NEGATIVE THIRD-PARTY EFFECTS OF FISHERIES INDUSTRY ON OCEANIC ECO-SYSTEM IN SRI LANKA

Wijayawardhana[1], W.M.P.M.
pasanwijayawardhana@gmail.com

Department of Economics, Faculty of Humanities and Social Sciences, University of Sri Jayewardenepura

Abstract

This paper investigates the negative third-party effects of fisheries industry on oceanic Eco-system in Sri Lanka. Semi Structured interview method was employed to collect data. Since the negative externalities of fisheries industry was not directly quantifiable a sample of related authorities in Sri Lanka were chosen to conduct interviews in order to collect qualitative data. Sample was limited to 7 government authoritative institutions operating in Southern Marine Region and Colombo of Sri Lanka. As per findings, biggest oceanic Eco-system damage due to fisheries industry is caused during "Point-of-catch" stage of the fisheries process. Modification of the coastal environment, environmental damage caused by illegal fishing practices, disposal of plastic to ocean, release of diesel from boats and chemicals, over-fishing result over-exploitation of marine ecosystem services, voluntary dumping or loss of fishing gear were found as major harmful negative third-party effects of fisheries industry during "Point-of-Catch" stage. In addition to that, minor negative-third party effects on oceanic Eco-system are found in other stages of fisheries process namely "Pre-Catch", "Point-of-Processing", "Point-of-Purchase" and "Point-of-Purchase". Negative third- party effect is not significant in the final stage of "Integration of Sea Food Supply Chain" according to this study. Introducing strong monitoring system to mitigate illegal fishing habits and strengthening legislation against them, enhancing the linkage among responsible government institution and unifying them, standardizing material and equipment usage in fishing activities, setting national policy framework for oceanic Eco-system conservation can be cited as few policy recommendations to control negative third-party effect of fisheries on oceanic Eco-system in Sri Lanka.

**Keyword:** _Fisheries Industry, Oceanic Eco-System, Negative Third-Party Effects, Sri Lanka_

1. INTRODUCTION

There are evidences that shows fish has been harvested in Sri Lanka since ancient times (wickramasingha, 2001). The fisheries sector in Sri Lanka plays a vital role in economic and social life style development by providing direct and indirect employment opportunities for about 560,000 people and livelihoods for more than 2.7 million coastal communities. Essentially, it provides more than 60% of animal protein requirement of people in the country. Recent decade shows a clear increasing tendency in total fisheries production in sri Lanka(_figure 1_).

Figure 1: Total fisheries production (metric tons) -2005-2016
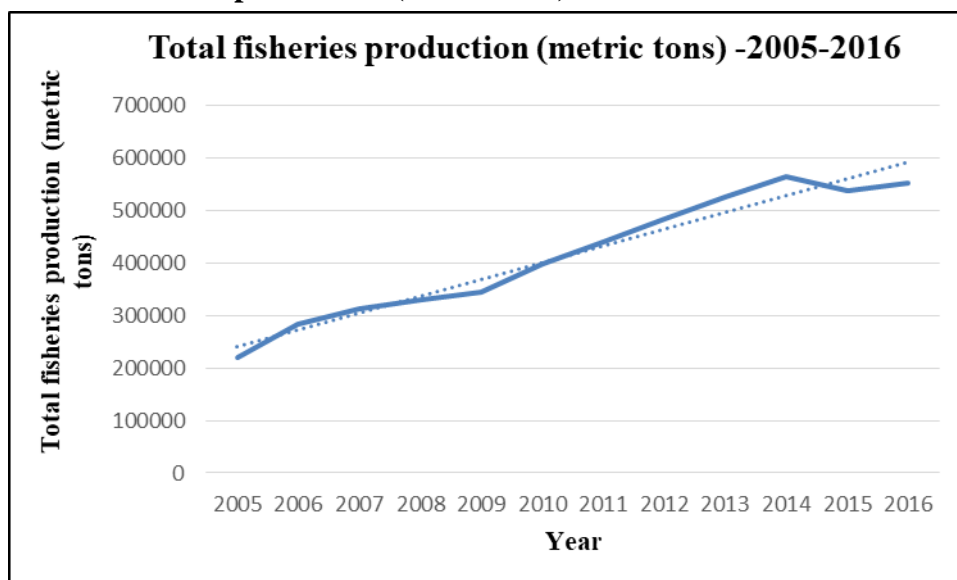
Source: World Development Indicator, World Bank

However, marine fish production represent major part in total fish production than the fish production from inland and aquaculture fishing*(Table 1).* The total fish production of the country in 2017 was 531,310 metric tons (Mt) and of them marine fish production was 449,440 Mt while the rest (81,870 Mt) from inland and aquaculture. Of total fish production 134,220 Mt of fresh fish had utilized domestically for dry fish production. Coastal fishery is still the major contributing sub sector that contributed around 49% to total fish production of the country.

Table 1: Annual Fish Production by Sub Sectors (Mt)

Sector	2012	2013	2014	2015	2016	2017
Marine	417,220	445,930	459,300	452,890	456,990	449,440
Inland & Aquaculture	68,950	66,910	75,750	67,300	73,930	81,870
Total	**486,170**	**512,840**	**535,050**	**520,190**	**530,920**	**531,310**

Source: Ministry of Fisheries and Aquatic Resources Development

The marine fisheries, Deep-sea and Coastal, had contributed about 85% or 449,440 Mt to total fish production of the country in 2017 although had experienced a marginal declined by 2% compared with 456,990 Mt in 2016. Tuna species, Balaya (Skipjack tuna) and Kelawalla (Yellow fin tuna) were dominant species in the catch composition and had contributed 13 and 9% to the total marine fish production of the country in 2017. Tangalle and Galle were dominant fisheries districts that contributed over 26% to the total marine fish production of the country in 2017. In addition, Jaffna (10%), Kalutara (9%), Putlam (8%) and Trincomalee (7%) districts had also contributed significantly to the total marine fish production of the country in sequence

The share of fisheries to the Gross Domestic Production (GDP) of the country was 1.3% (MFARD, 2018). Even though fisheries industry is contributed for GDP growth, it generates lots of negative third party effects/ negative externalities on the eco-system. Both marine fisheries and Inland & aquaculture fisheries may generate negative impacts on the coastal area and this need to be taken into account in the definition of policy measures for the sector. Synergistic and complementary impacts tend to be similar within the fisheries sector and between fisheries and the other sectors (they are hence dealt with together). Negative externalities generated by the fisheries sector tend to be high in marine fisheries compared to Inland and aquaculture fisheries (the two are therefore considered separately). Lost and abandoned fishing gear which is deadly to marine life makes up the majority of large plastic pollution in the oceans, according to a report by Greenpeace. More than 640,000 tons of nets, lines, pots and traps used in commercial fishing are dumped and discarded in the sea every year, the same weight as 55,000 double-decker buses. The report,

which draws on the most up-to-date research on "ghost gear" polluting the oceans, calls for international action to stop the plastic pollution, which is deadly for marine wildlife.

As per the findings from a 2018 survey commissioned by the National Aquatic Resources Agency (NARA), Micro plastics disposal due to fisheries activities and over-fishing are the leading causes of extensive marine pollution in Sri Lanka. The survey, the first of its kind carried out in 40 years, showed that the island's fish stock had dropped drastically by about 80 percent, in part due to high levels of micro plastic contamination . The island's northwestern seas recorded the highest levels of marine pollution, while seas to the east remain rich with marine life and should be made a conservation priority. Releasing micro plastics to ocean is a common bad practice of most of fishermen. The severity of the micro plastic contamination has contributed to a nearly 80 percent depletion in fish stocks, according to the Nansen survey findings. That means, fisheries practices have negatively affect back again on fisheries industry.

According to the earthday.org, Sri Lanka is placed as the 5th largest oceanic plastic polluter in the world among countries such as China, Indonesia, the Philippines, and Vietnam. We waste more than 5 Million kg of plastic, per day, despite not being one of the world's largest consumers of plastic. According to the Marine Protection Authority, Fisheries industrial activities can be recognized as the main contributor for this oceanic pollution. For many people in Sri Lanka, we're just happy to litter wherever we are and with no concern about the environment or potential impacts to wildlife. Therefore negative third party effect of fisheries industry on the oceanic eco-system in Sri Lanka is an important topic to be addressed.

2. OBJECTIVE

Main objective of this study is to investigate the negative third-party effects of fisheries industry on the oceanic eco-system in Sri Lanka.

3. METHODOLOGY

The data collection methods differed according to the objective of this research where Semi Structured interview method was adopted to collect data on negative third part effect of fisheries industry on oceanic eco-system. Since the negative externalities of fisheries industry was not directly quantifiable a sample of related authorities in Sri Lanka were chosen to conduct interviews. Due to time constraints sample was limited to 7 government authoritative institutions operating in Southern marine region and Colombo in Sri Lanka. Those institutions were Lanka hydraulic institute limited in Hikkaduwa, Fishing Harbor in Hikkaduwa, Marine Environment Protection Authority in Hikkaduwa, Urban Council of Hikkaduwa, Department of Wild Life Conservation in Baththaramulla, Ministry of Fisheries and Aquatic Resources in Colombo and FAO Fisheries and Aquaculture Department in Colombo. They represent different fields such as fisheries industrial field, aquatic resource field, wild life protection field, marine environment conservation field etc. The data and information collection took place over a one-month period from February 7 to March 7, 2020. This study focused on negative third party effects that can be generated at different stages of marine fisheries industrial process. Gorospe, Michaels, Pomeroy, Elvidge, Lynch, Wongbusarakum and Brainard (2016) have identified PRE-CATCH, POINT-OF-CATCH, POINT-OF-PROCESSING, POINT-OF-PURCHASE and INTERGRATION OF SEA FOOD SUPPLY CHAIN as the five basic stages of marine fisheries industrial process that was classified in order to sustainably manage the marine fisheries and biodiversity of dynamic regions and to balance the multitude of objectives that arise from its diverse resource users. Descriptive details are given in table 2.This research involved in exploring different oceanic eco-system externalities that have generated at each fishing stage.

Table 2: five basic stages of marine fisheries industrial process

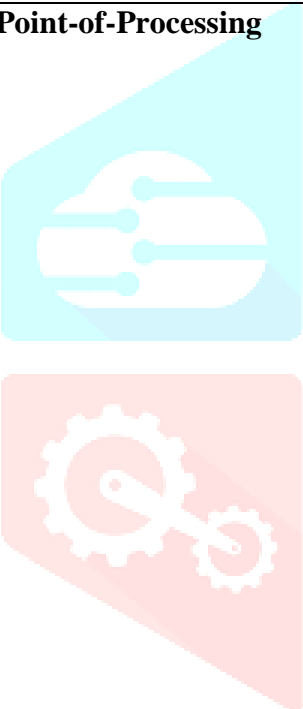| Stage	Description
PRE-CATCH,	Stage before fishing is started. (A stage of preparation for fisheries activities)
POINT-OF-CATCH	Stage of occurrence of fishing activities
POINT-OF-PROCESSING	Stage of accepting, processing, packaging, storing & exporting fish and fish products
POINT-OF-PURCHASE	Stage of purchasing of fish by consumers.

INTERGRATION OF SEA FOOD SUPPLY CHAIN	Transfer information among various points of supply chain, promoting sustainable fisheries.

4. RESULTS AND DISCUSSION

According to interview results, fishing externalities are commonly negative and occur when fishers can freely enter and capture a resource, and where a voluntary agreement of co-operation does not exist; in these cases, resource users do not consider the external effect imposes on others. Industry experts and authoritative officers related to fisheries industry who were interviewed commonly stated that negative third party effects are highly abundant in point of catch and point-of-processing with compared to other stages. The analysis of the semi structured interviews provides ten key negative externalities/ third party effects generated by fisheries industrial activities that have influenced on considerable oceanic environmental damage in Sri Lanka. Those findings can be presented as follows with respect to stages in fisheries industry (Table 3).

Table 3: Key negative externalities identified in most marine fisheries with respect to different stages

Stage	Negative third party effect
Pre- Catch	*Air pollution at preparation stage.* Air pollution is happened due to improper fire disposal system (burning fiber) in fiberglass boat building process.
Point-of-Catch	*Modification of the coastal environment*. Although all fishing methods used at the point-of-catch involve some perturbation of the marine environment, some have an environmental impact that extends far beyond the target species, for example the use of poisons and explosives, trawling and the use of other moving gears that tend to plough the sea bed, thereby significantly perturbing the benthos. This has caused severe damage for oceanic eco-system. *Environmental damage caused by illegal fishing practices* *Trolling* is a method of fishing where one or more fishing lines, are drawn through the water. The study found that this increases the likelihood of fatal wounding, especially if the gills are damaged. For fish hooked through the gills, 85% died. This has harmed bio diversity in the oceanic eco system. Dynamite fishing and Blast fishing is the use of explosives for easy gathering. This is destructive to the oceanic ecosystem, as eruption often destroys the underlying habitats (such as coral reefs) that support fish. Burn oil tanks, towed gears, Light cast, Push net, moxy net, monofilament net, gill net and trammel net on coral reefs have caused huge damages for oceanic biological resources and the environment. *Disposal of plastic to ocean* Release of plastic vessels by fishermen from boat to deep ocean have cause severe oceanic environmental pollution.

	Release of diesel from boats and chemicals This has caused huge oceanic water pollution and release of chemicals like sodium cyanide harm oceanic eco-system including coral reefs *Over-fishing result over-exploitation of marine ecosystem services* E.g. Increase the stress levels and bodily injuries resulting from lodged fish hooks. *Voluntary dumping or loss of fishing gear may lead to ghost fishing.* Species affected by discarded gear include not only teleost fish but sea birds, marine mammals and turtles in oceanic eco-system.
Point-of-Processing	*Excessive decrease in biomass.* In the absence of fishing, a fish stock will tend to some average size that reflects the carrying capacity of the environment and interactions with other species (predators, etc.). Changes in environmental conditions (e.g. exceptional conditions for larval survival or the increase in a predator stock in storage) will alter the biomass of the stock. Fishing adds another predator to the system. *Sub-sector conflicts (industrial, artisanal, and recreational).* There are various sources of conflict within the fisheries sector. These include conflict for a particular fishing area or for the fish stock, or between artisanal and industrial fishers. E.g.: large-scale fishing vessels used to store fish often operate closer to shore than the law allows.
Point-of-Purchase	*Impacts on other sectors.* This is mainly because of incorrect disposal techniques at purchase points.
Integration of Sea Food Supply Chain	*Effect is not significant in this stage according to this study*

Moreover, pollution affects other sectors of fisheries like water and air pollution from fishing vessels, air pollution from fish smoking and processing plants, or traffic generated by fisheries activities. The waste generated by fish landing sites and coastal tar balls can cause considerable oceanic eco-system pollution.

According to above results, overfishing is reducing the abundance of high-value predators; fisheries deeply modify the trophic chain and the flows of biomass (and energy) across the ecosystem. This result is followed by Pauly in 1979 as well. Negative third party effect of ghost fishing, blast fishing and dynamite fishing found in this study was also followed by Goni (1998). Moreover, negative effects like destruction of sea grass beds because of the use of modern towed gear and harms like destruction of the coral reef habitat , decline of aquarium and food fish caused by usage of chemicals (e.g.: sodium cyanide) were also

found by Kaiser (1998) , Dayton (1995) and Goni (1998). Evans (2000) representing FAO also have explained the consequences of illegal, Unreported and Unregulated Fishing which was a finding of this study.

5. CONCLUSION AND RECOMMENDATIONS

The fisheries sector in Sri Lanka plays an indispensable role in economic and social life style development by contributing around 1.3% to the GDP (2018). This industry is comprised of marine and inland & aquaculture sub sectors. Marine fishing sector covers a significant portion of this fisheries industry relative to inland and aquaculture fishing sector. Even though marine sector in fisheries industry is contributed for considerable uplift in the economy, it generates lots of negative externalities on the oceanic eco-system. This study has employed semi structured interview method to collect data in order to explore the negative third party effects of fisheries industry on the oceanic eco-system in Sri Lanka. Major finding in this investigation proved that, negative third party effects are highly abundant at the point-of-catch and point-of-processing with compared to other stages namely pre-catch, point-of-purchase and integration of sea food supply chain. Findings proved that, air pollution at preparation stage, modification of the coastal environment, environmental damage caused by illegal fishing practices, disposal of plastic to ocean, release of diesel from boats and chemicals, over-fishing result over-exploitation of marine ecosystem services, ghost fishing due to voluntary dumping or loss of fishing gear, excessive decrease in biomass, sub sector conflicts, impacts on other sectors are the ten third party effects that negatively effect on oceanic Eco-system in Sri Lanka.

According to results, negative third party effects from fisheries on the oceanic environment are a serious burden in Sri Lanka. Making the "polluter pay" system, imposing fair fine from fishermen who are following environmental unfriendly practices, discourage negative externalities by taxing goods and services that generate spillover costs, introducing strong monitoring system to mitigate illegal fishing habits and strengthening legislation against them, enhancing the linkage among responsible government institution and unifying them, standardizing material and equipment usage in fishing activities and ultimately , setting national policy framework for oceanic Eco-system conservation can be cited as few policy recommendations that government can follow in order to ensure oceanic Eco-system friendly fisheries industry in Sri Lanka.

References

(2005-2016). Retrieved from DataBankWorld Development Indicators: https://databank.worldbank.org/

B.Wijayarathna. (2001). Coastal fisheries in Sri Lanka- Some reccomendations for future management.

Dumped fishing gear is biggest plastic polluter in ocean, finds report. (2019, November 6). Retrieved from https://www.theguardian.com/

Evans, D. W. (2000). THE CONSEQUENCES OF ILLEGAL, UNREPORTED AND UNREGULATED FISHING FOR FISHERY DATA AND MANAGEMENT.

Handunnetti, D. (2019, June 7). MONGABAY. Retrieved from https://news.mongabay.com/

JONES, M. M. (1995). Fishing Debris in the Australian. Marine Pollution Bulletin, 30, 25-33.

Kelvin D. Gorospea, b. W. (2016). The mobilization of science and technology fisheries innovationstowards an ecosystem approach to fisheries management in the CoralTriangle and Southeast Asia. Marine Policy.

Md. Shahidul Islam, M. T. (2004). Impacts of pollution on coastal and marine ecosystems including. Marine Pollution Bulletin, 48, 624–649.

Miguel AGoñi, T. E. (1998, September 18). A reassessment of the sources and importance of land-derived organic matter in surface sediments from the Gulf of Mexico. Geochimica et Cosmochimica Acta, 62, 3055-3075.

Pauly, D. (1979). Theory and management of tropical multispecies stocks: a review, with emphasis on the Southeast Asian demersal fisheries. Resilient small-scale fisheries .

S.Rasanjala, K. (2015). Illegal ,Unreported,Unregulated Fishing by Sri Lankan Fishermen .

Simon Jennings, M. J. (1998). The Effects of Fishing on Marine Ecosystems. Advances in Marine Biology, 34, 201-212, 212e, 213-352.

Socio –Economic and Marketing Research Division. (2017). Fisheries Industry Outlook 2017.

www.earthday.or