terminals already to cover most of its gas needs. It has not been able to use this asset as a geostrategic bargaining chip with the Kremlin because LGN itself has been in scarce supply, as it is mostly diverted to Japan and Korea. It is a likely chance that many of the European nations may not need Russian gas at all in a couple of years (Hellenicshippingnews.com, 2015).

5.8 The future of LNG market and the Role of Emerging nations

In the present weak market, the companies may find it difficult to invest in the present cycle, particularly when capital budgets are slashed. However, there are companies that may invest in LNG even in the current situations. These are the big fish who do not hesitate to take risk in the face of market fluctuations. Companies of countries like India, China and Japan find this as an opportunity and will develop LNG at striking terms for their own market locally as well as internationally. In this way, LNG is likely to play a crucial role in the future and bring strong incentives for LNG development. It will continue to be a source of clean energy.

One of the reports indicates that 21% energy demand is satisfied by natural gas. There are some areas where the LNG gas demand is concentrated. For instance, Asia Pacific demands 36% of LNG (IEA, 2013). Moreover, there are 11 importers that play a major role in the import of LNG and account for 88% of LNG demand throughout the world. The Figure given below portrays a clear picture of the regions that rely on LNG to fulfill their heavy gas demands.

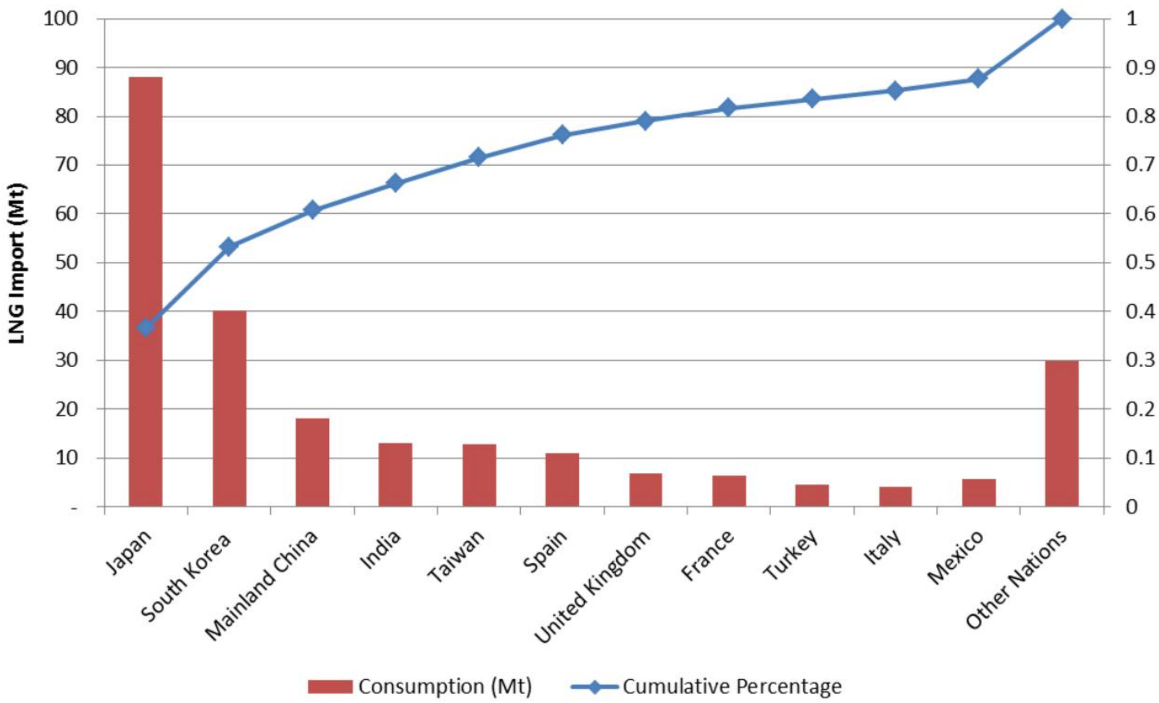

Figure 19: Showing the LNG consumptions by countries in the year 2013 (BP, 2014)

As the figure depicts the market for natural gas is growing extensively. Moreover, it is estimated that there will be a rise in the demand of the present 120 Tcf to 140 Tcf by the year 2020 and more to around 180 Tcf by the end of 2035 (IEA, 2013; BP, 2014). Economic growth is one of the major factors that drive the demand of LNG, along with the cost of fossil fuel, energy supply, and environmental situation and slow down of nuclear power growth. As discussed in detail in the literature review section, with the rise in the demand of LNG the emerging countries like Kenya, Poland, Indonesia, Malaysia, India, Columbia and Mexico are likely to gain benefit (US Department of Energy DOE, 2013).

Chapter 6 - Conclusion

6.1 Limitations and Future Directions

Although the present study provides useful insight on the economic factors that are affecting the LNG market along with the lowering freight rate and the role of the emerging countries; however, of course, one cannot rule out all alternative explanations and have some shortcomings which must be addressed while interpreting the findings. These limitations of the study suggest important guidelines for future researches.

First of all, the current study focuses on LNG and therefore other sectors are only briefly covered for reference. The study is much driven by the aim to explore the economic factors affecting LNG and so there is no analysis regarding how shipping relates to other transport modes.

Furthermore, this study does not claim to be exhaustive on the planning process of investments in the sector. Instead, the aim is to focus on those parts that can be unintentionally postponing or hindering the investment by emerging and advanced countries and companies. Although the findings of the present study are based on relevant research work, however, it is suggested that to obtain more conclusive results, it will be an advantage to use a longitudinal design that would help in identification of diverse associated factors of LNG as the development proceeds. Moreover, there are other characteristics too; for instance, the technical issues, operational issues, safety and risk factors and others. which should also be studied in future studies to have a broader vision of associated factors in the LNG market.

6.2 Implications and Recommendations

The findings of the present study shed light on the significance of LNG exploring the past, present and future of the shipping in LNG sector. These findings may allow the experts and economists to have a better understanding and identify the economic factors that have been affecting the LNG freight market which in turn may facilitate them to develop more effective programs in the industry.

The present study reflects that LNG infrastructure business is distinguished by positive feedback, in other words, a mounting demand of LNG may lead to reduction of prices and further increase in the demand. Therefore, it is important to establish a reasonable infrastructure that would provide a solid base for a positive development the years after 2020. But it is obvious that an infrastructure as extensive as this will not be built at once so it is significant to coordinate efforts and investments. Therefore, it is recommended that the market players in the LNG supply and value chain coordinate efforts efficiently and communicate in order to meet and help generate LNG demand. Moreover, the demand from other than maritime end users should also be included to aggravate economies of scale. Lastly, a minimal infrastructure that can enable a secured market is established quickly. The work in this regard has already been initiated by the national authorities, ports, LNG suppliers, traders and end users and can further be increased (Danish Maritime Authority, 2012).

The present study also identifies the economic issues along with some of the operational and technical issues. On the basis of these identified issues it is recommended to formulate safety assessments. The safety assessment and risk analysis of LNG concepts includes identification of relevant design for possible LNG accidents and estimations of the associated consequences. Today many different approaches and software are being used for the estimation of possible outcomes of different accidental events. It may be difficult to discuss in detail the general guidelines that will be internationally accepted. The use of appropriate risk tools will facilitate identification of adequate and efficient preventive risk control measures. It is strongly recommended that guidelines for adequate risk approaches to be applied in safety assessment and risk assessment with the aim to facilitate fair assessment of various LNG projects (Danish Maritime Authority, 2012). The description of LNG terminals shows the importance of a well thought-out location of the establishment by the well developed countries, as well as considerations of different locations by the emerging countries. It is recommended that LNG terminals must be located close to their customers in the port to be competitive. Such requirements may create conflicts with safety aspects. Moreover, there are guidelines available regarding the sites for large-scale LNG import terminals, but no guidelines regarding small scale LNG infrastructure. So it is recommended that national authorities and the Society of International Gas Tankers shall develop guidelines on the sites for LNG terminals based on national and international regulations with a view to possible international harmonization (Danish Maritime Authority, 2012).

6.3 Conclusion

As a source of relatively clean energy, the natural gas has become very significant. The shipping market of the liquefied natural gas (LNG) is not as liquid as the bulk markets; nevertheless, the trade of LNG has emerged in the past few years. This trade has caused quick expansion in the size and the capacity of the LNG fleet market. The analysis of the study has spotted the major parameters that have been affecting the freight market rates of LNG shipping.

The market experts have agreed that the rate of the global demand is likely to slow down in the long term that is, after the year 2020. There are certain factors that are attributed to the expectations for instance, the higher energy efficiency, slower growth of the economy and liberty provided to the emerging energy markets. However, the study signals that the demand rate might be lower than the expected growth.

In addition, the LNG shipping market was initially based on dedicated long-term contracts. However, with a constant rise and fall in the gas supply, the short-term market is also expanding. But still, long-term contracts continue to be dominant as project investors have to secure their return on investment for the capital facilities.

The economic factors affecting the LNG market are discussed in detail and the main factors that are likely to affect the freight rate are recognized to be the amount of ship trading, the structure of LNG, regasification and the liquefaction capacity. Meanwhile, in long term contracts freight rates should not be affected until and unless LNG demand overtake shipbuilding supply. In the short term contracts excess of ships available will push freight rates down.

Moreover, the present study also concentrates on how the LNG rates are inter-related with rates of the other competitive sources of energy. The shipping of the liquefied gas can be economically operated on medium and long distances. In all divisions of supply demand chain the cost reduction of LNG has triggered a world of whole new investments in LNG shipping and terminal projects. This has also provided the emerging countries like Colombia, Indonesia, India, Kenya, Malaysia, Mexico and Poland to play a vital role, and influence the LNG market.

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