



Assessment of waste disposal and its impact awareness level of coastal communities in the Gurunagar fishery harbour, in Jaffna, Sri Lanka.

Anandakrishnan Sivanandan¹, Prof. (Mrs). Sivashanthini Kuganathan² and Eng. (Dr). Balachandran Ketheesan³

1 Faculty of Graduate Studies, University of Jaffna, Sri Lanka.

2 The Head, Department of Fisheries, Faculty of Science, University of Jaffna.

3 Senior Lecturer, Department of Civil Engineering Faculty of Engineering, University of Jaffna. Sri Lanka.

Abstract

Gurunagarharbour sea water quality has serious risk relating fishery operations due to untreated waste effluents generated as a result of land based external sources such as human settlements around coastal fishery landing site premises. The degree of water pollution is also raised by anthropogenic activities by dumping untreated wastewater in the coastal sea area which acts as a reservoir for reactive chemicals and lead to bioaccumulation in long-run. Gurunagar main domestic drainage, which are mixing up at the Gurunagar coastal sea and carrying heavy polluted effluents from upstream residential areas. These coastal waters are the ultimate receivers of the organic waste materials generated by surrounding residential areas. Gurunagar settlement has one of the options for disposal of their daily waste is sea outfall. A major part of wastewater is disposed into the sea, which pollutes the marine environment.

The research has an assessment questionnaire study to identify coastal fishing communities' attitudes and awareness on waste disposal and its hygienic health impact. A face-to-face survey was conducted with randomly selected residents at Gurunagar coastal site. A structured questionnaire was prepared to carry out the survey among 200 participants. Coastal and marine ecosystems at Gurunagar are being severely affected by dense human population and intensive habitat in this coastal region. It was found that 72% of residents in the study area disposed of waste in the drainage channels, whilst 24% disposed of waste in storm water channel and only 4% used the domestic waste for their home garden. The waste disposal found that 44% used open common places whereas 16% threw off coastal area, the rest of the residents accounting for 40% utilized disposable bins. Also shows that only 26% of the population utilized disposal bins whereas 24% directly disposed waste in common open places near coastal shore. Reveals that 74% of domestic wastes were collected by MC, remaining percentage of respondents said that 20% was collected by individuals, a negligible percentage (6%) replied that it was collected by private sectors functioning within the MC limit. It was found different types of collecting waste in the coastal area.

According to the feedback obtained from the survey revealed that 68% said that there is a common collection pool whereas 32% adhered to collection at the doorstep.

The majority (70%) answered that the waste collection occurs twice in a week, among the participants 14% said that it was about once a week and 16% strongly reported that the collection is irregular. It was found that 86% of people agreed that the landing site is often polluted by oil and grease discharge from fishery operations in the marine water whereas only 14% disagreed that there was negligible amount of oil spills into the harbour area.

This water also contains debris of fish during cutting process and blood water, that act as a potential source of contamination. According to the survey, 84% agreed with the aforesaid clause whereas 16% disagreed. Harmful effects of water pollution in the landing site were found that the majority of the population (74%) in the coastal line agreed that coastal pollution impacts on human health rather causing damage to the living aquatic organisms. Problems relating to biodiversity were also reported by 14% of respondents in the survey. About 8% of feedback received for salinity related issues whereas 4% reported an increase in the water temperature. It shows several health effects reported by coastal residence, The most hazardous health issues relating to respiratory impairment and carcinogenic effects were reported by 28% of participants whereas 6% reported the effect of eye irritation. Negligible percentage stated that no odour nuisance near coastal pollution.

Key words: Harbour pollution, Anthropogenic activities, Bioaccumulation, and Hazardous to biodiversity.

1. Introduction.

Gurunagar is a coastal village in Jaffna city in Northern Sri Lanka. It is also known as Karaiyur. The suburb is divided into two village officer divisions whose combined population was 3,386 families at the 2019 census. The suburb is mainly populated by Catholic Sri Lankan Tamils, engaged in sea fishing activities traditionally. Fishing is an ancient occupation for the people in Gurunagar which is one of the major populated areas, contains 9,159 people who directly depend on the coastal fishing and fishery related activities (Ministry of fishery, 2019).

Gurunagar landing site is located between the geological coordinates of 9°38'57" N latitude and 80°1'8" E longitude and is situated on the southern coast of Jaffna. Gurunagar landing site belongs to Jaffna west Fishery Inspector (FI) division. Nearly 3,386 families live in Gurunagar area, among them 3,117 are fishing families consisting of 10,760 members. There are nearly 5,261 active fishermen in this area. Approximately 90% of people from this area depend on fishing directly or indirectly, which is their major source of income. Fisheries sector is the major economic driver of this area, and its annual fish production is 7,192 MT and the dry fish production is 562 MT. In this fishery landing site 686 out boat motor (OBM) fishing crafts, 388 in boat engine (IBE) crafts and 148 non mechanic traditional boats (NTRB) are in operation. (Dept. of Fishery Performance Report 2019).

The research has an assessment questionnaire study to identify coastal fishing communities' attitudes and awareness on waste disposal and its hygienic health impact. Project will be analyzed the attitudes of fishermen causes towards to marine litter and pollution at landing sites this finding whether they are acutely aware this issue is affecting them, their catch, and the general population. They also want to be a part of the solution, the study suggests. Marine litter is a global, persistent, and increasing threat to the fishery landing sites at coastal, our study shows it makes use of people in the right place at the right time

and empowers fishers to understand something directly or indirectly causes these problems that affect by both whilst at fishing operation also during their leisure time activities.

The Gurunagar fishery harbour is located along the beach road from Jaffna Dutch fort and it was not in pleasing nature. The whole coastal belt is covered with a thick layer of garbage and plastic waste. Not only that, the surroundings of the whole fishing village were also polluted by the dumped garbage and plastic waste. It was observed, the plastic consumption is very high within this fishing community. Not only in Gurunagar is the situation the same even in other places. Most of the equipment that they have been using for fishing is made of plastics and plotline materials which are dangerous to dump without the process of recycling.

People in Gurunagar have no proper system to collect or recycle garbage. I noticed, the people who live in these fishing communities dump all the garbage and plastic waste into the sea. All these plastic wastes come through the canals and drainage and deposits at the coastal belt. A questionnaire survey was done among men and women of the Gurunagar fishing community and realized that they are not conscious of garbage and plastic waste which are loaded in front of their living premises.

Objective of research

To identify the factors responsible for causing landing site pollution.

To assess the awareness level of coastal communities in Gurunagar fishery harbour, on the impacts of waste disposal and its health effects.

2. Material and methods

2.1 Site description

Gurunagar fishery landing site on the southern coast of Jaffna Peninsula was selected as the ideal location to carry out this study analysis, with the objective of assessing the severity of the pollution level.

This research was carried out at Gurunagar major fisheries landing site to assess pollution status, and to identify information about anthropogenic activities attributed to pollution at fishery landing site. The aim of the study is to gather information while focusing on improving the current status and management of this fishery landing site in the consecutive years to come.



Figure 1: Waste disposal at the Gurunagar landing site.

2.2 Selection of sampling.

A qualitative survey was carried out among 200 randomly selected residents of Gurunagar. The aim of this survey was to point out the behavioral trends of the coastal community in disposing of sewage waste and the socio- economic impact on marine pollution.

2.3 Qualitative survey on the pollution level at the landing site of Gurunagar

A face-to-face survey was conducted with randomly selected residents at Gurunagar coastal site. A structured questionnaire was prepared to carry out the survey among 50 participants. The scope of the survey possessed 50 questions under three modules. These modules are as follows.

Demographic information

Behavioral trends

Pollution abatement

Statistical analysis

Data derived from this survey was pooled in MS Excel spreadsheet and descriptively analyzed. The response rate of participants was 100% (all 200 of them were used for this analysis). Upon their feedback, the following results were obtained.

3. Results and Discussion

a) Method of disposing domestic wastewater

Figure - 02 shows the response rate of participants in disposing of domestic waste. It was found that 72% of residents in the study area disposed of waste in the drainage channels. Whilst 24% disposed of waste in storm water channel and only 4% used the domestic waste for their home garden. According to the pie diagram the majority of the residents of Gurunagar dispose of their domestic waste in the drainage channels where amalgamation with sea water takes place. Pollutants discharge into the water column create an unsuitable environment to the biota of the aquatic ecosystem. The natural resources in the marine environment get depleted due to deterioration in the water quality. The level of BOD is diminished as the pollutant load increases.

Many of the rural folk possess relatively low level of literacy in understanding the hazardous effects of marine pollution. They are adapted to live with limited facilities including income generations. They are a bit reluctant to follow regulations imposed by government authorities from time to time. Their habit is to leave domestic litter wherever possible and ease rather strictly adhering to waste disposal criteria.

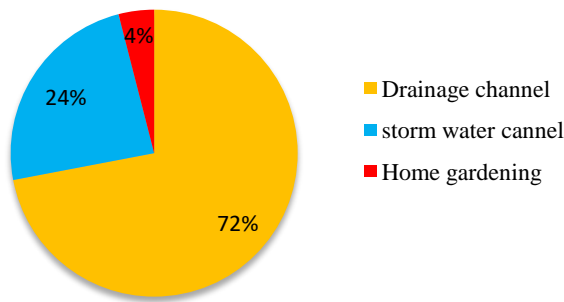


Figure02: Diagrammatic representation on method of wastewater disposal

b) Method of disposing solid, plastic, and metallic wastes

When considering categorized waste disposal by residents of the study area, it was found that 44% used open common places whereas 16% threw off coastal area. The rest of the residents accounting for 40% utilized disposable bins. This is clearly illustrated in Figure– 03 below.

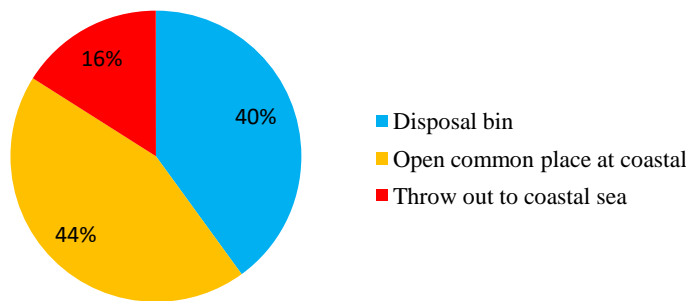


Figure03: Method of disposing solid waste.

c) Type of disposing domestic organic waste

According to the questionnaire survey conducted at the selected site of Gurunagar showed that 50% of households threw off their waste to coastal area. This is mainly due to the lack of proper waste disposal monitoring system operating in rural areas. Many of the coastal communities live under the poverty level and suffer from financial constraints. It’s intricate to meet the day-to-day requirements of their family members through insufficient earnings. In addition, the health and hygiene are likely to be low lying when compared to the urban sector. Many of the coastal communities are lacking their own lands and accommodated in a limited space. It’s impossible to collect and dispose of waste in a unique way which doesn’t impair the coastal environment. Thus, they used to throw off waste on bare land adjoining coastal sea where the interference by public is very stumpy. Regarding the pie diagram in Figure – 04 shows that only 26% of the population utilized disposal bins whereas 24% directly disposed waste in common open places near coastal shore.

On the other hand, government authorities are unable to launch proper waste management schemes in the coastal areas. The solid waste management performed by Municipal Council within the town limits is at a low profile. It’s vital to locate disposal bins in public places where the population is densely occupied.

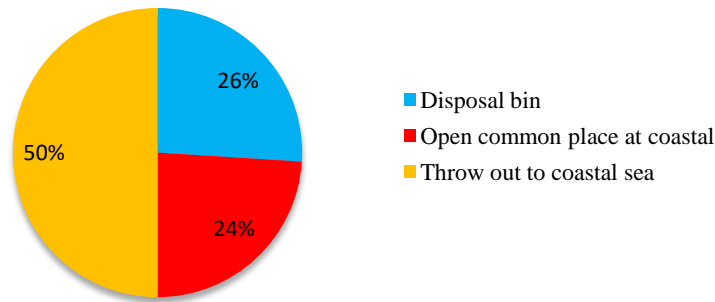


Figure04: Type of disposing domestic organic waste.

d) Authorities responsible for collecting waste.

There are government owned authorities responsible for collecting waste under their purview. In this research, the Gurunagar coastal area comes under the purview of Municipal Council (MC). Thus, MC is responsible for the waste management process. There is a separate unit functioning at MC for collecting and disposing of waste at proper places.

Regarding the qualitative survey, the Figure - 05 reveals that 74% of domestic wastes were collected by MC. Remaining percentage of respondents said that 20% was collected by individuals. A negligible percentage (6%) replied that it was collected by private sectors functioning within the MC limit.

The MC is responsible for collecting domestic waste routinely. The residents are advised to separate waste based on degradability. The glassware and plastics should be separately disposed as the latter is non- biodegradable. Glassware should also be handled and disposed of with care as they cause dangerous effects when left unsafe.

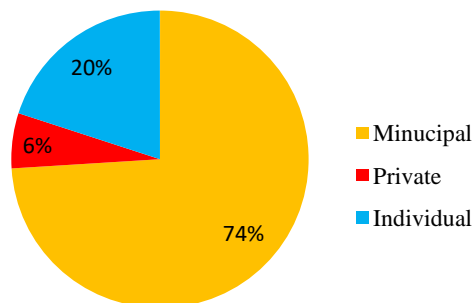


Figure 5: Waste collection by relevant authorities

e) Type of waste collection

There are two different systems adopted by MC while collecting domestic solid wastes. Common collection and Door to door collection system is usually practiced by MC in Jaffna city. Figure – 06

shows different types of collecting waste in the coastal area. Accordingly, the feedback obtained from the survey revealed that 68% said that there is a common collection pool whereas 32% adhered to collection at the doorstep. The following diagram (Chart – 05) shows the feedback upon waste collection by authorities.

Waste accumulation occurs as a result of low degree of collection. It's difficult for households to stagnate waste at their doorstep. This might lead to several environmental issues and contagious diseases by decaying waste materials. The odour from decaying matter also creates an unsuitable environment and decreases the aesthetic landscape. The free roaming livestock and dogs are the major threat in spreading and scattering the waste materials along the path/roads and creates public nuisance. The cleanliness of the environment is reduced by dispersing decaying litter and acts as a potential reservoir for the multiplication of flies and mosquitoes during wet spells.

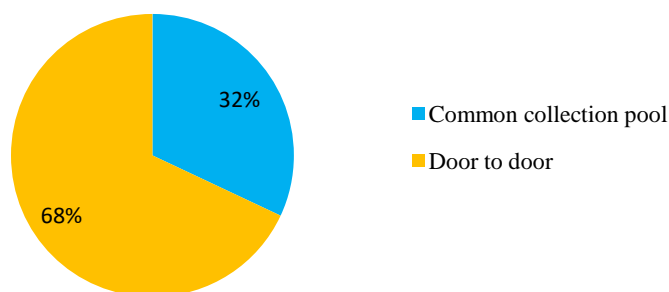


Figure06: Type of waste collection by relevant authorities

f) Frequency of waste collection by relevant authorities

Figure – 07 shows the response rate of participants regarding frequency of waste collection by responsible authorities. The majority (70%) answered that the waste collection occurs twice in a week. Among the participants 14% said that it was about once a week and 16% strongly reported that the collection is irregular.

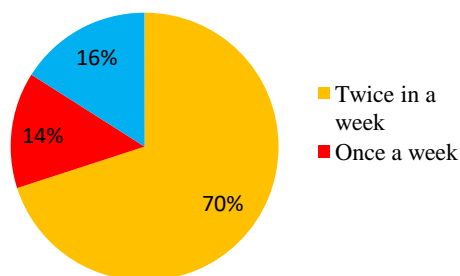


Figure 07: Frequency of waste collection by relevant authorities

g) Oil spills in the coastal landing site water during fishing vessel operation

Figure – 08 represents the degree of oil spills into coastal landing site. Oil spills occur as a result of fishing vessel operation and engine and hull maintenance in the coastal environment and ultimately affect the quality of harbour water. It was found that 86% of people agreed that the landing site is often polluted by oil and grease discharge from fishery operations in the marine water whereas only 14% disagreed that there was negligible amount of oil spills into the harbour area. Oil and grease float on the surface water and clog the mouth parts of the living biota in the marine ecosystem. Oil layer prevents the light penetration deep inside the water column and affects the growth of living organisms.

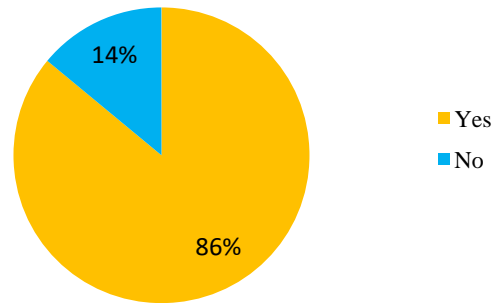


Figure 08: Oil spills in the landing site by fishing vessel operation

h) Wastes from fish market / auction center discarded in the coastal landing site

Figure – 09 represents the degree of waste discharge into coastal landing site. Wastewater from fish markets and auction centers in the vicinity of harbour area also had a negative impact on the quality of harbour water. Cleaning of auction centers accumulates large volumes of water and ends up with coastal sea. This water may also contain debris of fish during cutting process and blood water, that act as a potential source of contamination. According to the survey was found that 84% agreed with the aforesaid clause whereas 16% disagreed.

It was observed that the decaying organic debris from fish stalls may spread contagious diseases by attracting house flies. This in turn increases the risk of health issues among children and elderly people in the residential areas near coastal shore.

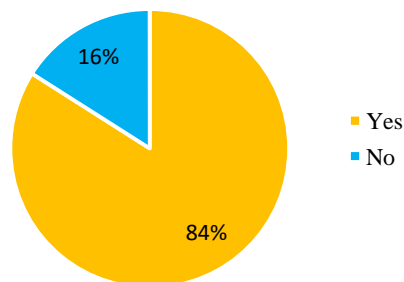


Figure 09: Waste discharge from fish market/auction centre into coastal landing site

i) Harmful effects of coastal pollution near harbour area

There are several issues reported as a result of coastal pollution in the landing area. Figure – 11 shows the harmful effects of water pollution in the landing site. It was found that the majority of the population

(74%) in the coastal line agreed that coastal pollution impacts on human health rather causing damage to the living aquatic organisms. Problems relating to biodiversity were also reported by 14% of respondents in the survey. About 8% of feedback received for salinity related issues whereas 4% reported an increase in the water temperature.

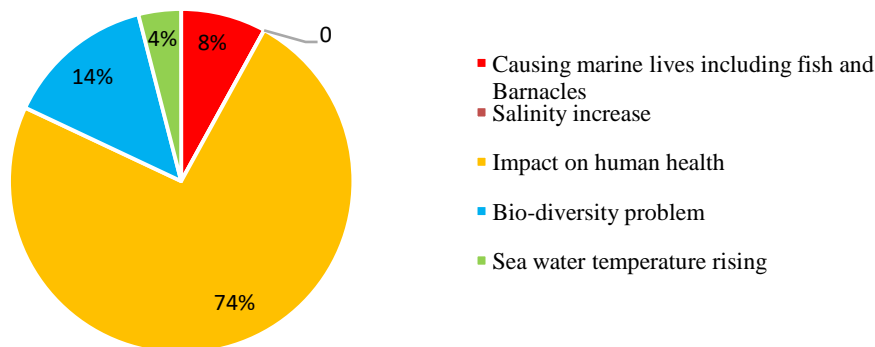


Figure 10: Harmful effects by coastal water pollution

j) Vigilance among residence about the hazardous health effects caused by sea water pollution

Coastal pollution is correlated with many health-related issues such as eye irritation, impairment of the respiratory track, odour nuisance, initiation of asthmatic issues and carcinogenic effects. Figure – 11 shows several health effects reported by coastal residences. The most hazardous health issues relating to respiratory impairment and carcinogenic effects were reported by 28% of participants whereas 6% reported the effect of eye irritation. Negligible percentage stated that no odour nuisance near coastal pollution.

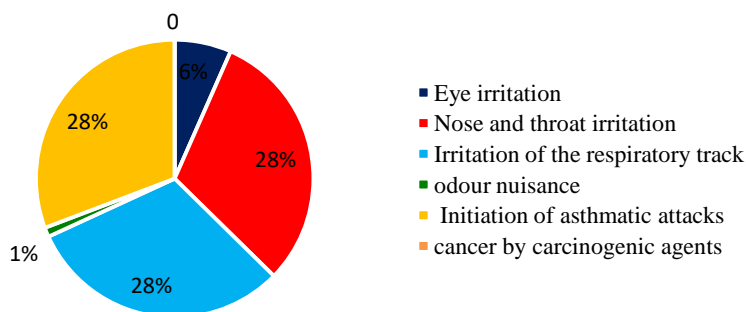


Figure 11: Harmful effects caused by coastal pollution.

Non- biodegradable waste highly undergoes bioaccumulation and eventually enters wellbeing through the food chains. These hazardous chemicals cause carcinogenic effects and are lethal to human health.

CONCLUSION

The research showed that the waste effluents discharge into the coastal area were highly contaminated with pollutant loads which are considered as a real threat to all walks of life in the coastal suburb of Gurunagar. The untreated wastewater coming from households is left untreated into the sea creates

unsuitable environment for fish and serves as a reservoir for infectious diseases, Floatable material may escape from the area and end up along the coastline and beaches causing further damage to ecology and aesthetics.

In the absence of adequate facilities for collection, treatment and disposal systems, these wastes will pollute the harbour complex and the harbour waters. The Plastic and polystyrene boxes are not biodegradable, and their use leaves a huge quantity of coastal litter. Cast-off tyres, ropes, nets are the major non-biodegradable flotsam in the fishing harbours. These can cause carcinogenic effects on wellbeing.

The present study recommends that initiatives should be made by government officials to adopt an effective waste disposal and management system among the coastal communities in the future.

Compliance with ethical standard

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Disclosure of conflict of interest

No competing interests.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

This is to certify that the thesis entitled "Assessment of waste disposal, and its impact awareness level of coastal communities in Gurunagar fishery harbour, in Jaffna, Sri Lanka."

submitted by Anandkrishnan Sivanandan for the degree of Master of Science in Environmental Management to the university of Jaffna is a record of original independent research carried out by Mr. Anandkrishnan Sivanandan under the guidelines and direct supervision of Prof. (Mrs). Sivashanthini Kuganathan and Eng. (Dr). Balachandran Ketheesan.

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