Counter-Urbanization of Fishing Areas in Scotland: Toward a Resilience Concept

Case Studies in Aberdeen City and Peterhead

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Abstract

Urban system do not function in isolation. It is systematically not only affecting the system itself but regionally and international influencing others'. The study focused on how governance strongly influenced the urban areas, and thus, changed the structures of surrounding settlements at the same time. Resilience, a concept which was been highly aware and applied in governmental policies over recent years, was used in the study to analyze the pros and cons of the existing urban system in studied cases. Aberdeen City and Peterhead, located in North East Scotland, were both strongly depending on their fishing industry back in several decades. Citizens in Aberdeen City have the highest average salaries among Scotland due to the oil industry located it the city. Fishing industry was replaced causing by the new development goals of Aberdeen's municipality. Phenomenon of counter-urbanization was observed as numerous fishermen and fish processing firms began to move into Peterhead.

This paper raised to hypotheses in order to discuss the causes and consequences of this phenomenon. First, society in Aberdeen will gain more profit by transforming fishing industry to oil industry. Second, Peterhead will also be benefit due to less complexity of governance with a clustered economy. Research methods included both literature reviews and stakeholder interviews. Interview questions were administered via a semi-structured interview guide with interviewees been chosen through purposive sampling frame. A designed resilient urban framework proposed by Desouza and Flanery (2013) and a policy analytical approach designed by Bredgaard et al. (2003) were used for analyzing results.

The results presented that, Aberdeen City economically profited by the transformation but with loss on its social stability. Fluctuating oil prices affected the society from time to time. Increasing unemployment rate and insufficient potential abilities to recover from future stressors were recognized. On the other hand, situation in Peterhead was not as good as hypothesised. Governance was even more complicated with greater regional cooperation proposed due to limited financial sources. To sum up, cities with a more diverse industrial base structure may have better capability on addressing potential stressors. Moreover, cities and settlements should not put all the efforts on pursuing economic performance. A balanced development through different aspects would be the key for having a more resilient and sustainable society.

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With all my LOVE and APPRECIATION to my friends and my family!

Szu-En Hsiao

2nd June, 2017

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1. Introduction

During the last several decades, Scotland has experienced some changes in the make-up of the key industries in North East Scotland. The investigation of North Sea Oil field since the 1960s benefits lots of surrounding nations, for instance, United Kingdom, Denmark, Norway, Germany, and Netherlands. Scotland gained numerous profits due to the oil field discoveries which also slightly changed the industrial structure in the country (See Section 1.1). Oil drilling activities at North Sea influenced the development of cities and settlements in those countries. The needs of infrastructures for Oil Companies and accompanied industries changed the economic and industrial structures. This in turn, also created certain impacts on local society. North East Scotland, where fishing industry was the dominant industry in that region for hundreds of years, is still the dominator for Scottish fishery related industries. However, flourishing oil and gas industries became a trigger that accelerated transformation of certain area in North East Scotland. The Fishing industry dominated the harbor area in Aberdeen City from the 19th Century (Coull, 1996). Today, the oil industry occupies almost the whole harbor area when overlooking the harbor from the air. The switch of influential industries at the harbor occurred over only a few decades. Most of fish catching and processing sector firms moved from Aberdeen City to Peterhead, a town to the north of Aberdeen City (Coull, 1996).

The research focused on the interactions between governance and the fishing industry, exploring the impacts of economic transformation in North East Scotland using sustainable development concepts. The two primary hypotheses of this research was “society would benefit more by transforming into oil based industry” and “the migration of fishing industry makes governance less complicated in urban area” were analyzed in the paper. A resilient concept was used in order to evaluate urban mechanisms in selected cases. Resilience is a concept helping systems to enhance, build, or strengthen capability back to or close to its original functions when its system temporarily or permanently suffered stressors caused by outer and inner factors in system (See Section 4.3). The resilient concept used in this research had four main categories: Economic, Natural, Human, and Technological resilience. The study was aimed to analyze how the governance in urban settlements influence economic structure and industries in the region. Moreover, the increased proposal of having resilient considerations in development strategies can be seen worldwide. The 100 resilient cities’

framework (100 RC), pioneered by the Rockefeller Foundation, had received more than 300 applications from around 100 countries applied to join the Framework (100 Resilient Cities, N.d.). The ambition of this research was also including the understanding of how and what urban settlements could accomplish a sustainable and resilient society.

1.1. Fisheries and Aquaculture — with High Market Potential among the Globe

> *"Fisheries and Aquaculture*[1] *make a vital contribution to the food security, nutrition and livelihoods of hundreds of millions of people. […] Indeed, the livelihood of more than one-tenth of the global population are dependent on fisheries and aquaculture. They also generate significant government revenue and foreign currency. However, both fisheries and aquaculture require good governance and careful management to be sustainable."* – *Fishing for Development, OECD, 2014*

Fishing Industry includes not only those who actually go fishing at the coast or on the sea but also labors who work in fishing processing industry and in fishing farms. The improvement and renovation of fishing equipment enhances fishers' capability of fishing. Hence, fishermen could catch more and more stocks and the fishing industry bloomed in 19 century due to industrialization (Coull, 1996). However, unlimited fishing caused the crisis of biodiversity loss and environmental irrecoverable damages. World total catch amount of fish stocks remain steadily from 2007 to 2012 (Figure 1.1). The length of fish stocks are significantly shorter compared to previous recorded data. Some report even shows that coastal areas were destroyed or damaged due to the bottom trawling fishing which destroyed carols and made numerous species loss their habitats. A report published by Food and Agriculture Organization of the United Nations (FAO) (2014, pp. 7) stated "the proportion of assessed marine fish stocks fished within biologically sustainable levels declined from 90 percent in 1974 to 71.2 percent in 2011, when 28.8 percent of fish stocks were estimated as fished at a biologically unsustainable level and, therefore, overfished." The whole ecosystem couldn't recovery by itself and thus, it is a chain effect that also dramatically influence human activities as well. These phenomenon and facts led human to see fishing industry as a questioned industry which produced

[1] "Aquaculture is the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators and so forth. It also implies individual or corporate ownership of the stock being cultivated." – FAO, Available at: http://www.fao.org/docrep/003/x6941e/x6941e04.htm

lots of negative effects among the globe.

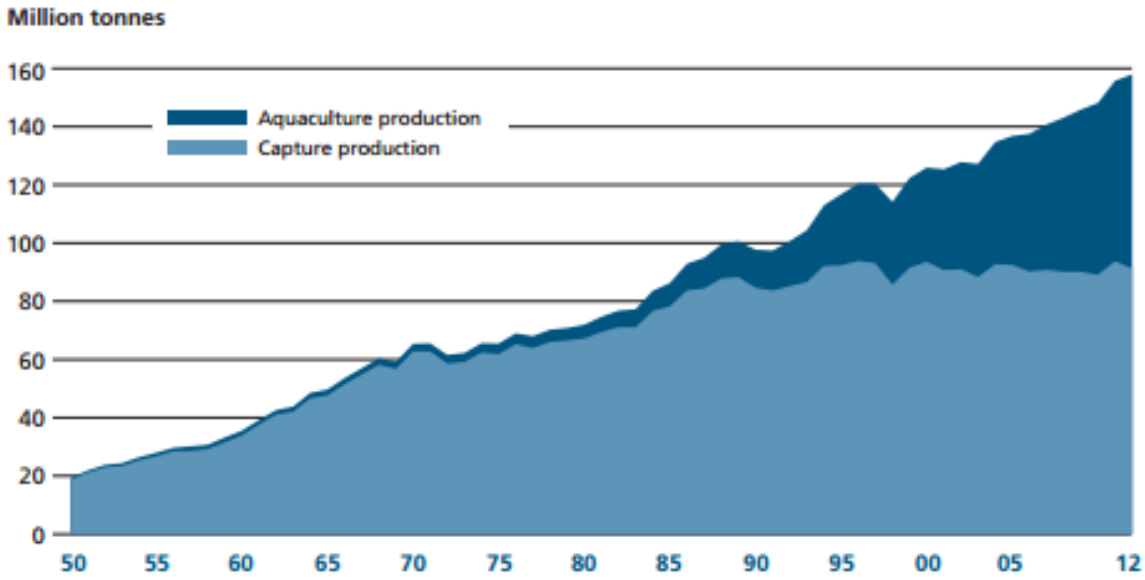

Figure 1.1 World capture fisheries and aquaculture production (FAO, 2014)

Throughout the globe, governments began to limit total amount of fishing vessels and formulated policies in order to reduce the damage to the oceanic ecosystem. Some fishery areas were greatly affected by the laws and people protested to against governments in order to maintain their daily live and jobs. Fishermen from British Colombia in Canada opposed the policy due to the prohibition of cod fishing activities promulgated in 1992, but they failed (Grafton, Lane, 1998). Nevertheless, developing new types of industry became a trend as people seek to find another opportunities to compensate for the loss. Fishing aquaculture production[2] becomes an important economic type in fishing industry and increasing greatly after 1970s (FAO, 2014). In Figure 1.1, global aquaculture production increased steadily every year. However, some areas or cities might transmit their economic type to a totally different industry and no longer rely on traditional fishing industry. Aberdeen City, Scotland, is a case that successfully changed to oil industry oriented city due to the discovered of North Sea Oil Field. Scotland is a country which is surrounded by oceans. Historically, their economy was based on the fishing industry. The number of fisherman regularly employed on

[2] "Aquaculture production specifically refers to output from aquaculture activities, which are designated for final harvest for consumption. At this time, harvest for ornamental purposes is not included." – FAO (http://www.fao.org/fishery/statistics/global-aquaculture-production/en, Front page)

Scottish based vessels has decreased significantly since 1970s (Figure 1.2). Numbers of regularly employed fishermen are almost half the number of employees compared to 1970s, having fallen 49 per cent (Marine Scotland, 2016). According to the Scottish sea fisheries statistics report, there's a large decreases in each employment category. The percentage of irregular employment also decreased 48 percent with a decrease of 81 percent in the number of crofters[3] worked with fishing industry. The decreasing amount of fishermen might be caused by reductions in vessels' capacity and increased vessel efficiency (Marine Scotland, 2016). There has a need for governments to rebuild and strengthen the fishing industry to reduce the impacts which effects employees and families working in fishing industries. The need of a resilient and sustainable developing plan is raised in this situation.

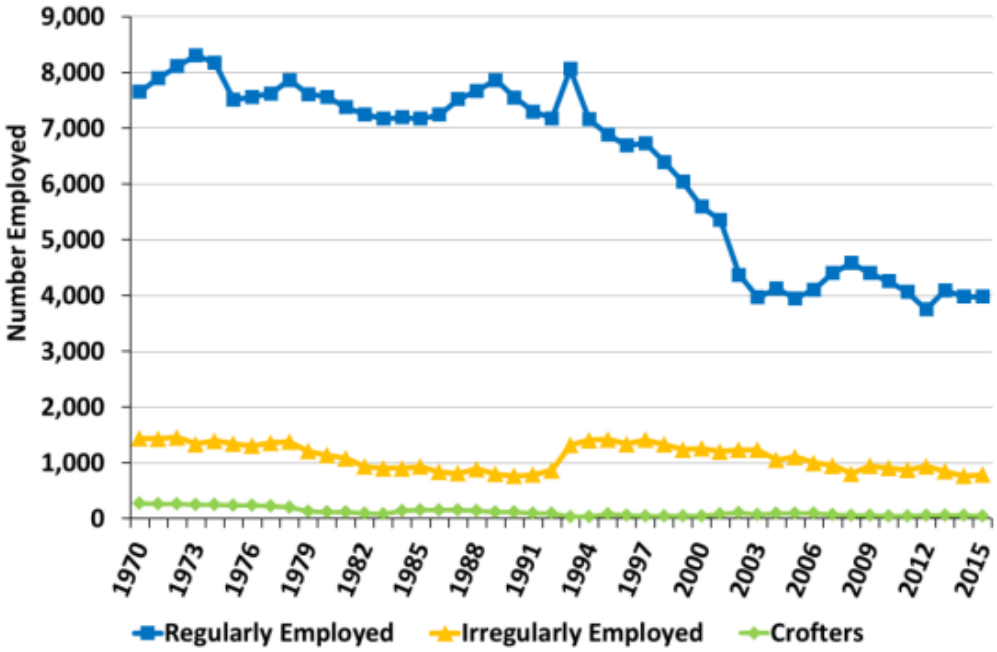

Figure 1.2 Number of fishermen employed on Scottish based vessels - 1970-2015

(Scottish Government, 2016)

[3] A person that works a small landholding so called a crofter in Scotland. And, croft is an agriculture unit. "A crofter is normally the tenant of the croft, paying rent to the landlord of the croft. But many others have purchased their crofts and are owner-occupiers of their crofts." Stated by Scottish Crofting Federation (http://www.crofting.org/faqs/67, p.1)

1.2. Sustainable Urban Development and Resilience

"Resilience has become an increasingly important urban discourse and has been taken up by international, national and local urban initiatives at a rapid pace" stated by Maina and Hsiao (2017, p.3)[4]. Resilience became a serious discussion due to the increased populations, immigration, economic changes, and distribution of resources that keep occurring in modern urban areas. People see resilience as a way to tackle he upcoming stresses and risks. Therefore, the resilience concept has a very broad meaning. It is about enhancing or rebuilding the capacity of system which will be permanently or temporally accelerated by stressors from outside of the system (CPWF, 2013). A well designed resilience system could have the ability to face the future unexpected forces. The concept of resilience is increasingly be putting into governmental strategies and priorities, companies or organizations' developing goals and broader sustainability initiatives (Wilkinson, 2011). Also, there is a strong connection between resilience and sustainable development. Walker et al. (2004) pointed out that if an area performed ecologically, economically, and socially sustainable, it would also be considered as a resilient socio-ecological system. Resilience is been used to tackle issues related and formed by, the environmental, ecological, social, economic drivers. Linkages between each drivers are strong and highly effect the urban area. The majority of the world's population resides in urban areas, issues of vulnerabilities, adaptations of risks due to the natural stressors and shocks made from human interactions and activities are the main things need to be discuss in the resilience concept. In this sense, it is necessary to understand and realize the participation of stakeholders in the implementation process and the management of development plan in urban areas in order to avoid conflicts between different sectors and minimize impacts on vulnerable groups.

The concept of resilience can help fishing areas tackle the future disasters and changes. Indeed, rebuilding fisheries could improve social and environmental outcomes which reduce the unemployment rate, improve livelihoods, promote diverse biodiversity and provide society with stable and safety food (OECD, 2012). However, rebuilding fisheries is not the only means for governments while encountered frustration of development. Governments could also choose to explore new industries instead of rebuilding fishing industry. Through policy, resilience has diverse

[4] Original statement was proposed by Evans (2011). Resilience, ecology and adaptation in the experimental city, Transactions of the Institute of British Geographers, 36: 223–237, doi:10.1111/j.1475-5661.2010.00420.x

meanings under different development goals. Therefore, different urban development strategies lead to distinct outcomes in particular space. The paper aims to uncover whether transforming industrial type from fishing to other types of industry benefits society more than rebuilding current fishing industry in an urban area. North East Scotland is the region which has strong oil and fisheries industries in Scotland. Aberdeen City and shire are the main industrial areas in Scotland with good economic performance. Additionally, industries relate to food & drink are particularly important in Aberdeenshire, while Aberdeen city has the main oil port which benefit both areas (Aberdeen City Council, 2017). According to the report from Aberdeen City Council, Aberdeen City has the highest average weekly wages among Scotland. The full time averaged wage is 17 per cent higher than Scottish average wage, £622.6 (See Table 1).

Council Area	All Employees	Full Time	Part Time
Aberdeen City	£ 593.4	£ 727.8	£ 219.2
Aberdeenshire	£ 469.7	£ 624.0	£184.9
Dundee City	£ 477.8	£ 581.5	£236.3
City of Edinburgh	£ 578.2	£ 681.5	£ 252.6
Glasgow City	£ 544.8	£ 655.6	£ 213.4
Scotland	£ 504.9	£ 622.6	£ 212.8

Table 1. Average gross weekly earnings, 2016 (workplace-based) (Source: Aberdeen City Council)

Notwithstanding the active industries both Aberdeen City and shire have, some challenges are observed in both areas. The development objectives of Aberdeen City focus almost exclusively on the oil & gas industries, monopolizing the city's economy. It might have potential crisis once if oil industry collapse in the future. The two main threats of oil industry are fluctuating global oil price and the end of oil in the North Sea. Another curious issue is Aberdeen City used to be one of the main fishing landing port in Scotland, however, the fishing industry started to shrink in late 20 century and the oil industry became dominant. The changes of policy directions, found within Aberdeen city's development plans and strategies, triggered the phenomenon of counter-urbanization of fishing industry. Most of the fishers and processing sectors in Aberdeen City shifted to Peterhead, a town which has the largest amount of landings for all of Europe. The two localities rely on specific, key

industries, especially Aberdeen City. This is a phenomenon where the economic structure of the urban settlements has less diversity, which means their economies might alert easily by changes in the market. The vulnerability could easily affect society through deliberate market manipulation or economic collapse. The pros and cons of this will be discussed in the following sections as in the opposite, agglomeration economics might reduce governmental complexity and create more benefit to the area. Delgado, Porter, and Stern (2014) suggested that clusters formed by related industries in specific area will encourage better interaction with customers, access to important inputs, and more opportunities of innovation. This is another hypothesis that was aimed to examine in the paper.

The thesis examines and answers the research questions through assessing of governmental policy making process, direct and indirect observation from collecting data, and literature reviews. The study of historical reviews aimed to clarify the context of industrial changes. Literature reviews helped the study to apply and explicit phenomenon at research sites. It also supported the concept of necessities of being resilient and having sustainability in modern urban settlements. The interviews provided a broader and comprehensive knowledge of current economic status in selected sites. Through interviewing stakeholders from different sectors, the researcher got a better understanding about planning process of exist development strategies. The results were evaluated by means of policy analysis theory and urban theories. The next Section presents methodology of the research. Historical reviews are introduced in Section 3 with literature reviews of the studies are presented in Section 4. Section 5 includes interview results and analysis of the whole study. Lastly, Conclusion is presented in Section 6.

2. Methodology

This section represented the methodology used in the paper in order to answer the research question: "Transforming fishing industry to oil based industry benefits society more than maintaining to rely on fishing industry and the governance would be straightforward." The research was based on literature review and semi-structured interviews with discourse analysis. The results of interviews was used to compare two selected areas to examine the two hypotheses that first, society would benefit more by transforming into oil based industry. And second, the migration of fishing industry makes governance less complicated in urban area. The research was looking through governmental structures and development strategies in specific areas. Under a resilient concept, it was important for institutions and organizations to design a developing plan that reduce and minimize the shocks coming from outer places. The literature review was conducted in order to understand the industries and current situations in the research areas, in addition, discussed urban theories that demonstrated the causes and consequences of changes in cases. Furthermore, the study also included interviewing representatives from local institutions and groups. Details of interview design and objects are discussed in the following sections. An analytical approach for strategies and development plans during implementation processes which was proposed by Bredgaard, Dalsgaard & Larsen (2003). The approach went through four steps to analyze policy making processes from formulation, implementation, and outcome defining to evaluating a resilience framework proposed by Desouza and Flanery (2013) was another tool for analyzing the systematic framework of cities. Resilience was categorized into dealing with human, economic, technological, and natural stressors happening in research sites (See Section 4.3). Limitation of the research were insufficient research time for conducting additional interviews. Some strategies were only analyzed through its written context. Key details of formulation and the implementation process were unavailable in the written text. Moreover, accuracy of information collected from interviewees needed to be evaluated and analyzed. Even interviewees gave absolute truth they thought of, results might not be accurate as information was provided through individual perceptions (Bernard, 2005). It might also have deference effect during interviews when the topics went to sensitive issues. Therefore, information from respondents sometimes were diluted (Bernard, 2005).

2.1. Case Selection

The study took place in two selected urban areas in North East Scotland: Aberdeen City and Peterhead. Aberdeen city is the third largest city in Scotland. It used to highly depend on its fishing industry before oil was discovered in the North Sea and was the third largest fishing port in Scotland in early the 20th Century (Aberdeen Central Library, N.d.). Nevertheless, Aberdeen City still has the fishing processing industry in the city which provide aquaculture products to all of Scotland. Now, it is an oil-industrial based city in North east Scotland and the city produced second highest CO_2 emissions per capita in 2013 in United Kingdom (Centre for Cities, 2016). In contrast, Peterhead is a relatively small area with nearly 18,000 citizens located in North East Scotland. But still, Peterhead is the largest urban settlement in Aberdeenshire. The town is highly reliant on its fishing industry and oil & gas industries. The production in Peterhead comes mainly from white fish which are cod, herring, and haddock. Most of the white fish products in North East Scotland are landed at Peterhead Port or Fraserburgh port (Marine Scotland, 2016) another main fishing harbor in Scotland focusing on shellfish stocks, where is just North of Peterhead.

One of the reasons for selecting Aberdeen City as study site was due to the significant changes in its economy structure and dominant local industries. Peterhead, as a smaller settlement close to Aberdeen City, might be influenced by the big changes in Aberdeen. Another reason for choosing these two sites was the similarity of the dominant industries back in history. Both Aberdeen City and Peterhead's economies were historically based on the fishing industry and other agricultural industries. In the 1960s, the fishing industry was still considered as a prosperous industry in both areas. Unfortunately, by the 1970s, the two places suffered a downturn of the fishing industry. Trawlers stopped sailing to sea and docker workers went on strike in Aberdeen City (Aberdeen Central Library, N.d.). News published at that time all threatened that fish industry would have a black future. In the end, most of trawling boats in Aberdeen City sailed to other regions seeking for better opportunities. The City seemed to develop oil industry as a solution of the economic crisis of the harbor while Peterhead successfully maintained its fishing industry at the same time. With such a big difference in each area, it was appealing to figure out the causes of the contrasting consequences and analyze the research results to see the consequences of replacing new industries at Aberdeen Harbor.

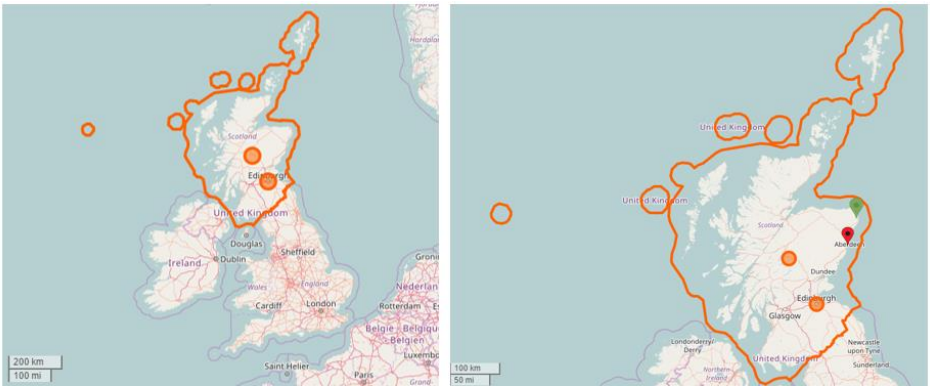

Figure 2.1 Map of Scotland (Red map-pin: Aberdeen City; Green map-pin: Peterhead)

(Source: OpenStreetMap.)

2.2. Data Collection

Data collection included three stages. First, secondary data collection and stakeholder analysis was to target possible interviewing groups and get comprehensive understanding of research sites before field work. Second, designing interview questions by applying theory of public policy making process. Third, collecting data at study sites through interviews and local documents. The study time was approximately four months. The first one and half months were spent collecting secondary data and contacting interviewees. The fieldwork period include three weeks in both research sites interviewing stakeholders and collecting local historical data from local libraries and institutions.

2.2.1. Secondary Data Collection and Stakeholder Analysis

Fishing activities are highly influenced by governmental regulations, laws and initiatives. Therefore, interview objects were stakeholders who were influenced by governmental policies or contributed to designing governmental policies and strategies. During this stage, strategies and development plans published by institutions from selected areas were collected primarily. Fishing and urban development strategies were included in the research and institutions who issued the strategies were being listed as potential interviewees. Second, the research applied among purposive sampling frame to decide interviewees (Bernard, 2005). The sampling frame was choosing representatives from private and public sectors related to fishing industry in the selected sites based on the research's study purpose. Snowball sampling also happened during field work. Targeted objects were municipalities, fishing related organizations from both public and private sectors, NGOs, and local urban development groups.

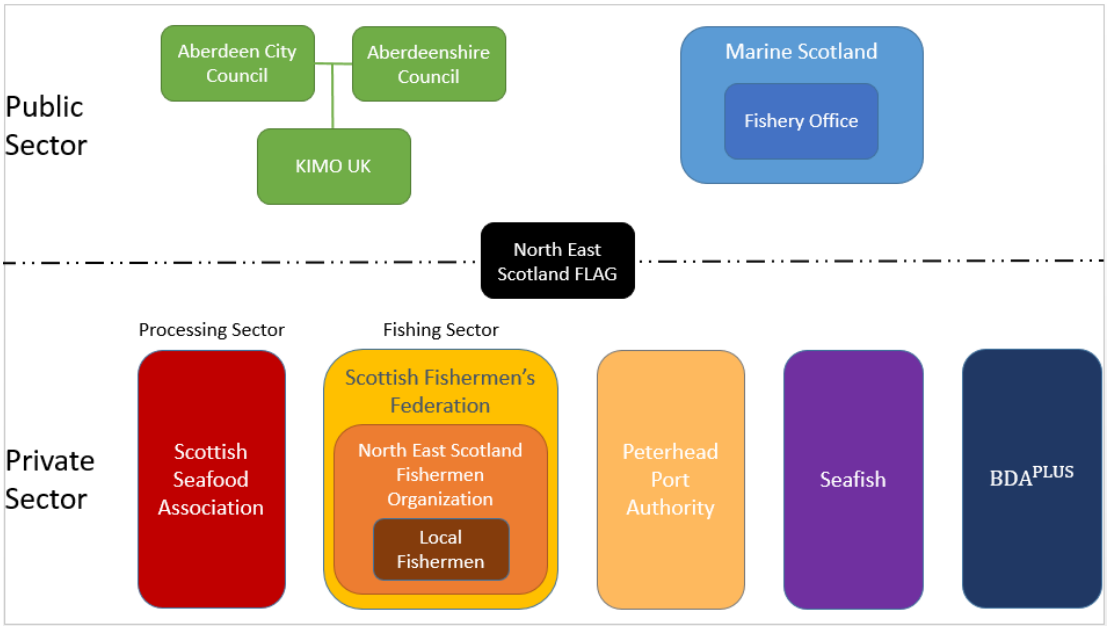

Figure 2.2 Interviewed stakeholders by Sector (Source: Author)

The election criteria was representatives from municipalities who were working in fishery related departments or were involved in working groups on fishing development strategies. Under this criteria, Aberdeen Fishery Office, Peterhead Fishery Office, Aberdeen City Council, Aberdeenshire Council and KIMO UK were interviewed. Citizens and businesses from private sectors that were working in fishing industry were included in the research. Due to the limitation of research timeframe, representatives of local fisheries association were chosen to represent the view of local citizens and workers. The interviewees of private sectors were Peterhead Port Authority, North East Scottish Fishermen's Organization, Scottish Seafood Association, Seafish Scotland, Scottish Fishermen's Federation, and BDA^{plus}. Interviews also included representative of private-public partnership group, North Aberdeenshire Local Action Group (NALAG). The action group is formed by both public and private sectors in order to promote fishing industry in North East Scotland. With interviewing people from different sectors, the goal was to correlate the aspects and discern if the public sectors and private sectors had potential conflicts or inconsistent perception on the development of fishing areas. More importantly, the necessity of interviewing stakeholders was to clearly perceive real situation in selected sites which is not possible through secondary data.

2.2.2. Interview Questionnaire Design

The questions asked were semi-structured. The interview question guide contained four main sections of policy making process: designing, planning, managing and accessing. It aimed to examine the level of participation and involvement of each stakeholder in the urban development process. And see how the development plan fulfilled the needs of stakeholders. Or it, on the other hand, may have created negative outcomes for the society. Furthermore, results from interviewing governmental institutions which had specific developing initiatives or strategies on fishery issues were analyzed through an analytical approach for analyzing policy implementation processes proposed by Bredgaard, Dalsgaard & Larsen (2003). The analysis examined if the policy answered the needs of citizens and could achieved their ultimate policy goals through policy implementing process to affect areas. This approach contained analysis from policy formation, implementation to evaluation of policy outcomes. Unfortunately, most of the relevant strategies were implemented less than 2 years previously, and thus, outcomes were not yet showing significant in selected sites. Interviewees from private sectors also had business strategies and visions for selected sites. Interview questions for representatives from private sectors were likewise similar with those for public sectors. But the questions were tailored as the goal was focusing more on the effects of public strategies and plans.

2.2.3. Field Work

In this stage, the research took place in North East Scotland for three weeks. Local data, for instance, local news and historical collections were collected in local libraries or museums. Interviews were another main part of field work besides local data collection. Representations of institutions who were not located in North East Scotland or could not arrange a suitable time for both interviewees and researcher having face to face interviews, telephone interviews were used to solve the problems. In total twelve interviews, including three telephone interviews and nine interviews in person, were conducted. Each interview took forty minutes to an hour by using the semi-structured interview. The guide was adjusted slightly depending on interviewees.

3. Historical Fishery Reviews of Studied Sites

"A people without the knowledge of their past history, origin and culture is like a tree without roots." — Marcus Garvey (1887-1940)

It was important to review the historical events and changes at regions to analyze the movement of entire fishing industry from city to smaller settlement. The study of history built the basic understanding of formation and establishment of selected urban areas. It also helped to interpret evolution of governance and development of fishery in North East Scotland throughout centuries.

3.1. Aberdeen City, Scotland

Aberdeen City, nicknamed Silver City and Granite City, is the third most populous city in Scotland located on the east coast North of Edinburgh. Its harbor was established 900 years ago. The fishing industry was once prosperous in this region. The target species used to be white fish such as cod, halibut, and haddock. In addition to fishery from fishing at sea, Aberdeen Harbor also caught wild salmon from the rivers Dee and Don in the past (Turner, 1986). Before World War I, boats from other countries including Scottish vessels were laid by Aberdeen Harbor due to its good price. Lots of German and Icelandic vessels' trawlers landing their caches in Aberdeen. Trawlers were the main sources of Scottish demersal caches in the city. The Granite City was once one of the six main trawl ports in United Kingdom and accounted for over 70% of total Scottish landings of trawlers (Coull, 1996).

Aberdeen fish market was built in 1889 in order to accommodate the rapid growing fishing industry, and lately enlarged for the developing trawling sector. There used to be over 300 steam trawlers and more than 60 steam liners in the Aberdeen harbor during the peak between the two World Wars (Coull, 1996). However, the costs of operating trawlers were comparatively higher than the value of fish stocks. In the 1920s, fishing costs were once reached to three times more than the level in 1914 due to increasing coal prices. Trawlers stopped operating and laid at the harbor for more than three months (Aberdeen Central Library, N.d.). The problem was mainly caused by the landing amount from other counties, especially Germany, which decreased fish prices. This impact forced the

entire white fish fleet from Aberdeen laid up for three months which made government opened the conversation with other fishing countries. After negotiated with foreign governments, the situation was re-solved. The fishing industry returned to its normal standard (Coull, 1996). In the 1960s, boats having seine-nets mainly landed at Aberdeen as the city had better connections and infrastructure to transport goods to other regions. With many seine-netting landing in Aberdeen, the city started to develop its harbor. Aberdeen port was operating under the Dock Labor Scheme[5]. Fish market porters monopolized landings from fleets. Good fortune doesn't last forever and in the 1960s, the harbor ceased to have Saturday auctions at Aberdeen due to additional costs and labor problems. The auction was then moved to Peterhead which was not a part of the Dock Labor Scheme, which enabled fishermen to reduce their costs. Moreover, the fishing industry faced another difficulty as the fish amount in 1970s dropped dramatically and made the fishing fleets in Aberdeen couldn't cover their costs forcing them to lay up at the port again (Aberdeen Central Library, N.d.). Moreover, international restriction of operation bigger vessels and more awareness of overfishing that made vessels in Aberdeen more difficult to operate in the meantime. The city, in the end, is no longer the first landing port in Scotland. Peterhead became the first place of landing port while Aberdeen still had most processing factories in Scotland (Fraser, Personal Interview, March, 2017). Other than that, salmon fishing in Aberdeen was also shrinking from time to time. The amount of wild salmon decreased dramatically which accelerated the fishing companies reduced working hours and made voluntary reductions in the fishing time (Turner, 1986). However, these measures couldn't help the salmon back to the river and farming salmon started to replace wild salmon in the market as it could provide salmon stock in entire year. The salmon fishermen also complained and blamed harbor traffic for the low river stocks. Thus, it is rare to find commercial salmon fishing near Aberdeen Harbor today. Salmon fishing have operated in Aberdeen for over 600 years but the development of harbor has made its threatened continuity.

After the Second World War, development of maritime related industries became the main goal for Aberdeen city. In early 1960s, North Sea Oil field been discovered. The surrounding regions and

[5] "Dock Workers' (Regulation of Employment) Scheme" or "Dock Labour Scheme" was proposed by British Parliament in 1947. The Scheme was aimed to have equal number representatives of dock workers and representing employers. "Each local board was responsible for keeping a register of employers and workers, paying wages and attendance money, controlling the hiring of labour, and responsibility for discipline." - Wikipedia

countries started to develop the oil resources around North Sea. The Oil field closed to Aberdeen City was discovered in 1970s. Continent Shelf Act was passed in April 1964. Aberdeen Harbor Board and first oil companies' discussions started from 17 September 1964 and companies' entry been approved in 1965 (Turner, 1986). American Oil Company such as BP moved and settled in Aberdeen city to develop the precious resources. Oil companies increasingly settled by the harbor and Aberdeen Harbor Board started reconstruction of harbor quay. Economic growth in Aberdeen City raised apace, however, fishing industry was not benefited by the new industry. Simultaneously, the 1970s were the time when fish stocks around the world suddenly decreased. At the same period, coal prices were raised rapidly which increased the operation costs of vessels. The value was not worth for fishermen to fish in the sea at that time due to the comparatively high operating costs but low landing value, stated by Turner (1986). Then, the oil industry became the key industry in Aberdeen City. There were over seven exclusive oil supply based in Aberdeen Harbor in 1977. It replaced coal and became the main fuel from sea to inland transportation by early 1980s. There was some voices raising the fear of relying too heavily on the oil industry and stated the fishing industry might be a better long-term industry which might not be effected by global market compared to oil industry (Aberdeen Central Library, N.d.). However, Aberdeen fish market was closed in 2013 and there's no more fish landing at the port (Fraser, Personal Interview, March 2017). Aberdeen harbor is now totally occupied by oil and gas industries with only the historical fishermen house and fish market of fish market remain in the city reminding citizens its fishery history.

Figure 3.1 Crude Oil Price May 2013 - May 2017 (Source: http://www.macrotrends.net, 2017)

Today, Aberdeen City is still one of the main oil industrial cities in all of Europe with nearly 47,000 jobs. Aberdeen City Council estimated there are over 1,500 energy related companies serving in Aberdeen and surrounding areas. Recently, some concerns are raised as oil resources might drained out in few decades. Ambrose from The Telegraph reported that Aberdeen is facing a vicious downturn of its oil industry[6]. A statistic report made in 2015 shown that oil price of North Sea decreased almost 50 per cent comparing to 2013 with total revenues fell 30 per cent, and a prediction of 43 per cent oil fields at UK continental shelf (UKCS) might make a loss if current oil price stay the same. More and more labors are hired either through periodical contracting instead of being long term employed. This Granite City is now facing new economic crisis of its main port related industry. In order to twist the predicament, municipality of Aberdeen City is planning to build a new harbor with increased depth and width to afford larger cargos come into the city and has some related strategies implemented to address the dilemma (See Section 5.2). Moreover, businesses alliance and municipality of Aberdeen City both endeavor to make oil and gas industries pick-up again through implementing economic strategies[7].

3.2. Peterhead, Aberdeenshire, Scotland

Peterhead stands around 45 kilometers northeast from Aberdeen City. It is a small urban settlement historically supported by their fishing industry. Now, it has one of the biggest landing port in the European Union. The area has nearly 100 registered vessels, with most of the vessels under 10 meters (Marine Scotland, 2016). The highest production of fishing species is white fish. Peterhead harbors were built in several phases, the harbors were mainly for trading and whaling in 18 century. Later on, herring industry was developed and dominated the usage of harbors in middle 19 century. In 19 century, there were some regional fishing settlements committed of catching herring or other specific species in Scotland. Peterhead was one of those regions that targeted herring industry which been highly impacted while the whole Scottish herring industry suffered huge challenges after World War I[8] (Coull, 1996). When other countries, such as Germany, Iceland, Norway, and Holland,

[6] Ambrose, J., Aberdeen: The Granite City in crisis, The Telegraph, 14 May 2016, URL: http://www.telegraph.co.uk/business/2016/05/14/aberdeen-the-granite-city-in-crisis/

[7] Related Economic strategies: Regional Economic Strategy (Aberdeen City Council et. Al., 2015), The North East Strategic Economic Plan (North East Local Enterprise Partnership, 2017)

[8] Details in James R. Coull, The Sea Fisheries of Scotland – A Historical Geography (1996), Ch. 11, John Donald Publishers Ltd., ISBN: 0859764109

modernized and readjusted their fishing industry after the war, Britian was no longer the leading of herring industry. The stress of the interwar period in UK was due to slow rise of living standard, and also caused by serious decline of UK market. The British government tried various measures to rebuild the herring industry. However, there were no real solution to address the problems. It was not until later in the 1960s, Scottish fishing industry returned to its standard and maintained steadily. Due to the decline of herring fishing, white fish fishing became the most important sector in Scotland after World War II (Coull, 1996). And, as a consequence of Dock Labour Scheme operated at Aberdeen port mentioned in Section 3.1, Peterhead port which had lower pier charges and landing costs without going through porters with operating Saturday auctions as add on got more fishing boats landing at the port. Hence, Peterhead port became the largest landing port in Scotland and United Kingdom with one fifth of Peterhead's businesses are primary industries nowadays (See Figure 4.5) (Aberdeenshire Council, 2016). Petrehead harbor, where fishing industry, used to settle was under port authority before integrating administrators with Peterhead bay area. The bay area was occupied by oil industry and under another authority. The two institutions, in the end, combined and established Peterhead Port Authority which is dominant and tackle with all the port services, infrastructure and business (Peterhead Port Authority, 2017). The port is now renovating its former fishing port (See Section 5.3.2). The harbor is now surrounded by fishery related industries. Aberdeenshire Council is in charge of the development of fishing industry in Peterhead.

4. Literature Review

4.1. Fisheries & Aquaculture

To date, the United Kingdom is listed as one of the top 10 importer of fish and fisheries products (OECD, 2014). The imported fishing products raised 69.6% from 2003 to 2012 in United Kingdom (See Table 2). Under the assumption made by OECD, the total fish production will grow steadily by 2024. Aquaculture production will also be benefited and grow rapidly. However, the global annual growth rate of the industry is only 2.5% between 2014 and 2024 which is 3.5% lower than historical levels. This is due to various reasons but mainly caused by competing uses of coastal areas and inshore areas.

2012 Ranking	Country	2003	2011	2012	Variation 2003-2012	Variation 2011-2012
1	Japan	12,395	17,340	17,988	45.1%	3.7%
2	United States	11,653	17,466	17,561	50.7%	0.5%
3	China	2,388	7,572	7,441	211.5%	-1.7%
4	Spain	4,904	7,309	6,487	32.3%	-11.2%
5	France	3,771	6,567	6,040	60.2%	-8.0%
6	Italy	3,558	6,211	5,563	56.3%	-10.4%
7	Germany	2,635	5,513	5,305	101.3%	-3.8%
8	United Kingdom	2,507	4,257	4,252	69.6%	-0.1%
9	Korea	1,905	3,935	3,736	91.5%	-5.0%
10	Hong Kong, China	1,752	3,513	3,663	109.0%	4.3%

Table 2. Top ten and OECD top eight importers of fish and fishery products (USD millions)

The importance of the aquaculture production is increasing. OECD (2014, pp.25) assumed “Both nominal and real prices of fish and fish products are expected to rise by 2024.” The shift of prices could contribute to certain reasons. Steady growth of population, new applied legislation, increasing feeding cost of fish farming, raising price of fuel, and relatively stable capture are those main factors that influence the shifting of aquaculture production price. Landing Obligation is under Common

Fisheries Policy (CFP)[9] with aiming to reduce wastes and discards at seas. As Landing obligation[10] be adopted in European Union since 2015, fishermen are mandatory to land all the captured commercial species including juveniles which means discards are entirely banned. Due to this legislation, the amount of marketable fish products slightly decreased. Undersized fish landed at ports could not be marketed as direct human consumption. Meanwhile, undersized captures still be counted into Total Allowance Catch (TAC)[11]. Landing Obligation could be considered as main trigger for fishing industry seeking to add values on its fish and fish products to balance lost. An additional driver is the demand of sustainability. Sustainable development is now the mainstream among worldwide. More and more requirements are proposed by different stakeholders to monitor the fish production process. Fishermen are required to innovated their equipment, fishing in conservative way or even be monitored their activities on boat. Fishing Industries are now trying to have innovations and improvements in processing, preservation of fish and ecosystem, reducing packaging, and optimizing transport and logistics as means. The trend of being sustainable effects both quantities and market price of fish and fish products as a consequence.

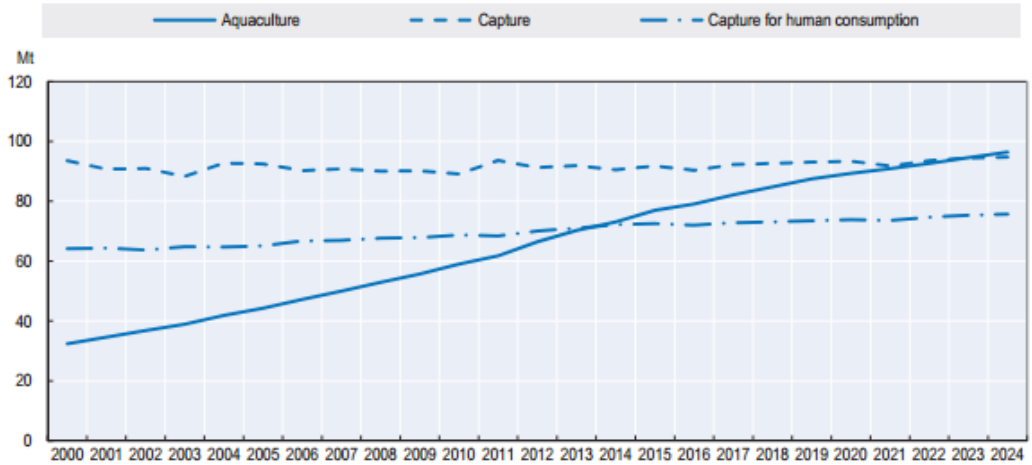

Figure 4.1 Aquaculture has surpassed capture fisheries as main source of human consumption

(Source: OECD reviews of fisheries, 2014)

[9] Details about Common Fishery Policy could be found on European Commission's official website. URL: https://ec.europa.eu/fisheries/cfp_en

[10] Details about Landing Obligation could be found on European Commission's official website. URL: https://ec.europa.eu/fisheries/cfp/fishing_rules/discards_en

[11] Details about Total Allowance Catch could be found on European Commission's official website. URL: https://ec.europa.eu/fisheries/cfp/fishing_rules/tacs_en

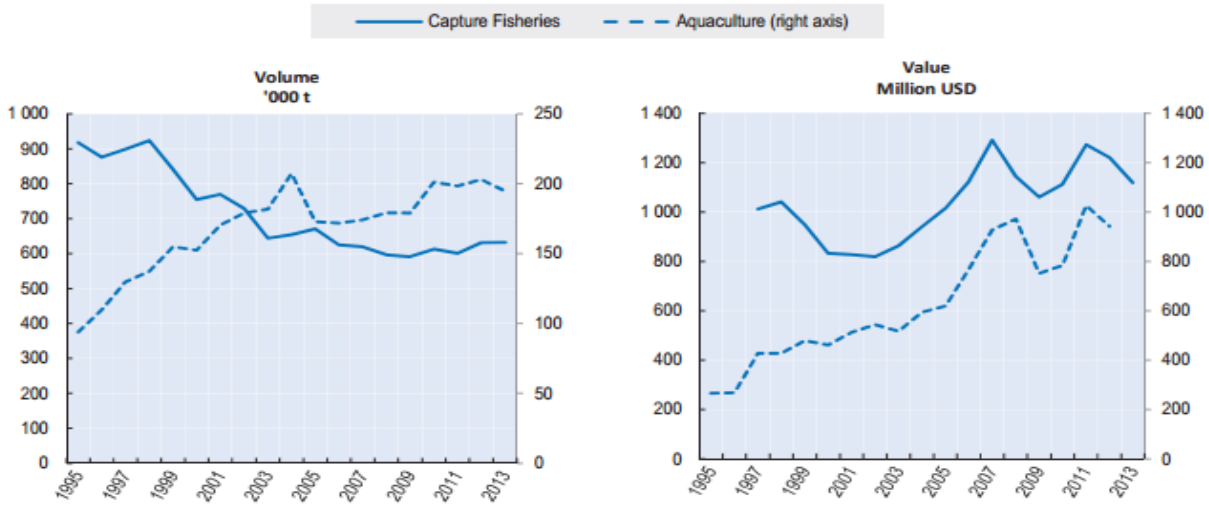

Figure 4.2 Capture fisheries and aquaculture production in United Kingdom (Source: FAO FishStat Database)

Outcomes	Thematic Objects		
	Economic	Environmental	Social
Sustainable Development of a Successful Marine Renewables Energy Industry in Scotland	• Facilitate development of wave, tidal and wind energy sectors in a planned and sustainable manner • Ensure efficiency licensing processes to help facilitate sustainable green energy development within Scottish water • Ensure effective collaboration with all stakeholders to ensure a successful and sustainable future for the industry		
Sustainable, Profitable and well Managed Fisheries, and Fish Processing Industries in Scotland	• Implementation of Common Fisheries Policy Reform (CFP) • Implementation of New Inshore Fisheries Strategy • Maximize Socio-economic value flowing from Scotland's fishing opportunities consistent with maintaining a healthy environment		
Sustainable, Profitable and well Managed Aquaculture Industries in Scotland	• Maximize socio-economic value flowing from Scotland's sustainably growing aquaculture industry • Implement Aquaculture and Fisheries (Scotland) Act 2013 • Contribute to European Blue Growth agenda through the implementation of Aquaculture CFP Reform		
Sustainable Managed Salmon and Recreational Fisheries	• Maximize socio-economic value from Scotland's salmon and recreational fisheries, whilst protecting and enhancing stocks • Implement Aquaculture and Fisheries (Scotland) Act 2013 • Develop a management framework for salmon and freshwater fisheries fit for purpose in the 21st century		
A Healthy and Sustainable Marine Environment where Key Components of the Marine Eco-system Structure are Protected	• Development and implementation of the National Marine Plan, establishment of Scottish Marine Regions and regional plans • Ensure Good Environment Status in our seas through implementation of the EU Marine Strategy Framework • Develop an ecologically coherent network of Marine Protected Areas		

Figure 4.3 Simplified Marine Scotland's Strategic Framework 2013-16 (Source: Marine Scotland)

In 2010, the OECD identified green policy options and market approaches concerning improving food system's to mitigate climate changes. It Encourages governments to develop sustainable economic growth on fishing sectors. Marine Scotland, the Scottish fishery department, developed the Marine Atlas to tackle general marine affairs in 2013. Furthermore, Marine Scotland Strategic Framework was proposed the same year. The framework was aimed to reach more sustainable and

profitable fisheries and aquaculture sectors (Marine Scotland, 2013). It considered the three characteristics suggested by OECD (2014) for a good governance and institutions, which are: "good availability of information about the actions engaged in or supervised by the entity, transparency in the decision-making process, and accountability in decisions made and enforcement measures taken."

According to Scottish fishery statistics (Marine Scotland, 2016), Landing quantity abroad by Scottish registered vessels was 169,000 tonnes of sea fish and shellfish in 2015. The main landing countries were Norway with 120.639 tonnes, followed by Denmark, Ireland, Netherland, and Spain. Among all landings by Scottish vessels, landing abroad held 38 per cent quantity and 25 per cent value. Peterhead port accounted the most quantity of landings in Scotland in 2015 with 138,077 tonnes and value accounted 124 million pounds. 58 per cent of quantity of landing in Peterhead was pelagic species that accounted. Current fish catching industry gathered in North East Scotland. Figure 4.4 shows the values and quantities of landings into Scotland by all vessels by districts in 2015. Peterhead has both the highest values and quantities among Scotland. Aberdeen City is no longer the third biggest port in Scotland with only 1,208 tonnes landings at port. However, the reality is Aberdeen Port has no fish landings at port, as its boat regulated in Aberdeen land in Peterhead or other ports (Fraser, Personal Interview, March, 2017). The harbor closed down its fish market in 2013. Thus, most of the landings are landed in Peterhead with auctions held on weekdays at Peterhead fish market. Back to 1970s, there was a trend for fishing industry moving from Aberdeen City to Peterhead or other urban settlement. (Coull, 1996)With the advantages of large amount landings located in North East Scotland, lots of fish processing sectors likewise settled in North East Scotland. 53% of the total number of fish processing enterprises in Scotland are gathering in the area (BDA^{plus}, 2015). Peterhead has 25 enterprises located in town and Aberdeen still has 29 fish processing companies. Even though the city still obtained the most processing factories in North East Scotland, factories might move out to Peterhead or other settlements in the future with its less focus on fishing industry.

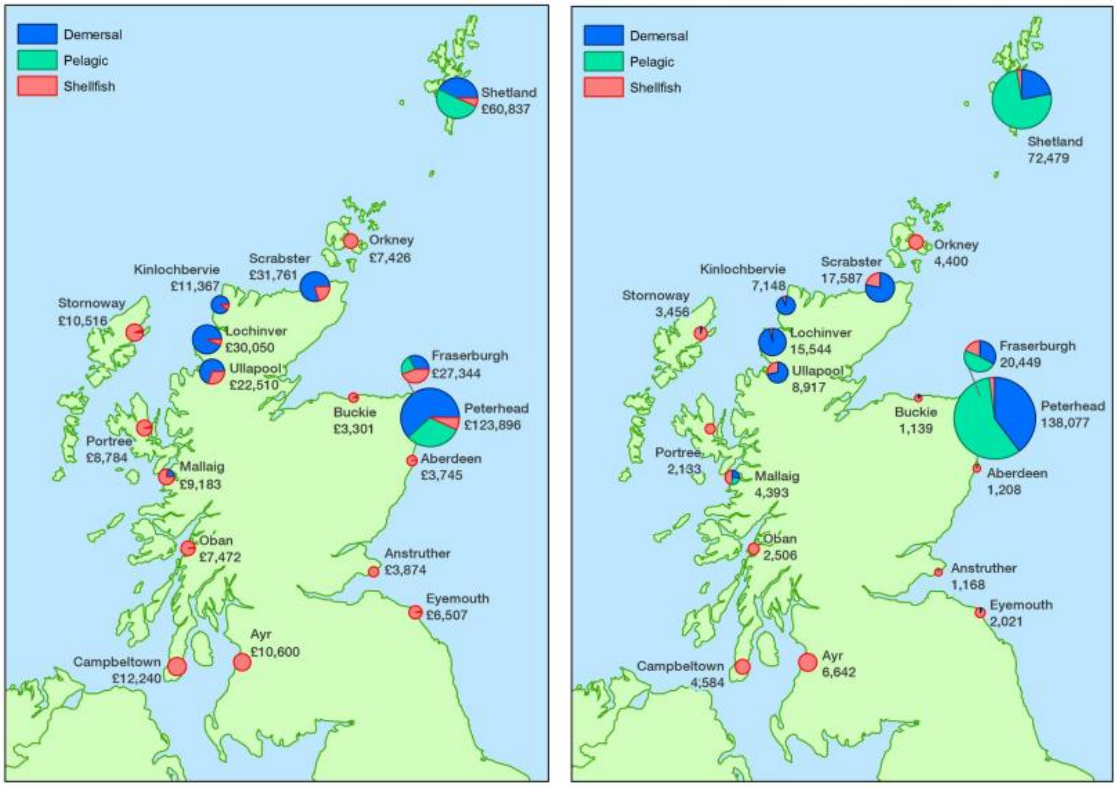

Figure 4.4 Values (Right, thousand £) and quantities (Left, tonnes) of landings into Scotland by all vessels by district 2015 (Source: Marine Scotland, 2016)

Aberdeen City no longer dominates the fishing industry in Scotland. Without enough landings at the port, the geographic advantages of Aberdeen City were not to encourage fishing industry to stay in the area. Processing factories in Aberdeen city tended to move to Peterhead as it's only less than an hour drive from Aberdeen City. The transportation networks of Aberdeen City and shire are convenient and well developed (Aberdeen City Council, 2015). Likewise, municipality of Aberdeen City has not shown the wiliness of prosperous its fishing industry. These facts drive most of the factories and fishermen move to smaller urban areas or suburb instead of staying in city center (Stephen, Telephone Interview, April, 2017). In Figure 4.5, one fifth of total business units in Peterhead are primary industries which mainly consists by fishing sector (Aberdeenshire Council, 2016). Accounting other related manufacturing and transportation industries settled around, positive effects brought by gather economic is another incentive for fishing industries moving from Aberdeen to Peterhead. Migration of fishing industry shows the appearance of counter-urbanization happening in the region. The counter-urbanization phenomenon of fishing industry is compelling and unique in North East Scotland as there has few studies of specific industries counter-urbanized around the

world as current discussions and studies about counter-urbanization were about migration of individuals (Hosszú, 2009). This phenomenon of changes in selected sites was discussed in the next section.

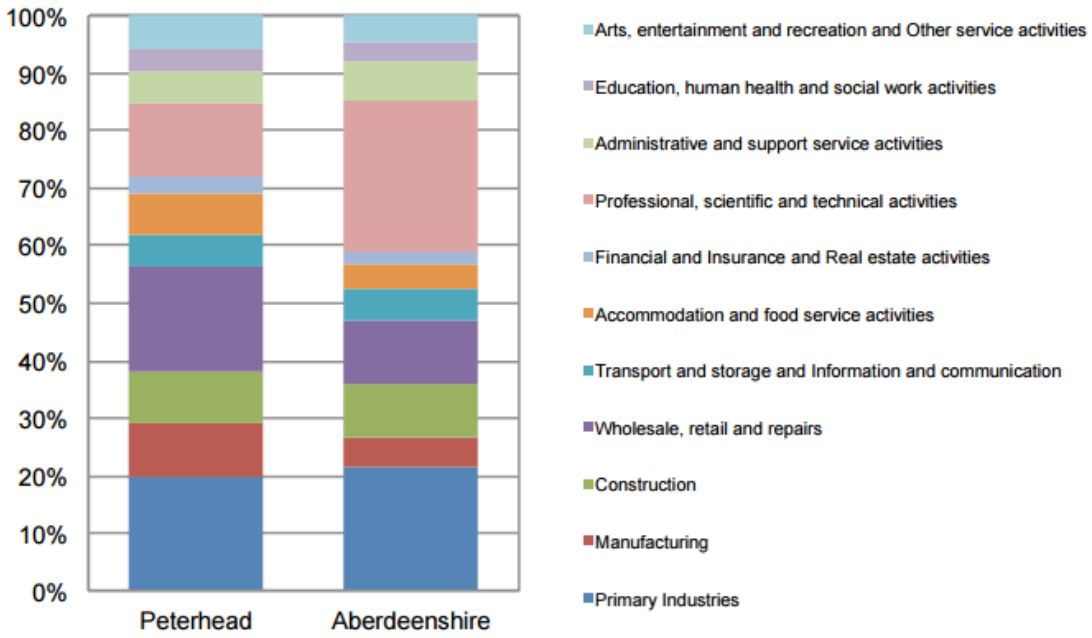

Figure 4.5 Numbers of Business Unit in Peterhead and Aberdeenshire, 2015

(Source: Aberdeenshire Council)

4.2. Phenomenon of Counter-Urbanization

Before discussing the phenomenon of counter-urbanization, it is necessary to briefly interpret "urbanization" and "development process of urban settlement". The *Oxford Dictionary* defines *urbanization* as "The process of making an area more urban." In early studies, urbanization was the most common words to clarify the trends of population moving from rural areas to urban areas. However, it has a broader meaning in modern era. Hosszú (2009)[12] pointed out that urbanization has double meanings which describe the spreading concepts of contemporary urban life style and infrastructures; and illustrate the phenomenon of population continuously moving and settling in urban areas. Moreover, urbanization was included as the first phases of development process of urban settlement. The process could be divided to four different phases: urbanization, suburbanization, des-urbanization and re-urbanization (Van Den Berg, L. et al., 1982). Urbanization

[12] Originate from Enyedi, Gy. (1988) A városnövekedés szakaszai. – Akadémia Kiadó, Budapest, p. 115.

happens at different times in different areas. However, the consequences of urbanization were quite similar and were discussed for several decades. Overpopulation, industrialization, gentrification are the most common discussion of consequences during urbanization phases. Market and industries growth increased rapidly and gathered more and more labors into urban settlement. The needs of space for both individual and public use became a serious issue in urban areas. Therefore, conflicts between different stakeholders and groups raised at the same time. Counter-urbanization was raised to describe the phenomenon happened in 1970s in United States (Halliday and Coombes, 1995). The trend was seen as a consequence of various problems happens in cities. The most common factors caused counter-urbanization were insufficient spaces and inappropriate governance or policies affected certain groups of citizens. Therefore, citizens chose to leave away from city centers. Unlike suburbanization, counter-urbanization is a trend that populations in cities or metropolitan areas moved out to non-metropolitan areas surrounded by. It could be seen as a "deconcentrating process" of cities and large settlements (Mitchell, 2004). Smaller settlement located around cities got opportunities of having migrations and wealth inhabitants moved in to the areas which provided them more resources to have further development. Fuguit and Beale (1996, pp. 2) defined "non-metropolitan turnaround as a period of renewed and widespread non-metropolitan population growth and net migration gain, which overall was at a higher level than that of metropolitan areas". A migratory movement also interpret the phenomenon of counter-urbanization (Mitchell, 2004). Nevertheless, Robert and Randolph (1984) stated two prerequisites when counter-urbanization being considered as a process of spatial de-glomeration of population: de-concentration and decentralization. The former emphasizes a migration of population from larger metropolitan areas to outer settlements that are beyond the influence of metropolitan areas. The latter exposes the movement of population from central metropolitan areas to non-central areas. Changes caused by the process of counter-urbanization might happen in some places for instance, changing of life styles, environment, economic structures, and amount of populations (Hosszú, 2009).

The theory of counter-urbanization can be applied to fishing industry in Aberdeen City. The de-concentration of fishing industry started when it gradually lost the support from governmental institutions and the harbor board in the 1970s (Turner, 1986). Meanwhile, the fishing industry needs to competitive with new coming industry which got supports from governments. Without backing

from the municipality, fisheries in Aberdeen City had no choice but seek to relocate themselves in neighboring areas. In Section 3, the historical review of both Aberdeen City and Peterhead interpreted some factors caused the movement of fishing industry. Another interpretation for the phenomenon of counter-urbanization is the increasing accessibility of transport system and communication technologies between settlements (Hosszú, 2009). The distance between Peterhead and Aberdeen City is only 45 kilometers; of it's less than an hour drive from each other without traffic. To date, Aberdeen City plans to relocate its remaining processing factories from the city center (Stephen, Telephone interview, April, 2017). The city is now highly dependent on oil and gas industries but suffering another economic crisis due to fluctuating oil prices. A similar dilemma of urban development plan raises again in Aberdeen city. Complications of economic growth, social welfare and other social issues increase due to the monopoly of a single industry. A more comprehensive development strategy and well governance are required to implement in Aberdeen City. Resilience is a concept that been applied and discussed in urban discourse recently. The concept was raised on account of increasing natural disaster that caused tripled global economic costs stated (WorldBank Press, 18th Nov. 2013). Most frequently, being resilient and sustainable becomes an important inquiry to practice and involve in urban development plans. Urban area where most of populations gathered is a complex system affected by numerous factors. The concept of resilience tries to include all potential urban drivers into consideration. Environmental, social, economic, and ecological drivers are those affected urban mechanism the most (Anastasopoulou et. al, N.d.). Hence, measures accompanying with resilient and sustainable concepts might be solutions for Aberdeen City and surrounding regions to prevent harms.

4.3. Resilience & Sustainability

As mentioned in Section 1.2, resilience is a popular concept raised in recent years. The concept is to build the ability of urban systems in order to reduce impacts from potential threatens. The concept is criticized as it is difficult to be explained and implemented in strategies. With abundant issues happening in urban areas, administrators have to collect and evaluate the massive data they receive and picking up those most urgent conflicts and challenges they need to solve. Governments will not able to answer and respond to all stakeholders' needs. It is certainly more difficult to address decide which issue is the most urgent one than design the whole strategies (Maina and Hsiao, 2017).

Urban system is a complicated mechanism recycles and affect each factors in the system. Being resilient is not a means that could perfectly solve threatens and recover city's capability to origins. Impacts might be either permanent or temporary, destroying a city's capability (Desouza and Flanery, 2013). Resilient concept tends to strengthen and build urban system to tackle with potential stressors and help systems reach to its original standard as much as possible.

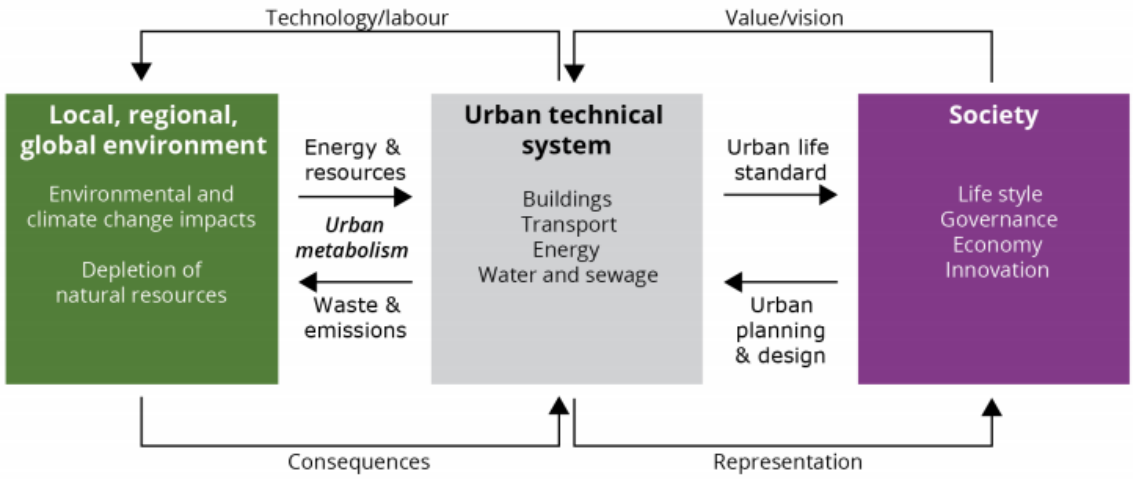

Figure 4.6 The urban system (Source: European Environmental Agency)

A general framework proposed by Desouza and Flanery (2013) tries to simplify this complicated debate. The proposal is to split the development process into three different stages: planning, designing and managing. There are four different categories of stressors might impact the urban system. Human stressors are caused by governance and institutional interactions in side urban areas. Natural Stressors are those unpredictable disasters coming from outer areas. Technological stressors illustrate the need of innovation. It express the needs of knowledge in the urban settlement and the necessity of developing a smart urban area conducive to renewed problems. The category of Economic Stressors includes several sub-categories: Structural resilience, focusing on infrastructure renewal and development; Financial resilience, targeting on economic flow and performance of urban settlement; and Social resilience, includes all possible factors happening in the city that cause by interaction of stakeholders (Maina and Hsiao, 2017). In Figure 4.7, the developing process of resilient strategy is separated into 4 phases. An additional phases "Assessing" is added on by author. Considering strategies are often renewable and retargeted after years, measures and criteria of

assessment by administrators plays a critical role in the whole process. Listed four main categories were used to analysis the research outcomes of studied sites. Next paragraph illustrated a more detailed explanation of those four categories under urban discussion.

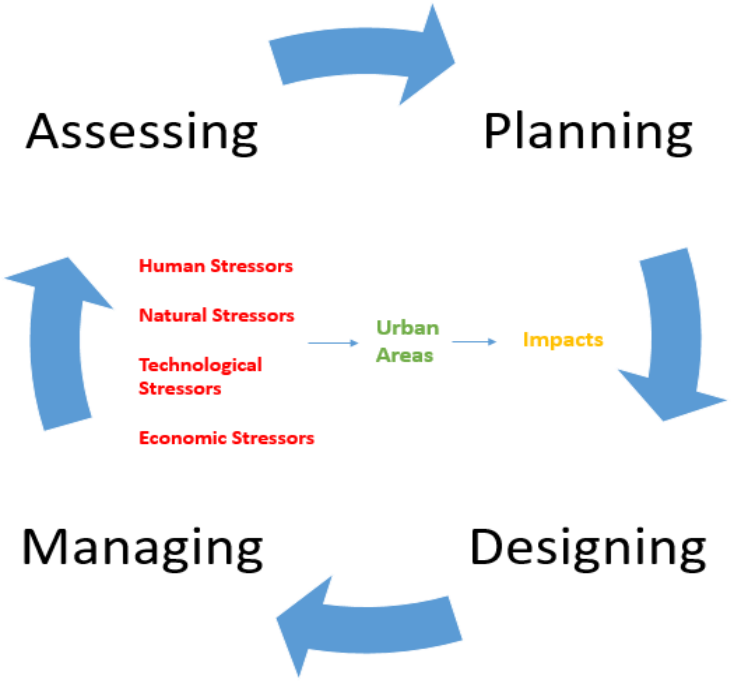

Figure 4.7 Public Sectors' Resilient Planning Process (Source: Desouza & Flanery, 2013)

Climate Change was often raised when mentioning Natural Stressors of cities. The vulnerability of cities caused by natural disasters were observed frequently with earthquakes, tsunami, typhoon and storms attack cities among the world. Society and territories affected by natural disasters as those risks result from a combination of the nature and the hazard itself (UNEP, 2007). Ernstson et al. (2010) proposed that cities need to construct their own capacity to endure impacts and shocks from outer factors. Natural resilience refers to enhancing cities' ability by using natural and built components (Maina & Hsiao, 2017). However, the principle of promoting sustainability were targeted on the utility of resources and energy efficiency. The sustainable discussion tends to preserve and improve the natural environment. Gasparini et al., (2014) raised a concern that the increasing vulnerability of cities was increasingly caused by climate change. Rahmsdorf, researcher from Potsdam Institute for Climate Impact Research, predicted sea levels would rise 1.5 to 3.5 meters globally due to climate change. With the majority of cities and settlements located near coastal areas, impacts from natural disasters

will be the most serious discussion in the future.

Human resilience includes governmental and institutional resilience. Human resilience could help to assist the social pillar of resilience (Johnson and Lehmann, 2006). Under governmental resilience, trust is the necessary elements between private and public sectors. Transparency and openness often accelerate citizens and communities involve in public affairs and be effective. Higher involvement of all stakeholders will pave the way for government to tackle with disasters. Today, involvement of citizens increased rapidly as many cities including the necessity of citizens' engagement into developing planning process. Sharing information between government and private sectors helps to make governance affective and efficient. Unfortunately, having highly communicated and transparent interaction between sectors might also cause risks (Maina and Hsiao, 2017). If certain groups of citizens felt their Interests were being violated by political decisions, demonstration or negative participation in public affairs would occurred. Governments should be aware of deciding prior development goals while designing strategies. It could sum up as Maina and Hsiao (2017, pp.21) stated "With a lack of government assistance, the recovery and relief after disaster is left to the private market forces which often leads to economic and social vulnerability." Furthermore, institutional resilience seriously affects whole society when the understanding of knowledge, perceptions and information are not equivalent within different institutions which shows common objectives and institutional integration are fundamentals to support urban social systems.

Hall (1998) suggested that all types of creativity and innovation originate from cities. Society and urban system continuously creating new problems that need to be solve. Cities could be seem as a system opened up possibilities for innovation but current literatures did not fully aware of this situation (Johnson and Lehmann, 2006) Smart system and efficient innovations plays an important role in current technological developing discussions. Technological stressors or innovative stressors are categorized as influential impacts nowadays. Knowledge, insights, competences and good interactions between people and industry are elements that support Innovation (Barantes, 2002). It is not only technical improvements are considered as innovative resilience. Application of new techniques and innovations in market always require skilled labors. Therefore, innovation also contains the discussion of proper educational system provided in Society. Overall, innovation

resilience requires sufficient and well inputs from economic, political, social, and other factors which determined the performance of new innovations in urban mechanism.

Economic Resilience consists of financial resilience, infrastructural resilience and social resilience. (Desouza and Flanery, 2013) The social resilience includes the concern of social, economic and environmental. And how these, in turn affect their own vulnerabilities in cities (Gasparini et al., 2014). Economic stressors often be placed as the first priorities for governments to tackle with as economic vulnerability is significant to be observed. Developing tools and making economic policies are the most common means for cities to recover their economic performances. One of the three sub-category of resilience under economic discussion is financial resilience. Financial resilience can be examined as if the urban system could "make the best of its capital stocks" or "have resilient aspects existing in its financial mechanism". The former looks into the productive capability of financial system. The latter focuses more on adaptive ways of financial system while suffering stresses (Derissen et al. 2009). Another sub-category is social resilience. Social resilience is the most common concepts that be raised in resilience strategies. It includes the discussion of poverty, housing, welfare, distribution of resources and other issues caused by human interactions in urban system. "Social resilience is therefore dependent on the power structure within the city that control resources and therefore the resilience and vulnerability structure" stated by Maina and Hsiao (2017, pp. 18). Unequal distribution of power and resources are often the core factors causing risks in urban mechanism. Social vulnerability could be seem as the most desired but difficult problems happening in cities. The last categories of sub-resilience is structural resilience. Investment of infrastructures, communication systems, transportations are included in this category. Infrastructural resilience in some cases assists to solve social vulnerabilities by providing houses and building facilities. Moreover, infrastructural development affected not only within single urban system but connected to surrounding urban systems as it creates communication between communities and urban settlements (Zeemmering, 2012). Changes in single area would cause surrounded settlements also be influenced. Therefore, vulnerability of infrastructures are regional or not confined to administration boundary of cities.

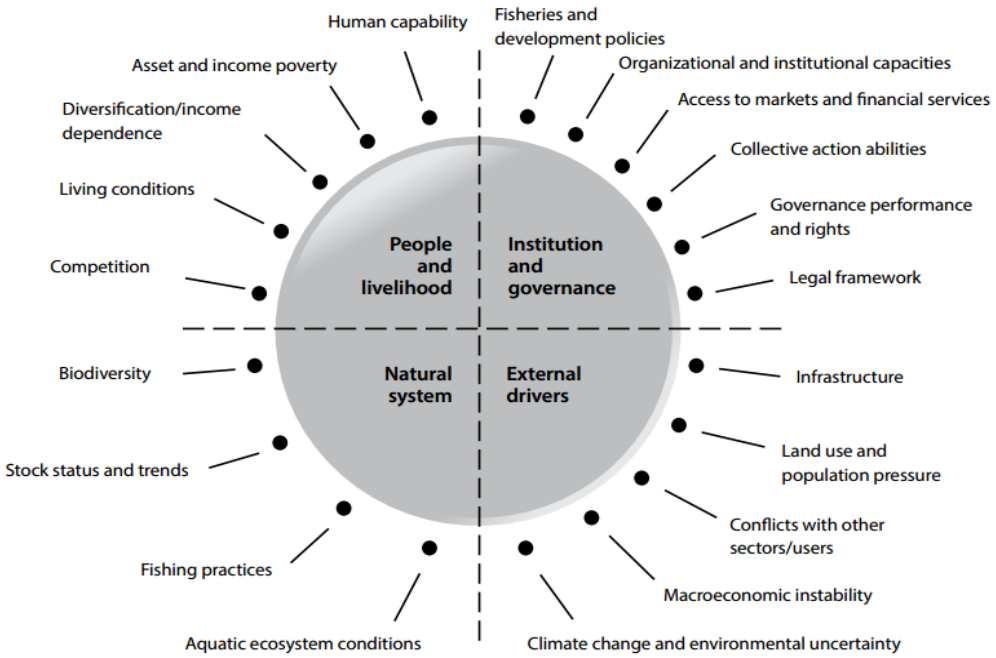

Figure 4.8 The 360° integrated assessment map for managing Resilience (Source: CPWF, 2013)

In the previous paragraph, resilience concepts were discussed within an urban scope. Figure 4.8 categorized stressors differently with framework designed by Desouza and Flanery (2013). The figure shows an analytic assessment of managing resilience of fisheries under international level. Unlike other industries, fisheries is a complicated issue highly influenced by global political stressors. Macroeconomic instability is the key factor affecting the development of fishing industry. Fish is movable and hardly to estimate the actual stock amount in fixed areas. Other characteristic of fish resources is they are often considered as common pool resources (Ostrom, 2008). This fact makes the management of fishing industry be more complicated as resource management were raised to national level or international level. Fishery is a unique industry which governmental policies need to be designed under international scope which might limit the development of industry due to various opinions from countries. Fishermen were required to adopt regulations from governments. Reporting fishing locations, amounts, species and detailed information were often stated in regulations (Johnson, Henry, and Thompson, 2014). According to Common fishery policy, Scottish available fishing quotas fluctuate each year base on scientific researches provided by Agriculture and Fisheries Council (AGRIFISH) under European Council (European Council, 2017). Fluctuation of fishing quota varied and enhance uncertainty of actual economic benefits from fishing industry. This uncertainty makes local governments had more challenging in development of fishing industry. The assessment map was

consider the fishery as isolated issue and points out potential considerations while pursuing sustainable development on fishery management.

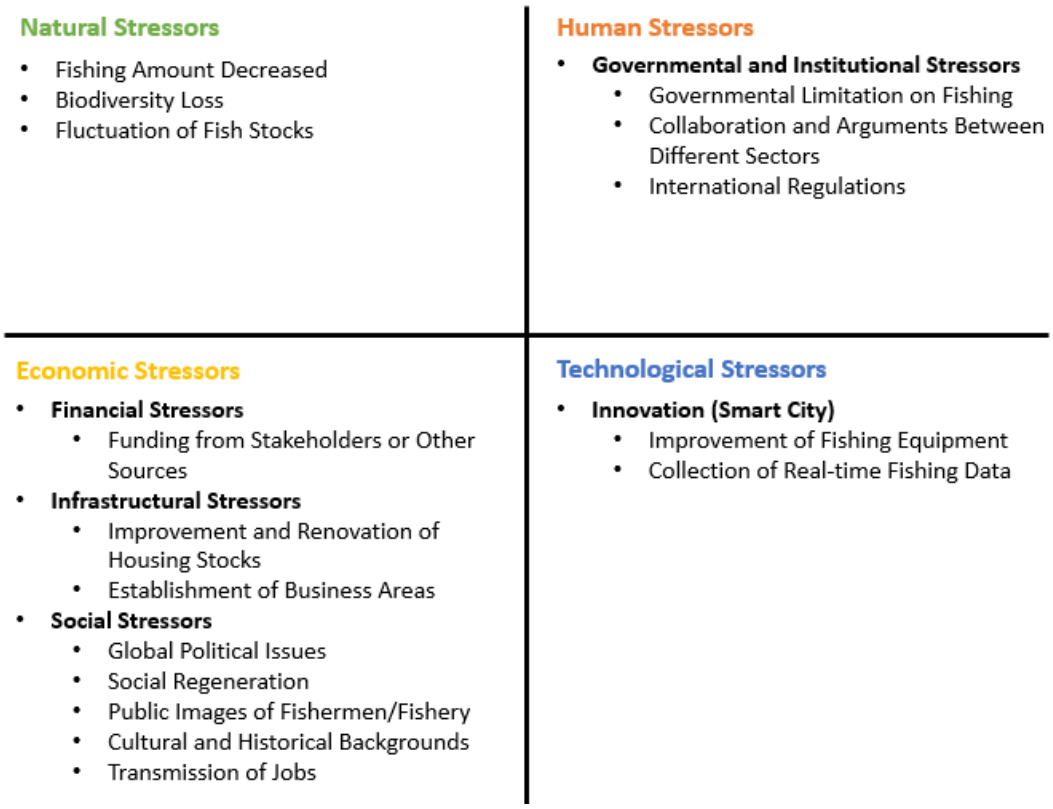

Figure 4.9 Stressors of Fishing Industry in 4 Categories

(Source: CPWF, Desouza and Flanery, 2013) (Designed by Author)

If fishery management is narrowed down into urban development scope, the assessment map needed to take all evidences happened in urban settlement into consideration. Combining the assessment from Figure 4.8 with the framework by Desouza and Flanery, Figure 4.9 shows the 4 categories of stressors that impact fishing industry in urban system. Majority of stressors are categorized under economic stressors. Human stressors are the second. However, natural stressors are the main uncertainty and threatens of fishing industry. It is the source that affects the whole supply chain of aquaculture and fish products. One of the challenges of fish processing sector in Aberdeen City and Aberdeenshire was mentioned in Section 1.1 as uncertainty of sources make the processing industry vulnerable and risky. It is an unsolved discussion with insufficient knowledge and techniques human beings have to discover the oceanic ecosystem. The principle of resilient approach is about to set an acceptable and appropriative configurations. It also aims to have all stakeholders

accepting the interventions, incentives and constraints that cities might face to while designing strategies (CPWF, 2013). Negotiation between each stakeholders is one of the important key for resilient strategies to succeed in urban systems.

4.4. Regional and Local Governance

The phenomenon of counter-urbanization of fishing industry and involvement of resilient framework were both related to governance in urban areas. In Section 4.2, migration of population could summarized as citizens were not satisfied with living standard or society in urban system. Consequences caused by counter-urbanization might be changing of life styles, environment, economic structures, and amount of populations. Those changes required governmental assistances as means. It was the same as Involving resilient framework into urban systems. Resilience was a concept to reach a desirable mechanism. In Practical, governance would play major role in implementing process. Developmental local government was raised in order to tackle increasing complexity of socio-economic and political challenges produced by capitalism and democracy (Schoburgh & Chakrabarti, 2016). It is to decentralized power from higher level to lower level institutions and actors. Common discussions on localized governance were about top-down oriented or bottom-up oriented approaches. Hildreth (2016) illustrated the relations between UK national and local governments. Primarily, governmental departments published policy outlines of what the policies intend to address and achieve. Secondary, local governments design initiatives to achieved desired policy outcomes. However, as fishery and oil industry are mainly regulated by central government, national regulations and local regulations both effected those two industries in North East Scotland with local development strategies often follow top-down approaches.

Besides discussing the two sides' approaches of initiatives, Maloney, Smith & Stoker (2000) pointed out three characteristics of formal institutional structure about social capital in urban system. First, degree of decentralization, with municipalities provided certain formal avenues for stakeholders to participate. Second, degree of coherence in public administration, which the two extreme were communities having different governmental institutions voluntary approaching or have higher collaborations between public sectors. Third, upper level of governmental associations execute requirements on voluntary community associations. By contrast, informal institutional structure

existed and varied depended on different local culture and governments which relations of governments and communities varied case by case. The three characteristics would be used to analyze the collaboration and power distribution of strategies regionally and institutionally at research sites. Furthermore, Necessity of building connections between urban settlements in both international and regional levels were increased in recent years (Zeemering, 2012). Proposal made by Barnes and Foster (2012) stated it is more importance to focus on capacities and purposes of regional governance instead of structures. However, the proposal does not ignore the functions and structures of governance. It emphasized the probability of desired outcomes goes beyond structures and cross borders.

5. Scottish Governance of Fishing Industry and Urban Development

The discussion of Scottish governance is hard to separate into different organizations and administrative structures in the research as local governments were working collaboratively or separately with Marine Scotland, the Fishery department in Scotland. Analysis of governance was deliberated by sectors in this section. In previous sections, the changes of economics were raised. The hypothesis of "society would benefit more by transforming into oil based industry" and "the migration of fishing industry makes governance less complicated in urban area" were analyzed in this section. Section 5.1 presents functions and brief introductions of conducted interviewees by sectors. The section briefly summarized roles, operational modes, and tasks of institutions in studied sites. Following sections 5.2 and 5.3 present research results from data collection. These two sections separately deliberate published development strategies by sectors. Strategies listed in Table 3 were in relation of economic development, fishing industry development, or sustainable urban development. Analysis and discussion are demonstrated in Section 5.4.

5.1. Institutions and Partnership of Interviewees

5.1.1. Interviewees from Public Sectors

Scottish marine policy is under the scope of UK fishery laws. Marine Scotland is a governmental institution in charge of all maritime issues in Scotland established in 2009. "Sottish Marin Atlas" is a comprehensive management plan of Scottish Marine industries (Fraser, Personal Interview, March, 2017). The entire plan was proposed in 2011. Under Marine Scotland Strategic Framework 2013-16, it is aimed to reach a prosperous and sustainable development of marine industries in Scotland. Reaching a sustainable, profitable and well managed fishing industry has been listed specifically as a pursuing outcome in the framework. The framework aimed to fulfill the objects of three different goals: economic, environmental and social thematic objects which could be seen as the categories of resilient design for the country. Under Marine Scotland's administrate structure, eighteen fishery offices been established each in charge of fishing data collection and industry situation for their district. Aberdeen Fishery Office manages the port from Aberdeen port go down south to Stonehaven. Peterhead fishery Office manages ports from Boddam to the boarder of north Aberdeen City (See Figure 5.1). Each Fishery Offices work closely with NGOs, businesses, and citizens trying to reach a

better industrial environment and better future. The formation of fishery offices was related to the development in industrial era. Before industrialization happened in eighteen centuries, fisheries were administrated by government and company bodies. The earliest fishery offices were formed due to the need of controlling inshore herring industry by district under the scope of Fishery Board, the Scottish governmental institution in charge of fishery issues. In 19 century, the coast was divided into sections which governed by each fishery offices. (Coull, 1996) Scottish fishery Offices are now under governance of Marine Scotland. Fishery offices also work closely with fishermen. The main task for the office is to collect catching data from each vessels and try to promote monitoring systems being equipped on fishing vessels. The fishing vessels equipped with cameras on boat would get additional catch allowance as bonus. The request of monitoring is aimed to prevent illegal actions made by fishermen while fishing, for instance, discarding, bottom trawling, and other illegal actions restrict by legislations (Higgins, Personal Interview, March, 2017).

Figure 5.1 Fishing Districts and Ports administrate by fishery offices in Scotland

(Marine Scotland, 2016)

Besides Marine Scotland, Aberdeen City Council and Aberdeenshire Council govern other inland fishing industries. Municipalities are responsible to the development of maritime industries within administrated boundaries. Since, North East Scottish fisheries are working closely together, local strategies are often designed and planned to address various regional challenges (See Section 5.2). KIMO UK is a governmental organization aims to protect and improve UK's marine environment. KIMO UK is under the organization of KIMO International. KIMO International collaborates with NGOs in local, national and international levels. It has several ongoing projects aims to provide practical solutions in order for stakeholders to improve marine environment (KIMO International, 2017). Proposed organization's projects of KIMO were more tend to prevent natural risks. Recently, the goal of KIMO UK is to reduce the marine litter by cooperating with fishermen. Registered fishing boat will collect litters in the ocean while they are operating on the sea. Collected litter were recycled. Collected gears and shred would transported by Danish plastics company, Plastix Global. The company clean and extrude the litters into materials. Processed materials were sold to plastic product manufactures. The recycling process aimed to bring in the concept of circular economy. (KIMO UK, 2016) KIMO UK work closely with Scottish Fishermen's Federation to get support from local fishermen and promote the action (Humphries, Telephone Interview, March, 2017).The North Scottish marine actions activated by KIMO UK was held by North Scottish governments which each local authorities have two representatives involve in the yearly meeting and decide the regional plan and strategies. The institution is founded by governmental funding and also from European Maritime and Fisheries Fund (EMFF). Statistics shows there were 214 vessels in Scotland involved in Marine Litter program. Joined vessels had collected 908 tonnes of litters at sea at the end of 2015 (KIMO UK, 2016). The action of collecting litters were seem to have more fellow joining. Scottish governments published a Marine Litter Strategy for Scotland in 2014 with specifying that governments should "promote the establishment of KIMO Fishing for Litter initiatives in fishing harbours" and facilitate the proposed goals and recommendations from Scottish Marine Litter Strategy Steering Group (OSPAR) (Scottish Governments, 2014).

5.1.2. Interviewees from Private Sectors working for Public Sectors

Besides collaboration between public sectors, Scottish government works closely to several different private stakeholders at the same time. Seafish Scotland is another non-government organization which collecting related economic, environmental data for governments. Also, provide the predicted future vision for governments to make the final policy making decision (Land, Telephone Interview, March, 2017). Seafish Scotland could be seen as a supporter of public sector and related fishermen, small fish processing factories. It work closely to government institutions (E.g Marine Scotland) working on cooperative projects such as "Evidence Gathering in Support of Sustainable Scottish Inshore Fisheries project". The Project took place from June 2014 to July 2015 including seven sub-projects to address the knowledge gaps in the management process. In the last final report of stage 8, there are 29 information gaps which highly related to socio-economic data lacking, not assessable fishery stocks, and fishing locational data missing. Even though it is a national program, the result somehow helps regional governments to have a general view of what might be the potential problems between governments and individuals (Seafish Scotland, N.d.).

BDA^{plus} is also a non-governmental organization working and cooperating with public sectors. It is a consultancy that works close with fish processing industries and provide professional advices and suggestions for developing plans (Moir, Telephone Interview, April, 2017). Aberdeenshire council worked with BDA^{plus} in development of strategies for fish processing sectors in North East Scotland. Advantage of committing consultancy to develop projects is the trustable information collected from enterprises. Public and private sectors are difficult to build trust between each other. With a third party plays the role of connection, interviewed or data collection would be more credible and efficiency. The collaborated strategy of fish processing industry was discussed in Section 0.

5.1.3. Interviewees from Quasi-public partnership

Forming partnership with private sectors is another means for public sectors to governance the industry. North Aberdeenshire Local Action Group was Form by local governments, fishery related businesses, and other private sectors. The partnership is seem as a bottom-up oriented group with partners making decisions together (Wilkinson, Personal Interview, April, 2017). Management of NALAG followed their "North Aberdeenshire Local Development Strategy (NALDS)". At the studies site,

there's not that much quasi-public strategies been published. Details about strategies was explained in Section5.3.1. The debates of unbalanced distribution of power was raised by interviewees from North Aberdeenshire Local Action Group (NALAG). The argument was about efficiency and appropriateness of final decision making stage. Since final decision making would still be made by public sectors, Marine Scotland, the arguments from stakeholders questioned about the principle of bottom-up measures were not truly exist (Wilkinson, Personal Interview, April 2017). Since, Marine Scotland plays the most important role in the decision making stages. Discussion about distribution of power might be a crucial issues in the partnership's framework.

Fish4Market working group formed by Aberdeenshire Council, Scottish fishing and fish processing sectors. The partners includes Aberdeen Fish Producers Organization, North East of Scotland Fisherman's Organization, Fishing Vessel Agents and Owners Association, Lunar Fishing Company, Scottish Seafood Association, Aberdeenshire Council, and Seafish. It first created by local industries. The partnership aimed to establish an online platform which provides real time fished stocks and helps stakeholders to access data easily before landing (McDonalds, Personal Interview, March, 2017). The transparency data required fishermen join in the platform and insert data before landing. The partnership meets regularly in Peterhead. Even though fishery office had online system recorded daily landing amount of fish, the data was not accessible for all stakeholders (Birnie, Personal Interview, April, 2017). Fish4Market platform is still under construction. The application aimed to attract more user and stakeholders involving in the system which might build a better communication and information exchange standard in Scottish fishing industry.

5.1.4. Interviewees from Private Sectors

Scottish Fishermen Federation represents all the fishermen organization or association in Scotland. It was formed in 1973. The federation plays an important role in national and international levels that aims to maximize the profits for Scottish Fishermen. (Scottish Fishermen's Federation, 2017). The organization provides information and work with different sectors closely. It afford research articles and data for members likewise the research on impacts of Scottish fishing rights due to Brexit. Nevertheless Scottish Fishermen Federation liaises with bodies and involve in offshore and energy trust to offered funding for fishermen that were influenced due to offshore activities by other

industries. The requirements of applying the funds is showing the impacts and real loss on fishing activities or fishing amount. The compensation fund and other trust fund are aimed to minimize conflicts among different industries working at North Sea (Morrison, Personal Interview, 2017). The Federation assist fishermen organizations and represents fishermen to negotiate with different stakeholders. Another interviewee related to fishermen organization was North East of Scotland Fisherman's Organization (NESFO). NESFO is a producers' organization formed in 1980. Members of the organization are producers working at the economic area from Peterhead to Avoch at Sea. NESFO is a member of Scottish Fishermen Federation. It also joined the establishment of Fish4Market online platform. The interviewee had no strategies or planed published but provided a general view of what had happened in Scottish fishing industry.

Scottish Seafood Association represents Scottish fish processing factories. The association aims to build a better vision for fish processing sectors in Scotland and UK (Buchan, Personal Interview, April, 2017). The organization works closely with fishing sectors, academic sectors, educational institutions and public sectors. Under Scottish administration, fish processing sector is under management of Marine Scotland. However, an argument was raised by interviewee as fish processing sector should work with Food & Drink, Scottish governmental department works on food industries, instead of Marine Scotland (Buchan, Personal Interview, April, 2017).

Peterhead Port Authority is established in 2006. The port authority was a merge of Peterhead Harbor Trust which managed the current main harbor area, and Peterhead Bay Authority, which in charge of bay area in Peterhead (Watt, Personal Interview, April, 2017). Now both harbor area and bay area are under ruling of Peterhead Port Authority. Peterhead Port is a trust port which runs independently by its legislation and all profit and surpluses from trust port operations will reinvested into the port (Peterhead Port Authority, 2015). The Authority is a partner of NALAG. It has an ongoing development project at Peterhead Harbor (See Section5.3.2). Main customers of Peterhead port authority are Energy Industry including oil and gas, fishing industry and other commercial activities (Peterhead Port Authority, 2015).

5.2. Developing Plan and Strategies by Public Sectors

It is important to mention Scotland's Government Economic Strategy published in 2011 before discussing local development plan. Most of Scottish regional and local strategies followed the priorities made by national economic strategy (Aberdeen City Council, 2016). Scotland's Governmental economic strategy is aiming to reach a more sustainable and adaptable economy. The six strategic priorities are: creating supporting business, promoting low carbon economy, establishing learning skills and well beings, developing infrastructure and place, building effective government, and improving equity (See Figure 5.2).

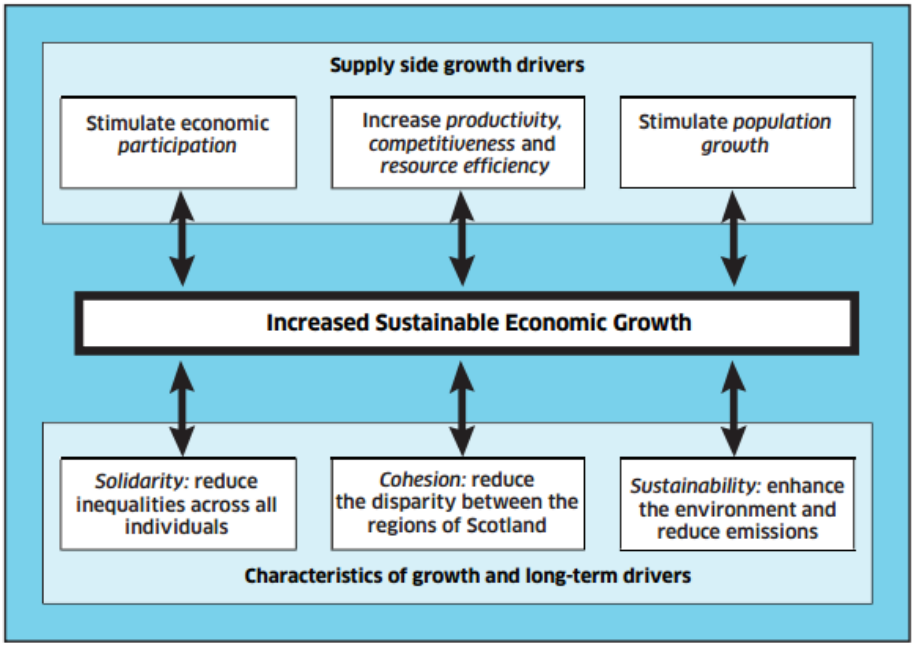

Figure 5.2 Six Strategic Priorities and purpose framework of Scotland's Government Economic Strategy.

(Source: The Government Economic Strategy, 2011)

The target of strategies are trying to accelerate the unemployment and reduce the unemployment rate in Scotland. Also, build a more livable and harmonized society. In the strategy, it proposed that global economic is fragile. The uncertainty of positive economic growth limited Sottish job market. Governments should targeted economic as main recovery goal through investing infrastructures, securing affordable financial remains, and combating with uncertainty lastly. Investment of infrastructures as the first priorities is aimed to stands still basic needs for developing new businesses. The next is to transmit the regions to low carbon economy. Governance and

educational needs are supportive priorities to reach a sustainable future. Taking four categories of resilience into account, Scottish Government Economy Strategy took financial resilience as the first goals to work on. Natural resilience was the next and followed by human resilience and technological resilience. This strategy is a national level development plan with local municipalities following the priorities of the strategies to design and plan their regional and local strategies and plans. In the research, five different strategies were listed and discussed in following sections. Those strategies were planned in regional or local scales. Selected strategies were designed for addressing either sustainable urban development issues or fisheries and economic related topics.

Scale	Name of strategy	Boundary
Regional	Regional Economy Strategy	Aberdeen City and Aberdeenshire
Regional	North East Scotland Fish Processing Strategy	Aberdeen City and Aberdeenshire
Alliance[13]	Towards a Low Carbon Scotland Sustainable Cities	Aberdeen City
Local	North Aberdeenshire Local Development Strategy (NALDS)	Aberdeenshire
Local	Peterhead Fishing Harbor development Plan	Peterhead

Table 3. List of Researched strategies

5.2.1. Regional Economy Strategy

This Strategy is mainly dealing with oil and gas industries in Aberdeen City and Aberdeenshire. In the report (pp. 10), it stated that “The region has 415 oil and gas companies per 100,000 people, and it remains a key location for oil and gas investment.” Oil and gas related job are categorized under “mining & quarrying” with lots of related supply chain jobs under “professional, science and technical activities” category. To sum up, Employees in North East Scotland are mainly working for oil and gas industries. This shows the necessity of having an industrial targeted strategies to address dilemma of economic crisis of oil industry recently. According to the Scottish government economic Strategy, even the European target of energy production should have 20% comes from renewable energy, Scottish governments aims to have 100% renewable electricity by 2020. This accelerate the development

[13] Scottish Cities Alliance is formed by seven different cities in Scotland. The alliance is aimed to promote a more sustainable and smart concept into urban development goals in Scottish Cities. Alliance includes: Aberdeen, Edinburgh, Dundee, Glasgow, Inverness, Perth, and Stirling

targets of Aberdeen City and Aberdeenshire focusing on being Energy Capital in Scotland. The vision of strategy in short term is building ability of economic recovery in UKCS. And reached a sustained and secured region in long-term. Development goals of strategies focused on innovation, inclusive economic growth, investment of infrastructures, and internationalization. Economic resilience is the main focus of this strategy. However, the unique point of this strategy is it took social resilience more seriously than other development strategies discussed in the paper. Insufficient infrastructures of housing and business land cut the willingness of employees moving to Aberdeen City, even though it has the highest average amount of salaries among Scotland (Aberdeen City Council, 2017). The goals of innovated infrastructures were focus on housing, transportation and particular water, gas and electricity supply in the region.

5.2.2. North East Scotland Fish Processing Strategy

It is consider as a regional plan of developing a better environment for fish processing sectors in North East Scotland. The strategy leads by Aberdeenshire Council with Aberdeen City Council, and cooperate with BDA^{plus}, a consultancy working closely with fishing sectors in Scotland for decades. The values of fish and fish processing products drops while the landing quantities are increasing according to Figure 5.3. Therefore, municipalities Commissioned BDA^{plus} to design the North East Scotland Fish Processing Strategy (Moir, Telephone Interview, April, 2017). It is a strategy with highly considered stakeholders opinions and suggestions. 75 per cent of fish processing sectors in North East Scotland were interviewed personally. The strategy is designed as a 15-20 years development strategy and with individual action plan designed every 5 years (McDonald, Personal Interview, March, 2017). First Action Plan published in 2015 and will be examined in 2019. Four main categories are raised to strengthen fishing processing industry: sustainable, smart, dynamic, and diverse. The vulnerability of fish processing sectors is the weak connections and trust with fishermen and market. The action plan focuses on developing supply chain and create more value on products, such as circular economy concept of using waste products or branding. Likewise, engaging and promoting industries with academic institutions to attract new generations join the industry, renewal of infrastructure et.al.

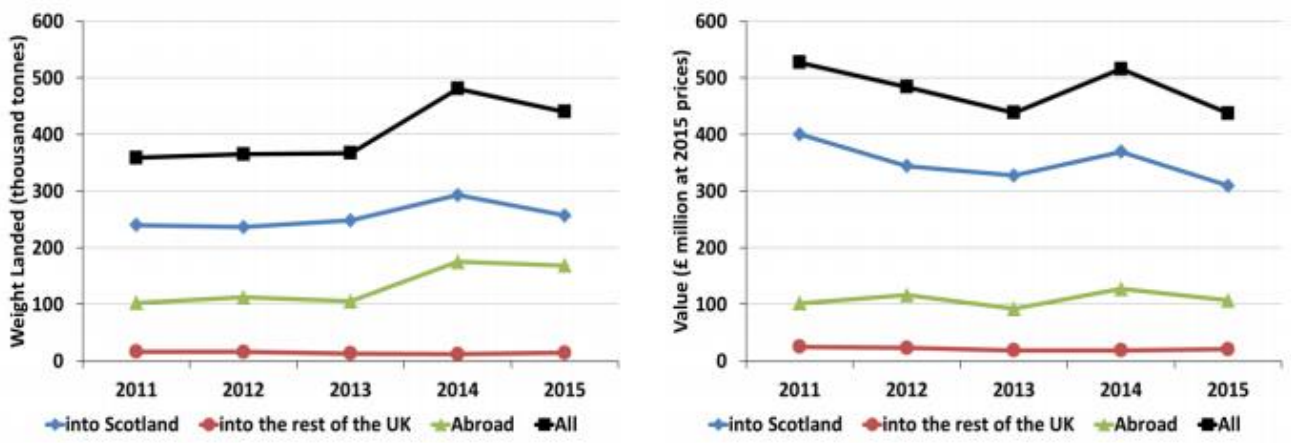

Figure 5.3 Quantity and value of all landings by Scottish vessels: 2011 to 2015

(Source: Marine Scotland, 2016)

5.2.3. Towards a Low Carbon Scotland Sustainable Cities

Aberdeen City Council is trying to build a sustainable city. It made alliance with six other cities in Scotland which called Star Alliance. This strategy was proposed by Scottish Cities Alliance. Scottish Cities Alliance is formed by seven different cities in Scotland. The alliance is aimed to promote a more sustainable and smart concept into urban development goals in Scottish Cities. Alliance includes: Aberdeen, Edinburgh, Dundee, Glasgow, Inverness, Perth, and Stirling. Strategies had four goals included: dealing with climate changes, having unique opportunities of investing infrastructures, developing local economy, and improving quality of life in cities. This strategies focused on developing and implementing new techniques into cities. Innovations, smart grids, intelligent mobilities and infrastructures applying smart techniques were the main focus of the Aliant group. The strategy was planned by Scottish governments and local municipalities. Strategy's main target could be seem as highly focusing on technological resilience. The ambition of having positive changes influencing other three resilience goals after.

5.3. Development Plans, Strategies and Actions by Private Sectors or Quasi-Public Partnership

5.3.1. North Aberdeenshire Local Development Strategy (NALDS)

North Aberdeenshire Local development Strategy (NALDS), published in November 2015. It is aimed to encourage further development of fishing related projects in North Aberdeenshire with funding provided by European Maritime and Fisheries Fund (EMFF). The strategy was planned and designed by local action group and published by Aberdeenshire council. The action group is a quasi-Public partnership which formed by both public and private sectors. Citizens and companies could apply to receive funding and supports from NALDS. There are three conducting phases before application be approved. Based on the plans applicants provide, action group will examine the goals and objects to see whether it fits the concept of promoting fish industry (Wilkinson, Personal Interview, April, 2017). The second stage will have representatives from partners investigate appropriateness of financial assumption before reaching to final stage. Marine Scotland is the final decision maker decided the approval of projects. There are five priorities of NALDS: Place, to enhance natural environment and improve facilities to attract more tourists; Connectivity, to improve internal and external connections and access of e-devices; Business Competiveness, to encourage sustainable diversification by supporting local business and communities; Better Opportunities, to support social excluded people integrating into local community; and Cooperation, to cooperate with FLAGs and enhance involvement in national and international levels. The strategy also follows the principles of reaching an innovative, sustainable, equal, and empowered community which matches the principles of Scottish National development plan.

5.3.2. Peterhead Fishing Harbor development Plan

Peterhead Port Authority is now redeveloping the former fishing harbor. The development plan is authorized by Harbor Board and be implemented by Development team of Peterhead Port Authority (Watt, Personal Interview, April 2017). The aim is to rebuild the harbor and make it be able to afford larger fishing vessels. The former depth of old harbor only could let small and old vessels laid at the port. Watt pointed out that as modern vessels are built larger and have deeper draft, the former harbor where the old Peterhead fish market was ceased due to the unsuitable functions for modern fishing vessels. Larger fleets used to lay at the harbor while the tide is high and have to leave

the port before been stuck at the port during low tide at old harbor area. The fish market and boat activities are now located at a new harbor next to old harbor area. After Peterhead Port Authority finished construction at old harbor area, spaces currently used by fish market will be rent to Oil Company once the new fishing harbor finished, stated by Watt. Fishing activities (processing market landing, and selling etc.) will all move to new harbor which aimed to be finished by April 2018. The Port Authority stated that "These strategic proposals for the introduction of state-of-the-art facilities will inject fresh life into the local fishing industry and help us further position the harbour as the premier fishing port in Europe. All aspects of the development will have a tremendous impact on the port, town and subsequently the local business community." (http://www.peterheadport.co.uk/ Masterplan_news.htm: front page).

The planning process of development plan was first decide and planed by Port Authority that conducting with agency, fishermen, and local communities (Watt, Personal Interview, April, 2017). The plan, than approved by Harbor Board and was confirmed in 2016. Funding of development plan is supported by Scottish government, North Aberdeenshire Local Action Group (Wilkinson, Personal Interview, April, 2017) and a commercial loan from Santander UK PLC (Peterhead Port Authority, 2016). The port development project is one of the three approved projects getting funds from NALDS. Peterhead port development plan is a project worked by private sectors which is not appropriate to apply policy analysis into it.

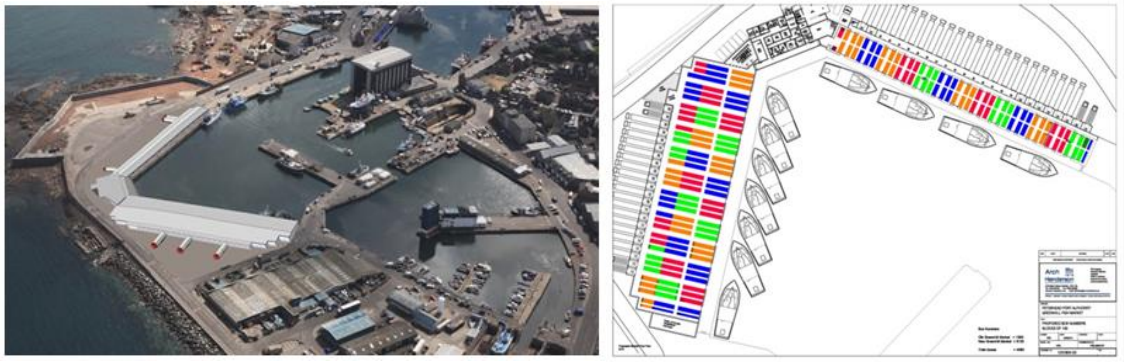

Figure 5.4 Development Site and plain view of Peterhead's New Fishing Harbour

(Source: Peterhead Port Authority, 2017)

5.4. Discussion

In an overall analysis, Aberdeen City and Peterhead lack resilience due to their inattention to human stressors and natural stressors (See Section 5.2 & 5.3). Most of the strategies were focusing on economic resilience and using innovation as a mean to enhance cities capability. Even though some strategies had mentioned institutional collaboration in documents, human resilience was not placed as prior focus in development plans. Few strategies mentioned reducing natural burden and preserving or conserving natural resources. Nevertheless, main regulations and initiatives on controlling nature resources, for instance, available fishing stocks and amount of fuel at North Sea were made by national or international institutions (See Section 4.1). Although, most of the resources were landed and produced in both places, Aberdeen City Council and Aberdeenshire Council had less power on managing nature resources. Main focuses of strategies made by local government in both areas were tackling possible threatens due to climate change or eliminating CO^2 emissions when related to enhancing natural resilience. Major technological resilient approaches of fishing industry were proposed by central government. Enlarging size of holes on fishing nets and renewing other new techniques on boat to utilize and control fishing activities at sea. Additionally, a local partnership built a smart online platform, Fish4Market (See Section 5.1.3), to increase efficiency of collaborations in fishing industry through transparent and accessible real time fishing data (McDonald, Personal Interview, March 2017). Other technological approaches of local development plans were considered using innovations to enhance living qualities, reduce emissions, and increasing efficiency of renewable energies. Related to innovations, institutional resilience on educational programs are required. New techniques often require skilled labors. Also, cooperation and educational opportunities would help to solve the lack of new generations involving in fishing industry. Besides Peterhead Port developing plan, all other strategies had institutional considerations on educating youth listed in actions.

Section 5.2 and 5.3 discussed strategies and plans that were implemented in studied sites. An approach was used in following paragraphs for analyzing institutional networks when making policies. However, only North East Fish Processing Strategies and North Aberdeenshire Local Development Strategy (NALDS) were analyzed through public policy analysis method due to accessibility of collected information in this research. The approach used in research was proposed by Bredgaard,

Dalsgaard & Larsen (2003) (See Figure 5.5). The approach included four steps of analysis: formulation, implementation, defining analytical findings, and proposing recommendation through evaluating outcomes. The first step was to identify desired policy outcomes of the strategy. Problems and arguments in governing boundaries were taken into consideration during formulating process. Secondary step was analyze factors influencing implementation of policy. Factors included several institutional and governmental structures for instance, networking between different sectors, available information, and stakeholder behaviors (Bredgaard, Dalsgaard & Larsen, 2003). Last two steps examined policy outcomes through referring back to its origin desires in first step and evaluating outcomes through theory of public policy analysis proposed by Dunn (1994). Since the two strategies were published in 2015 and had not be implemented for very long, analysis of evaluation could not be undertaken during the research timeframe.

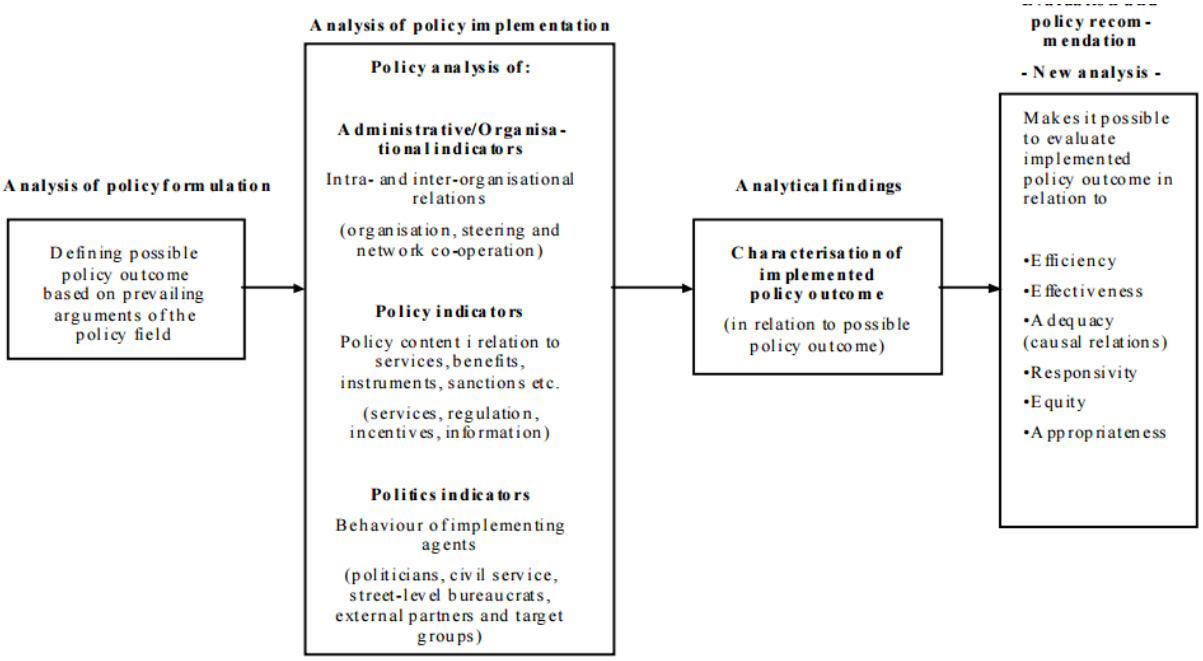

Figure 5.5 An Analytical Approach for Analyzing Implementation Processes

(Source: Bredgaard, Dalsgaard & Larsen, 2003)

The design stage of the North East Fish Processing Strategy involved interviewing and surveying firms from the fish processing sector in North East Scotland. In total, 75% factories in North East Scotland were consulted through face to face interview (Aberdeeshire Council, 2015). Formation of the strategy included opinions from private sectors into consideration. Possible policy outcomes were

designed based on needs of North East Scottish region. The strategy was a more top down approach but with highly cooperative with private sectors. Strategy was originally designed by BDA^{plus}, a local fishery consultancy which has worked with governments and the private sector for 17 years (Moir, Telephone Interview, April, 2017). Aberdeen City and Aberdeenshire Council also involved in strategy designing process and were the leader of implementing actions in strategy. Different participants were highly engaged in designing and planning process of strategies. This made the strategy more fit into desires of North East Scotland which had responsiveness to fish processing sectors.

North Aberdeenshire Local Development Plan (NALDP) is a bottom-up oriented strategy made by North Aberdeenshire Local Action Group (NALAG). NALDP was designed by coordinating group of the partnership. Designing process also included involving feedbacks from strategic partners and community members (NALAG, 2015). However, engagement levels of partners during designing process was unclear as current coordinator of action group was not involve in designing process. Networking between sectors were close and well designed. It had all partners engaged in working groups when approving developing proposals and funding (See Section 5.3.1). The group, however, was not very active with few stakeholders submitting projects and due to the administration difficulties. As operational time of the plan still has three years left, the outcome might shows differently in the future. In comparison with other discussed strategies, governance of NALDP was in a good structure within local scale through a bottom up approach. Notwithstanding, arguments were raised by interviewees as central governments had final decision making rights for approving projects and local government had no power influencing decisions (Wilkinson, Personal Interview, April 2017). The situation was significantly observed during research field work. A general problem of Scottish governance was its complexity in regional and national levels. That was a potential human stressors in research sites or in Scotland. Next sections presents a more detailed analysis on this complexity issues.

5.4.1. Complexity of Governance

As Marine Scotland was only established in 2009, the whole governance system is relatively new and under development. The governance structure is easy to confused people with its complexity. Local governments were not cooperating properly with institutions from Marine Scotland, as uncovered during interviews. Tasks for Fishery Offices were collecting, analyzing marine and fishery

data which submitted to Marine Scotland (Fraser, Personal Interview, March, 2017). Even though landing amounts at port were published online and easy to check daily amount, detailed data were not available for stakeholders. The needs of transparency and accessible data caused the formation of Fish4Market partnership (Birnie, Personal Interview, April, 2017). It was inefficiency as fishing vessels were required to insert data twice. The phenomenon showed that data collection and provided information by government were not helping industries very much.

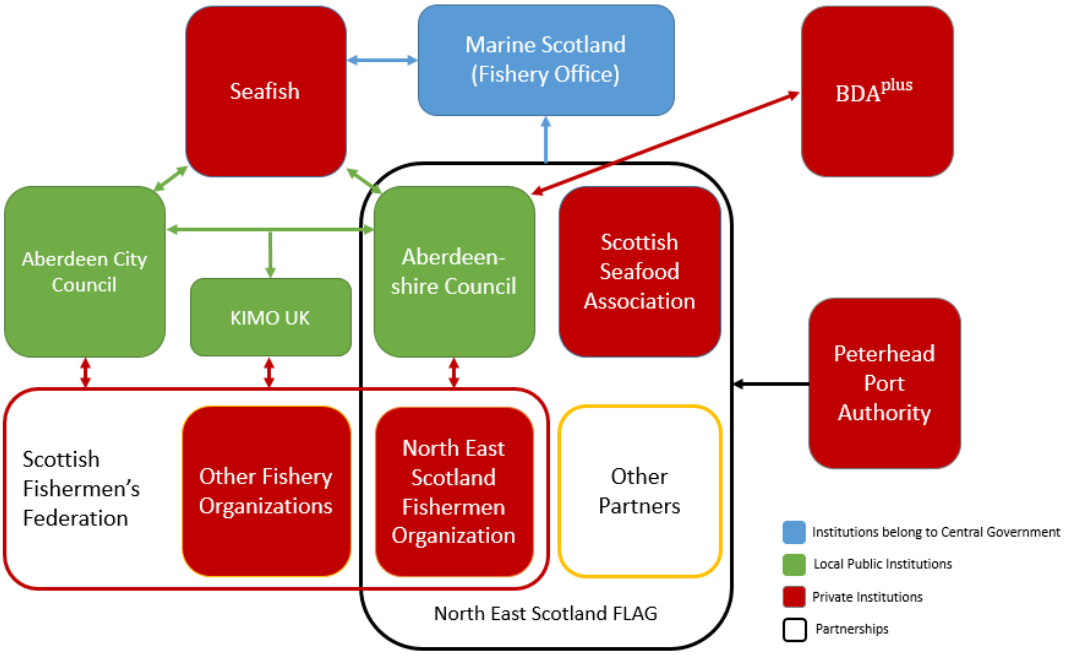

Figure 5.6 Relationship of different interviewed stakeholders (Designed by Author, 2017)

Another issue of management was urban settlements which have fishing industry based in, often need to include inland, inshore or offshore fishery activities under its urban development plan. However, management from central government partially took part in the development plan directly, for instance, North Aberdeenshire Local Action Group (NALAG) has Aberdeenshire Council involved in partnership nominally with it has no actual involvement in action group (Wilkinson, Personal Interview, April 2017). In contrast, Marine Scotland takes the final decision making right in final stage of approving submitted projects. This situation build up the difficulties of designing and implementing an appropriate urban development strategies in local areas. In contrast with the difficulties it had, the institutional structure of partnership could be explained by using the theory retrieved from Maloney, Smith & Stoker (2000). Even though the public government provided a high level of decentralization

for local level decisions, responsibilities, and functions from the top level still retains ultimate decision making authority. This might be designed in order to control funds without influencing main management process of NALAG. Figure 5.6 shows a simplified graph of interaction and collaboration between various institutions.

Nevertheless, boundaries of areas managed by local governments were enlarged without having absolute executive power on fishing industry. Power from Central government highly influences local fishery management. Majority management tasks for local governments are renovating infrastructures or promoting consumption in fishing industry. With limited development of fishing industry local governments could do, governmental institutions at studied sites tended to focus more on enhancing economic and human resilience (See Section 5.2). Other factors caused complexity of regional governance in Aberdeen City and Aberdeenshire was due to the industrial changes happening in Aberdeen city. Majority funding sources for fishing industry in Scotland are from European Maritime and Fisheries Fund (EMFF) which required applicants to have active fishermen in ports. However, Aberdeen City has no commercial fish harvesting activities and landing at Aberdeen Port as counter-urbanization of fishing sectors happened. In order to support remaining fish processing sectors in Aberdeen City, the municipality collaborated with Aberdeenshire Council and developed a regional development strategy for fish processing sector in both areas (McDonald, Personal Interview, March, 2017). The migration of fish harvesting industry certainly produced both pros and cons of financial resilience in Aberdeen City. The strategy were designed under broader boundaries and had diverse types of urban settlements included. Economic structures and needs differed in cities, towns, and rural areas. There's a possibility that objects of strategy might be designed too general due to having different scales of settlements in governmental boundaries. By contrast, the pros included that regional governance and networks were promoted. Institutions and individuals from different sectors are actors influencing urban systems. Involvement and coordination of various actors is key for pursuing better sustainable development in urban systems (Zeemering, 2014). Zeemering (2014), raised the importance of building connections between urban settlements in both international and regional levels as local actions would affect inter-national or on international borders. Both fishing industry and oil & gas industries are highly connected with international cities and settlements. The importance of sufficient communication between sectors and settlements has

been raised in studies (Batten, 1995).

Another concern raised by private sectors specifically about fish processing industry was the need for collaborating with other Scottish food industries (Moir, Telephone Interview, April, 2017). The raising concern from private sectors was fish processing industry seem to be isolated due to inappropriate governmental structure in national level. Fish processing sector is now under governance of Marine Scotland. However, Buchan (Personal Interview, April 2017) proposed that it would benefit the industry more if collaborate or under management of food & drink industries' related department, with its industrial characteristics. Like other food production industries, aquaculture products needs to have enough support from whole supply chain. Moreover, consumers' preferences would affect the industry also. In the 20th Century, the downturn of Scottish fishing industry was related to a reduction in fish consumption in UK (Coull, 1996). This misplacement of management at the national level makes local governance more difficult to manage and develop this industry. To sum up, the complexity of governance in Scotland solidly created various governmental stressors in urban system. The urge of restructuring governmental structures is a key to strengthen its human resilience in urban systems or even in its nation.

5.4.2. Industrial Structures of Port Areas in Research Sites

It is understandable that fishing Industry are often threatened by people from outside fishing communities and industries (Johnson, Henry, and Thompson, 2014). Stresses comes from NGOs, governments or consumers in different levels. Concluding all historical backgrounds and factors happening in Aberdeen City, it is not difficult to understand changes of economic targets of Aberdeen City Council. However, statistics shows the high dependence on oil enhances vulnerability of its economy in Aberdeen (See Figure 3.1). The dependency on one specific industry reduced its capability to tackle with future threatens. Lots of fishermen migrated to work in oil industry while it was prosperous over the years. There is a phenomenon being observed that those fishermen trying to come back to fishing industry due to the uncertain future of oil industry. However, international workers from the EU or countries already plus the hole from fulfill the lack of crew in the fishing industry. Those international fishermen are considered hard working and efficient. Employers have no incentive to hire those previous workers instead (McDonald, Personal Interview, March, 2017).

Since the future of oil industry is not yet clear, potential social conflicts might a rise in the region.

Looking back to Peterhead, the town also had faced challenges over the years. However, the economic structure in the settlement was comparably more resilient than Aberdeen City. Even though it's economic performance is not as wish as Aberdeen City, the town and its harbor has more diverse activities and industries located at (See Figure 4.5). The harbor has both fishing and oil & gas industries settled around (Watt, Personal Interview, April, 2017). The needs of multiple port related industries are included in its future develop plan. The diversity helps the harbor on its economic performance and steadiness. Besides, high resilience on changes of Peterhead fishing industry was presented in Section 3.2. Evidence shows its fishing industry historically had the ability to address economic and natural stressors. The main fishing species harvested in Peterhead changed from whaling, herring to white fish harvesting. The port was not as prosperous as Aberdeen city back in 1960s. But, it is the port which has its largest amount of landings in European Union and it has the ability to maintain diversity of industries in its port area.

Both studied sites are strongly relying on port related industries which had heavily influenced by global environment simultaneously. With information demonstrated in the paper, having a more diverse industrial structures would be more stable and benefit society than highly depending on specific industry. It is not stating Peterhead's industrial structures is superior to Aberdeen City's. Apparently, Aberdeen City has more services and other non–port related industry in urban area. However, Peterhead shows more capability on economic resilience as these two cases were all taking port industry as major economic sources. Yet, more governmental stressors and economic stressors might appear in Scotland in the future as the process of Brexit officially started on 29 March, 2017 (BBC, 25th April 2017). The consequences of Brexit are not observed so far. Adding on Brexit, there are lots of uncertainty of these cases. Unpredictable variables are discussed in next section.

5.4.3. Future Unknowns

There are two main variables affecting future development. First, outcomes of strategies were not significant during research period. Most of the strategies were all relatively new and only implemented for less than two years. Effects and changes in strategic boundaries were not east to

observe. Another unpredictable variables is Brexit. The Brexit process officially started in the end of March, 2017. The whole process was planned to be finished on 29th of March in 2019. Stephen and Moir (Telephone Interview, April, 2017) both mentioned potential threats on fishing industry due to Brexit. The fluctuation of value of British pounds might reduce incentives for international workers stay in fishing industry. The United Kingdom European Union membership referendum was held on 23rd of June, 2016. Figure 5.7 expressed the dramatically decreasing values of GBP since June in 2016. Exchange rate of GBP to EUR were reach to 1.3098 in June 2016 but it drop to nearly 1.1542 in the end of May, 2017. The benefit of working in UK will not be worthy with reducing value of currency and high consumption level. Funding from European Union will also stop and industries would need to find other financial sources.

Figure 5.7 GBP EUR Historical Charts (Source: Exchange Rates UK)

Besides, fishing industry also have uncertainty due to international political regulations. Employment of foreign employees and fish harvesting areas would also change depending on negotiations between governments. Exclusive economic zone would overlap between European countries and UK. The accessing and harvesting rights of fishing vessels at overlapping areas would bring out arguments between EU and UK (Scottish Fishermen's Federation, 2017). Moreover, referendum issue raised between UK and Scotland added on more uncertainty for industries in Scotland. All those unpredictable variables exhibit the immense necessity on applying resilient concept into mechanism especially focusing on human and economic resilience.

6. Conclusion

In this Section, issues and phenomenon discussed in Section 3 to 5 were summarized. As the start of this master research, it was aimed to discuss interactions between governance and fishing industry. And thus, exploring the potential impacts on economic transformation in Aberdeen City and Peterhead through resilience concepts. The research was aimed to answer the hypothesis of, first, whether society would benefit more by transforming into oil based industry; and second, whether the migration of fishing industry makes governance less complicated in urban area.

To answer the first hypothesis, it is true that economically, society would be benefit more from oil industry by offering more high paying jobs. Oil industry related businesses would also move in to the city. Thus, governments could have more taxes and use it to build infrastructure for other social services. However, none of specific industry should become monopolized industry in urban system. Negative effects happen when economy has less diversity. Thus, the monopolized of oil industry at Aberdeen Harbor deepens vulnerability of its economy. Economic performance was highly relied on oil & gas industries in Aberdeen City which easily been shaken by international fluctuation of crude oil prices in recent years. Economic depression on oil industry partially caused unemployment number increased. Oil workers who previously worked in fishing industry had no opportunity for re-joining as fishing industry counter-urbanized to outer areas and had other international labor force. Even though performance of fishing industry also fluctuated due to unexpected changes of fishing stocks and international regulations, a more diverse economic structure at port area will enhance stability of urban systems and spread investment out. Peterhead represented a case which has diverse port industries at the harbor. Reviewing historical backgrounds and current situations, Peterhead has better stability than Aberdeen City with both taking port related industries as main economic sources. Under social resilience aspects, the city itself was not benefit a lot from oil industry. Insufficient housing issues were mentioned in section 5.2.3 with statistics shows that Aberdeen been categorized under high economic performance with low welfare society (Centre of Cities, 2016). Taking up human resilience discourse, huge governmental stressors were observed in both cases. The discussion of governmental resilience relates to second hypothesis discussed in next paragraph.

The second hypothesis was that governance would be less complicated due to concentration of industries. Gathering economy did increase economic incomes, however, the governance was more complicated. Strategies were designed in regional levels without local development plan. This was due to limited financial supports from central government on fishing industry. Governmental cooperation with stakeholders was not coherent. Dynamic and diverse collaboration in different scales for various purposes complexed the urban systems. It was challenging at the start of the research to explore all related strategies and plans with clarifying responsible authorities. Governmental and institutional resilience were not performing well during the research. However, outcomes of strategies were not discussed in the paper as it two years is not enough time to show the policy impacts significantly. Unpredictable performance of strategies could possibly support the argument made by Barnes and Foster (2012) that capacities and purposes of regional and local governance goes beyond structures of governance. Additionally, discussion of resilience should more focused on human resilience and economic resilience. The lack of natural resilience and technological resilience should have be taken more seriously by Scottish local governments. The two hypothesis were both overturned. Transformation to specific industry would not help as much as people imagined. Or, it is better to say that instead of transforming to one certain industry and take it as dominant, a mixture of various types of industries would strengthen and benefit the society more. Going through all studies, the results show the unbalanced developing focuses in urban systems. A common blind spot is observed in this paper. Cities or urban settlements often take economic stressors as the primarily issues needed to address. However, this mis-conceptualizing will not help to accomplish a sustainable and resilient society. A balanced development plan through different aspects would be the key for having a more stable and adaptable system. In spite of the statements made in this paper, they might be approved as wrong “facts” since the policies and initiatives haven’t reached to their final outcomes. Therefore, for future research, it is suggested firstly to explore the outcomes of current ongoing strategies. And second, to discuss consequences caused by Brexit from different aspects if it could be observed. Results in Section 0 already presented major governmental difficulties in studied sites and generally in Scotland. In a practical way, it would be a plus to raise a proposal in order to solve institutional complexity as it was the root of all puzzles.

Finally, in order to make resilience more effective in urban systems, cities and surrounding regions should embrace up-coming changes and have willingness to accept opinions and new concepts related to sustainable development. Despite always trying to be resilient and trying to recovering to original system, sometimes changes are needed in the system. Considering the case happened in fish processing sector, a large scale changes on governmental structure is required. Otherwise the system will become moribund and won't be improved. Sustainable development and resilient concept both helped urban settlements to tackle with positive and negative events in urban mechanism. Threats coming from internal and external factors should not be ignored. Networking of urban areas would increasingly become important under global resilience. Once if, mitigation, adaptation and resilience from different sectors and aspects could also be embraced in areas across the world, global urban systems and living environment would be more stable and livable.

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Appendix

A. Semi-Structured Interview Questions

Interview question guide were designed based on the framework about process of planning resilient city's strategies proposed by Desouza & Flanery (2013). Questions could be separated into five sections. First section was about introduction of organizations and institutions including duties, working projects and interviewees' relations with fishery in Scotland. From section two to section four followed the framework mentioned in the beginning of the paragraph with author adding "Assessing" as an extra step (See Section 0). Interviews were semi-structured. Therefore, questions differed in different cases and changed according to different situations and objects.

Part 1. Introduction Q1. Could you please briefly describe the institution/organization? Q2. Could you describe the current situation of fishing industry in your area and North East Scotland?
Part 2. Planning Q3. How did you decide your target group and the goal of your strategy? Q4. Could you please take us through the process of how it happened?
Part 3. Designing Q5. Who involved in the designing process of strategy? Q6. What are the main problems you try to solve in your strategy?
Part 4. Managing Q7. What are the challenges of implementing the strategy? Q8. How was the involvement level of target groups?
Part 5. Assessing Q9. How did you examine and assess the outcomes or impacts? Q10. What is the process of adjusting strategies if there's inappropriate targets?

B. List of Interviews Conducted

Name	Organization	Type of Interview	Date of Interview
Mr. Land	Seafish Scotland	Telephone Interview	22nd March, 2017
Mr. Fraser	Aberdeen Fishery Office	Personal Interview	23rd March, 2017
Mr. Humphries	KIMO UK	Telephone Interview	27th March, 2017
Mr. McDonald	Aberdeenshire Council	Personal Interview	28th March, 2017
Mr. Higgins	Peterhead Fishery Office	Personal Interview	30th March, 2017
Mr. Morrison	Scottish Fishermen Federation	Personal Interview	3rd April, 2017
Mr. Watt	Peterhead Port Authority	Personal Interview	4th April, 2017
Ms. Birnie	North East of Scotland Fishermen's Organization	Personal Interview	5th April, 2017
Mr. Buchan	Scottish Seafood Association	Personal Interview	5th April, 2017
Mr. Wilkinson	North East Scotland Action Group	Personal Interview	6th April, 2017
Mr. Stephen	Aberdeen City Council	Telephone Interview	6th April, 2017
Mr. Moir	BDAplus	Telephone Interview	21st April, 2017