A Study on the Perceived Impacts of Waste and Waste Water on Aquaculture and Capture Fisheries at San Juanico Strait by NGOs for Fisheries Reform

Abstract

This is a follow-up study done after OXFAM's study on Public Health Risks in Tacloban City Permanent Resettlement Sites which assessed the water quality in the San Juanico Strait and predicted the possible implications of the development of resettlement areas near San Juanico strait.

This, however, focuses more on the awareness and the perception of local fisherfolk about the impacts of wastes and waste water from resettlement areas on their fishing ground and aquaculture area namely, the San Juanico Strait.

The study revealed that the fisherfolk in the area are aware of the possible dangers that solid waste and waste water pose on their source of living. Having this awareness, they suggest that the responsible authorities act on the problem at hand to prevent further damage on the strait which they rely on for mariculture activities. Through addressing the problem on sanitation, the seawater and marine life will be conserved and the fisherfolk's livelihood will be maintained.

The local government of Tacloban City, with the aid of some non-government organizations, has conceptualized and implemented measures to solve the existing problem in the coastal community, but the problem is still far from solved. The constituents of the coastal barangays call for immediate and effective means to mitigate, if not totally end, the pollution of the San Juanico Strait caused by solid waste and waste water, which affect the aquaculture and capture fisheries industry in the area.

Introduction

Tacloban After Typhoon Haiyan

Super typhoon Haiyan, locally known as *Yolanda*, whose wind speed reached 315 kilometers (195 miles) per hour with storm surge believed to have been 7.5 meters (24.6 feet) high (nasa.gov, 2013), left massive destruction in Eastern Visayas when it struck the region on November 8, 2013. The damage had been extensive, affecting not only the physical landscape, but also the social order and economic stability of the region, and the psychological well-being of its people. With cargo ships swept to the shore which crushed residential buildings, mountain ranges left bare by the strong winds, national highways and roads clogged by overwhelming debris, and thousands of casualties some of whom have not been recovered, the province of Eastern Visayas, particularly the city of Tacloban, was rendered helpless by the super typhoon weeks, or even months, after its landfall.

Joycie Alegre (2015) articulated the emotional difficulty that the residents of Tacloban and nearby municipalities gravely damaged by the typhoon in the book *Lunop: Haiyan Voices and Images* experienced. Her narrative encapsulates the situation in the region hours and days after the tragedy:

> . . . ***Ngarat.***[1] Nightmare, Negative dreams. Shock. Trauma. ***Ugmad***.[2] Unknown to our bodies that only knew the dancing of waves to mellifluous songs of the wind. The terror of sudden death of our beloveds. Death in the rubble. In the garbage. On streets. Among

[1] Waray term for nightmare.

[2] Waray term for trauma.

> debris. We could not even say goodbye. The soft warmth of love turned cold, bloated and stiff. And we wailed like the horrifying, howling, invisible mad dogs of Haiyan.
>
> Grief and isolation aggravated our anguish over loss and disorientation. ***Kalagiw***.[3] Flee for safety or help. Search the dead. And the living. Rescue the survivors. Find family and friends. ***Bilin***.[4] Stay behind. To watch over what was left. Stay because there is no choice but to stay. Stay because you choose to stay to help. To stand guard over mementoes. To help. To repair. To fulfill what the beloved dead wished to be done. To live on.
>
> While looting became a byword and robbery lurked in the dark days and darkest nights, a neighbor shares rice and water. A relative gets through the activated cellphone and sends in funds for tiding over. A frantic friend searches by social media and sends a word. Strangers from far nations fly in with food, medicine, water pumps and tents. The grace of humanity's best virtue – charity – came into action from nearest neighbor and farthest foreign volunteer. ***Burubligay***.[5] Help – not by one but by many – each other. Friendships bloomed and fellowship effloresced. Love's union beyond borders. (p.11)

Apart from the mental shock and emotional trauma, the residents of the region were also faced with pressing economic problems that surfaced and were addressed after the panic over destroyed properties and dead and missing relatives had been pacified. International media reported on the economic loss caused by the super typhoon. In his news article, Harress (2013) cited a report by the Kinetic Analysis Corp. saying that "the country's economists and

---

[3] Waray word which may mean loss or disorientation.

[4] Waray term describing someone who decided not to leave.

[5] Waray word which means collective effort to lend a helping hand.

international aid agencies have predicted that the economic impact could be up to $14 billion, with only $2 billion to come from insurance." Another news article reports on the poor performance of the Philippine peso and the loss of properties:

> The Philippine Stock Exchange Index has fallen about 5 percent since Typhoon Haiyan, also known as Typhoon Yolanda, arrived Nov. 8. This month, the index is the worst performer in the Asia-Pacific. The peso has dropped more than 1 percent in the same period. Damage to residential, agricultural and commercial properties from Haiyan is estimated at between $6.5 billion and $14.5 billion, AIR Worldwide said earlier in November. (Perlah, 2013)

Among the damages suffered by the region, the loss on agriculture and livelihood was one of those which heavily affected the people, with a big percentage of the population relying on farming and fishing before Haiyan hit the area. Food and Agriculture Organization of the United Nations (FAO)'s website gives an estimate on the amount of agricultural products and equipment lost to the typhoon:

> Agriculture sustained heavy losses, with total needs for recovery and rehabilitation estimated at USD 724 million. The typhoon struck between two planting seasons – damaging crops that were ready to harvest, harvested and newly planted. Around 1.1 million [tons] of standing crops were destroyed, primarily coconut, rice and corn. Infrastructure and production equipment such as storage, irrigation systems, boats and roads also suffered extensive damage. Damage to fisheries spanned the entire value – from catch to market. (FAO and the Typhoon Haiyan in the Philippines, n.d.)

Fisherfolk as Significant Sector

Not only is the region dependent on farming—having many coastal municipalities (Tacloban City, itself, is situated near a body of water), a considerable number of its constituents rely on mariculture.

According to the agriculture office of Tacloban City, as of early 2016, the city has a total of 3,309 registered fisherfolk, 1,705 registered fishing vessel, 1 fish sanctuary, 1 fishery reserved, and 82.5 hectares of mariculture park. Specific for Cancabato Bay which covers at least 15 barangays, there is a total of 1,099 registered fisherfolk and 613 registered fishing vessel. At present, there is a total of 150 cages in all of Tacloban with 50 found in Kataisan Point, 45 in Tagpuro, 35 in Old Kawayan, and 20 in Bagacay.

For capture fisheries, Tacloban City has a total volume of production of 1,103.04 metric tons with a value of Php110,304,000.00. Its major fishing grounds are San Pedro Bay, Cancabato Bay, Anibong Bay and San Juanico Strait.

For aquaculture, specifically for fish cages, it has a total volume of production of 87.807 metric tons with a value of Php8,780,700.00. It is mostly found in Tagpuro and Old Kawayan. Another component of aquaculture is seaweed farming with a total production of 27.984 metric tons for fresh seaweeds with a value of Php335,808.00 and 1.2 metric tons for dried ones with a value of Php36,000.00. The same is found in Tagpuro and Old Kawayan.

Vulnerability of the Fisherfolk

It has been revealed by latest data on poverty that the fisherfolk continue to remain as the "poorest of the poor" among the basic sectors of the country. In the 2012 Philippine Statistical Authority report, it scored as high as 39.2% against the national poverty incidence of only 25.2%. This economically disadvantaged condition of the fisherfolk can be explained by a lot of factors including governance setbacks.

In Tacloban City, the fisherfolk sector raised concern on the poor condition of the seas months after the disaster hit. Most of them reported on having lesser fish catch and notably, the existence of pile of mixed of garbage and debris that flooded the fishing grounds.

Cancabato Bay is one of the major sources of fish for the fisherfolk of Tacloban City. The bay is surrounded by 16 barangays and was once declared to be a mariculture area in 2003 by the Sangguniang Bayan. *Danggit*[6] production has been the primary livelihood of the fisherfolk around the bay for the longest time. It is also rich in sea shells, oyster, and crabs. However after the typhoon, despite the absence of a scientific assessment on the status of marine life, fisherfolk relayed that a lot of debris got piled at the bottom of Cancabato Bay. According to them, debris include wrecked cars, ammunitions from the nearby military attachment, and even dead bodies.

It was only on November 26, 2015 when the claim of the fisherfolk on the alarming status of Cancabato Bay was validated. In a joint retrieval operation spearheaded by the Public Attorney's Office (PAO) Forensic Team led by Chief Public Attorney Persida Rueda-Acosta through the initiative of Fr. Robert Reyes and the Tacloban Fisherfolk Urban Association (TFUA), two

[6] Salted, sun-dried fish

skeletons and two skulls from the swampy mangrove area of Sitio Burayan at Brgy. 83-A and a Honda car near Fisherman's Village at Brgy. 88 were retrieved.

The retrieval operation that happened in Cancabato Bay resulted in positive gains for the fisherfolk. On the 25th of November, a day before the conduct of the activity that was duly coordinated with the local government of Tacloban City, the Sangguniang Bayan passed two resolutions seeking for financial support for the clean-up of the bay. The resolutions called on the Local Finance Committee and concerned national government agencies, including their regional and local counterparts, to support the demand of the fisherfolk. Finally, on December 27, 2015, the first coordination meeting was convened. It was attended by the regional offices of Department of National Defence-Office of Civil Defense (DND-OCD), Department of Environment and Natural Resources (DENR), Department of Interior and Local Government (DILG), Department of Health (DOH), Philippine National Police (PNP), Armed Forces of the Philippines (AFP), and the NGOs for Fisheries Reform.

As specific details regarding funding and coordination are yet to be ironed out, the fisherfolk reiterates their call on the importance of clearing and cleaning up Cancabato Bay. With the declining fish catch and with the debris exacerbating the condition, the hope now rests on the rehabilitation of the bay and one concrete solution proposed by the sector is to declare a one year closed season. This only implies no fishing activities for all municipal fisherfolk until the bay is fully replenished. In this regard, the fisherfolk would like to have alternative sources of income. The combination of a closed season and alternative livelihood program for the fisherfolk after

Cancabato Bay is cleared up is only the start of sustainably managing the fishing industry of Tacloban City.

Another dilemma was confronted by the fisherfolk of Tacloban City and its coastal barangays when the national government through the Department of Public Works and Highway (DPWH) Region VIII revealed its plan of putting up a tide embankment along the coast of Tacloban City, Palo, and Tanauan. This project has two major components: road heightening and the establishment of the actual tide embankment infrastructure which stands at 4.5 meters and runs for 27.3 kilometers. It will be implemented from the year 2015 until 2020 and has an estimated budget of 7.9 billion pesos drawn from the national coffer.

It was the fisherfolk sector who first registered major opposition to the project. By all logic, the establishment of a tide embankment entails the tearing down of a significant portion of the foreshore land where the boats, drying areas, docking sites, and especially homes of the fisherfolk are located. With the strong condemnations the project has received from peoples organizations and civil society groups, its implementation halted for some months. However, according to DPWH, it will return to operation this first quarter of 2016.

The opposition of the fisherfolk to the tide embankment project was very well-founded. It is never the intention of the sector to discredit the study made by the Japan International Cooperation Agency on storm surge projection in Leyte which gave birth to the project. In fact, the fisherfolk themselves recognize its value and urgency. However, the thing they fear is the massive displacement that will surely happen.

For the fisherfolk of Tacloban City, tide embankment should be implemented in the area from Dulag to airport and not in Cancabato Bay. This location proved to be of strategic importance since it directly faces the Pacific Ocean where typhoons usually develop. Moreover, they suggested planting of belts of mangroves to serve as natural barriers against typhoons instead of a hard infrastructure for Cancabato Bay.

The housing plan of the local government is also contested by the fisherfolk who rather prefer an on-site intervention due to livelihood reasons. Despite the claim of the sector, the national government issued the blanket policy of then 40 Meters No Build Zone which basically requires demolition of infrastructures that are within 40 meters from the coastline. As a result, the fisherfolk now face the lingering threat of eviction from the coastal communities where they had since lived and prospered.

The reservation of the fisherfolk to the proposed resettlement program of the government is due to (1) its relative distance to the sea, the market, and schools, (2) the row house design of permanent houses does not fit to their socio-economic activities, and (3) the unclear provision on recovery cost. Given these concerns, consequently, most of the fisherfolk decided to rebuild their lives at their original dwelling locations near the sea instead of availing the resettlement program of the government.

It has been observed in Tacloban City that those fisherfolk who agreed to be resettled now started to come back because of the lack of services and access to livelihood in resettlement sites. But given the reference on the 40 Meters No Build Zone policy, it was found out that the same policy

was used by both national and local government units to deprive the disaster survivors of the Emergency Shelter Assistance and even aid coming from non-government organizations.

Today, the 40 Meters No Build Zone policy evolved into something that now categorizes areas along the coast to be “hazard zones” prone to storm surge as well as to tsunami and to other hydro-geological hazards. This indisputable finding of science through hazard maps further complicate the bid of the fisherfolk to remain near the source of their livelihood. Given this, the fisherfolk now demand identification of “safe” lands that are not too distant from the sea for the establishment of their longstanding call of a fisherfolk settlement.

It is a fact that municipal fisherfolk suffered the most from Typhoon Yolanda. They were left with nothing as their boats and other fishing equipment were taken away by storm surge. This loss of livelihood for capture fisheries also affected those who engage in fish vending. In the wake of the typhoon, they heavily relied on relief assistance and cash for work programs. Some non-government organizations and the government itself through the Bureau of Fisheries and Aquatic Resources (BFAR) also provided boats, fish cages, and gears to the fisherfolk to start up their economic activity.

The chaotic condition brewing in the City after the typhoon was not immediately contained by the police force of the government. Enforcers had forgotten to patrol the municipal waters of Tacloban City. With much dismay, some fisherfolk from Brgy. 52 reported of this group of people from Samar who stole their boat engines and other fishing equipment. A same incident of stealing was later reported by members of the Tacloban Fisherfolk Urban Association who were robbed of five motor boat engines.

Due to the magnitude of the disaster, relief assistance has not been very particular to the needs of every sector. It has been observed that assistance got out of control and in times even became counterproductive. Municipal fishers, for instance, have raised questions on the seemingly over production of boats with a design they considered to be not fit to their needs and unsafe for sailing due to its small size. Moreover, it is becoming apparent today that fish cages given to them pose serious threat to marine life due to wastes produced.

With the setbacks on assistance that could have been addressed had agencies that could have been more sensitive, the idea to reconvene the City Fisheries and Aquatic Resources Management Council (CFARMC) was opened up. The CFARMC is mandated by R.A. 8550, or the 1998 Fisheries Code of the Philippines, to serve as venue for the participation of fisherfolk in local development planning. Ideally, any law or legislation passed by the local government that is related to fisheries needs the approval of the CFARMC. The body is composed of both municipal and commercial fisherfolk with representative coming from other members of the community.

Through the initiative of the City Agriculture of Tacloban with the support of the Provincial Fisheries Office and with the assistance of the NGOs for Fisheries Reform, an election was held on June 19, 2015 to reconvene the CFARMC. The City Agriculture invited all the fisherfolk associations of Tacloban and Sir Jun Castillo of the Tacloban Fisherfolk Urban Association was elected as the Chairperson.

The new set of officers has been active in their duties. One of the major campaigns of the CFARMC is the clearing up and rehabilitation of the Cancabato Bay. However, like any other

organizations, problems started to emerge. It should be noted that CFARMC works on a volunteer basis. On top of the problems is the difficulty in gathering all the officers and members together because others come from far away barangays while some simply do not have the money to attend meetings and activities.

Given the limitations of CFARMC, its members call for a regular funding from the city council of Tacloban for its maintenance and operation. They request for a permanent office and a service vehicle for its members use. The end objective of these demands is to free them from additional costs for the fulfillment of their duties.

Objectives of the Study

The study aims to identify the perceived risks of waste water and solid waste on mariculture and capture fisheries in San Juanico Strait at Tacloban North.

Specifically, the study focuses on:

1. Gathering existing data about San Juanico Strait – its geographic characteristics, its history and development as a mariculture area, the communities in Tac North making use of its resources as well as the developments in Tacloban North affecting it

2. Identifying perceived and actual impacts of waste water from resettlement areas and host communities on the production of fisherfolk in Tacloban North who are engaging in mariculture and capture fisheries at San Juanico Strait

3. Proposing practical approaches and policy recommendations to mitigate the risk of pollution and/or contamination of the San Juanico Mariculture Park

Significance of the Study

The study would like to address the pollution of the San Juanico Mariculture Park by coming up with practical approaches and policy recommendations which are aimed at mitigating the aforementioned problem. Mitigation of such problem will help preserve the San Juanico Mariculture Park which is used for mariculture and capture fisheries by the local fisherfolk. The study not only intends to preserve this body of water, but also aims to help the locality sustain their livelihood.

Methodology

Local of the Study

Research Locale. The study was conducted in Barangay (108) Tagpuro and Barangay 102 (Old Kawayan) in Tacloban North where the communities in the said areas are actively engaging in mariculture & capture-fishing activities. Below is a map of the San Juanico Strait showing the locations of the two barangays:

Figure 1. *Map of the San Juanico Strait showing the locations of Barangay 108 (Tagpuro) and Barangay 102 (Old Kawayan)*

Thirty-eight (38) kilometres long and 2 kilometres wide at its narrowest point, the strait separates Samar from Leyte.

Latitude in degrees, minutes, and seconds: 11° 20' 25" N
Longitude in degrees, minutes, and seconds: 124° 58' 44" E[7]

[7] See http://www.geographic.org/geographic_names/name.php?uni=-3375232&fid=5003&c=philippines.

Data Gathering

Two methods of data gathering were done in this study:

1. Focused group discussion among fisherfolk living near and having fishing activities near San Juanico Mariculture Zone. The participants came from the Tacloban North Fisherfolk Association, Women Seaweeds Farmers and the St. Vincent Women's Association.

2. Key informant interviews and data gathering on developments in Tacloban North and San Juanico Strait

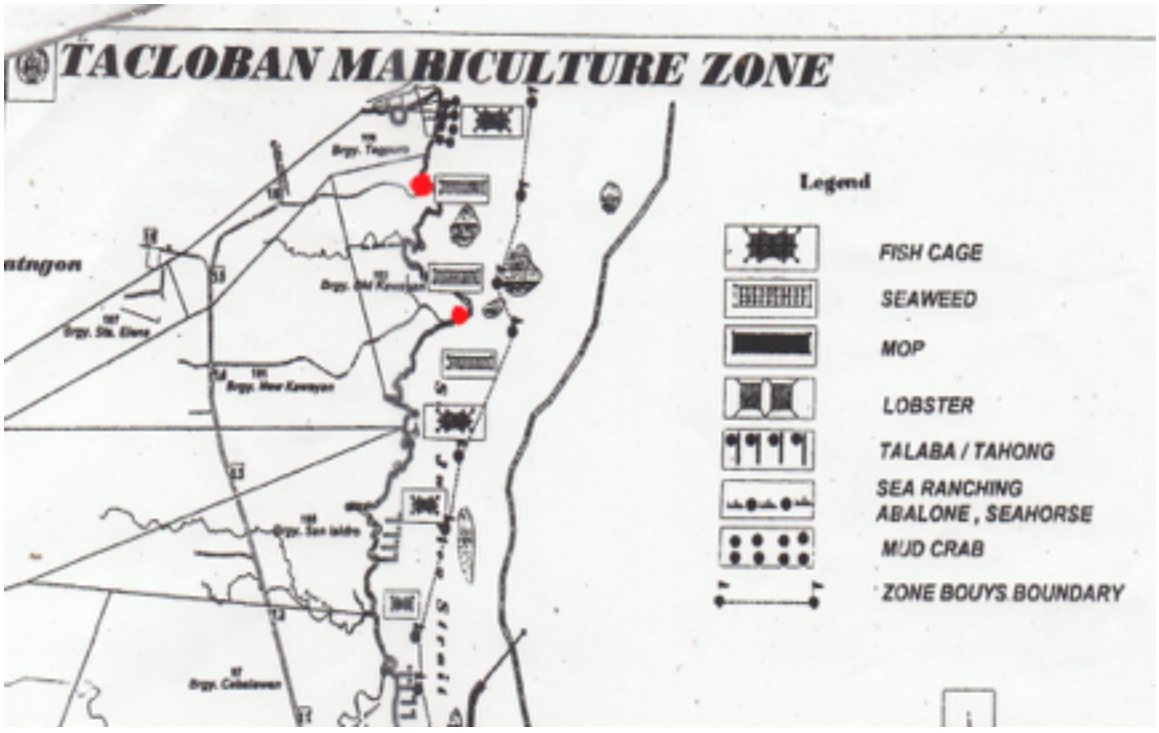

Figure 2. *Illustration of Tacloban City's Mariculture Zone.* Majority of the fisherfolk respondents mainly use fish cages, while some cultivate or gather sea shells.

Government Data

The government data were provided by the these offices: (1) City Health, (2) City Agriculture, (3) City Environment and Natural Resources, (4) City Planning and Development, (5) Bureau of Fisheries and Aquatic Resources. The Old Kawayan barangay captain and head of Tacloban North Fisherfolk Association were also consulted in the data gathering.

Table 1. *Methods of data gathering used in the study*

Method	Barangay	Occupied Area	Target Respondentds
Focused Group Discussion	Barangay 108 Tagpuro	Villa Sofia (Permanent Resettlement Area)	Fisherfolk engaging in aquaculture fisheries
			Fisherfolk engaging in capture fisheries
	Barangay 102 Old Kawayan	Barangay 102 Coastal Community (host community, not a resettlement site)	Fisherfolk engaging in aquaculture fisheries
			Fisherfolk engaging in capture fisheries
Key Informant Interviews and Data Gathering on San Juanico Strait and Developments in Tacloban North	N/A	N/A	Key informants: local fisherfolk leader, BFAR R08 and Tacloban City Agriculturist's Office and the City Planning and Development Office

Status of Housing Program in Tacloban North

The staff of Tacloban City Planning and Development Office, represented by Mr. Noli Cordero and Engr. Dennis Dacuycuy, expounded on the development plans for Tacloban North. According to them, the land area at Tacloban North was originally intended to be industrial zones. They showed a copy of the 2009 CLUP map which proves that the current sites where resettlement areas are now built were once planned to be allocated for commercial purposes. At the time of the conception of such plan, few residential houses existed in the area—households built their homes in Old Kawayan, Cabalawan, and along the highways of Tagpuro. Informal settlers also stayed in the mangrove area of Tagpuro.

After the onslaught of typhoon Haiyan, government agencies, either the City Housing Office or the National Housing Authority (NHA), exercised lenience in the approval and granting of permits to developers who were in need of resettlement sites for survivors, as the post-Haiyan emergency phase demanded drastic measures and immediate decisions. The City Planning and Development Office was not consulted or in any way involved in the choosing of areas to be converted to resettlement sites. Upon the construction of resettlement sites by the NHA and different developers and sponsoring non-government organizations, CPDO had no choice but to approve the reclassification of the supposedly industrial areas in Tacloban North to residential areas. Until now, the reclassification of land areas to be developed into new subdivisions is being done.

The representatives from CPDO revealed that there is no existing drainage system in Tacloban North; however, the resettlement sites have their respective septic tanks and drainage canals—

this is based on the construction plans presented by the developers of the resettlement sites. For instance, the NHA units' septic tank has two chambers whose content flows to the drainage canal which leads to the nearby creek connected to the river which in turn is connected to the sea. To address this problem, the City Engineer's Office is reportedly making a drainage system plan. But as far as the staff of the Tacloban City Planning and Development Office knows, the only existing drainage map in the city is the drainage map of the downtown area.

Perceived Impacts of Waste Water Due to Housing Program & Local Sewage System

San Juanico Strait and its Suitability for Mariculture

San Juanico Strait was declared suitable for mariculture by the Bureau on Fisheries and Aquatic Resources (BFAR) sometime in the year 2003 or 2004. In 2005, an ordinance declaring San Juanico Strait a mariculture park and Kataisan point was implemented. Upon its implementation, concerned agencies undertook efforts to develop San Juanico Strait into a mariculture park and a potential mangrove area. The strait started its mariculture operations in 2010 or 2011.

In the years 2011 and 2012, the Tacloban City Planning and Development Office made and submitted a proposal to establish a drainage system in Tacloban North since the area was already inhabited by residents at that time. The drainage system would also be needed the moment industrial complexes would be built in the said area. However, the proposed project did not materialise. Building and maintaining drainage systems along national highways, accordingly, are responsibilities delegated to the Department of Public Works and Highways (DPWH). Actual construction and approval of excavation permits, and making of city level drainage system should be done by the city engineer.

The City Agriculturist's Office and BFAR Region VIII declared that the San Juanico Strait is still fit for mariculture purposes. At the time of the interview, there have been no record of major fish kills or seaweed deaths and that in fact, seaweed farming and *bangus*[8] culture continues. According to past studies, the area is still optimum for mariculture. In addition, the ebb and flow of water in the strait keeps water clean.

---

[8] Milkfish; scientific name: *Chanos chanos*

However, the agencies confirmed that the water in the strait is harmed by waste water and solid waste pollutions. Runoffs from upland and resettlement areas from neighboring communities, which increase on rainy days, make the water murky which in turn disables bangus from eating feeds. These runoffs carry garbage and solid wastes which stick onto seaweeds and fishnets. This results in lowered oxygen levels which, on the long run, may harm marine life.

The polluted water and affected marine life pose harm on the consumers. They might ingest coliform and microbes from affected seaweed or fish coming from the strait. If such is the case, the mariculture operators' income will be compromised.

Table 2. *Inputs of participants of the key informant interviews regarding the suitability of San Juanico Strait for mariculture*

Key Informant Interviews	Themes	Sub themes
City Agriculturist's Office **BFAR RO8**	Area still fit for mariculture purposes	- They have no records of major fish kills or seaweed deaths - Seaweed farming and *bangus* culture continues - Area still optimum for mariculture according to past studies - Ebb and flow of water in the strait keeps water clean

Key Informant Interviews	Themes	Sub themes
	Waste water pollution	- Flow of runoffs from upland areas and resettlement areas from neighboring communities increase on rainy days - Murky water disables bangus from eating feeds - Lowered oxygen levels on the long run may harm marine life
	Solid waste pollution	- Waste water carrying garbage and other solid wastes flow to the strait on rainy days - Solid wastes stick onto seaweeds and fishnets
	Impact to health of consumers	- Consumers of mariculture products might ingest coliform and microbes from affected seaweed or fish coming from the strait
	Negative impact to production	- Consumers might stop buying affected mariculture products - Mariculture operators would fail to sell and earn when buyers reject their affected produce

Issues Raised by the Municipal Fisherfolk During the Focus Group Discussions

During the focus group discussions in Barangay 108 (Tagpuro) and Barangay 102 (Old Kawayan), the respondents complained about the proliferating pollution in the San Juanico Strait. They reported that water in the strait has turned murky from effluents and upland floodwater and that trash is caught by fishing nets. Some reported on sewage damaging the seaweeds and trash seen in mangrove areas and stuck in seaweed beds. They claimed that more trash and sewage contaminated the water when people started transferring to the area. Plastics, used diapers, and wooden materials, among others, get stuck on seaweeds and destroy the latter. When the water flow is strong, seaweeds inside the cages are washed away and replaced by solid waste. They also supposed that organic load from neighboring communities help pollute the strait. They blamed the waste coming from the nearby areas, namely, the Suhi creek, the GMA housing, the Sto. Niño creek near the GMA housing, and the Barubuan creek near Cabalawan. The waste water comes from the downtown area and is brought by the waves to Babatngon, they added.

The fisherfolk respondents also complained about the upland and agricultural run offs coming from the rice fields of Sto. Niño, Tagpuro and Old Kawayan, which contaminate the water together with other solid waste when farmers start to plow their lands in preparation for the planting season. The runoffs mix with the feeds, making the water murkier. The fishers are then forced to supplement the regular sacks of feeds required—4 to five 5 months of feeding requires 250-300 sacks as advised by BFAR. Fortunately, USAID donated 250-300 sacks of feeds good for one cropping; the Association of Old Kawayan also purchases sacks of feeds—each bag,

according to them, costs Php700.00. In Barangay Tagpuro, Save the Children allocated two million pesos (Php2,000,000.00) for feeds.

Figure 3. *The fisherfolk respondents of Barangay Tagpuro brainstorming during the focus group discussion*

Tay Roms, a fisherman who has just transferred from the transitional housing in Barangay San Jose to Barangay Tagpuro, shared his thoughts on the impacts of waste water on the strait and their livelihood. He said that when the two-chamber septic tanks of the households overflow, their contents go directly to the more than one-meter deep canal. He is aware that failure to maintain the drainage system will result in pollution of seawater; luckily, a developer talked to

them about their plan to build a water treatment facility. The effects of water waste will be felt if the population in the barangay grows, he added.

The respondents also talked about the changes in the body of water after the onslaught of typhoon Haiyan. These changes include displaced and damaged corals in the strait; larger fish species caught due to halt in fishing activities after typhoon Haiyan; fishes taking shelter in debris from under the bay that served as "artificial reef"; and damages in mangrove areas that affected the crabs and fishes.

When asked about the current status of the San Juanico Strait as a fishing ground, the respondents from Old Kawayan reported that the amount of catch from the strait was bigger before typhoon Haiyan happened. Before the typhoon hit the region, no fisherfolk associations were present and fishers made their catch, which included *lapu-lapu*,[9] danggit, *sapsap*,[10] and *bisugo*,[11] through *pangangawil*,[12] *paninilip*,[13] *pamamana*,[14] and *pamumukot.*[15] The typhoon damaged the corals, killing and driving the fishes away. They added that the catch is bigger when there is half-moon; the fishes do not come out when there is a full moon because it is too bright, said the respondents.

---

[9] Common name is grouper.

[10] Ponyfish; scientific name: *Leiognathidae*

[11] Threadfin bream; scientific name: *Nemipteridae*

[12] Fishing using hook

[13] Catching fish which entails diving

[14] Fishing using spear

[15] Fishing by means of the fishing net

The respondents narrated that before the implementation of mariculture in the strait, their daily catch ranged from 3 to five 5 or sometimes ten 10 kilograms using spears and fishing nets. They used to fish at nine to ten in the evening and drop their nets in the middle of the sea because it was where the schools of fish were located. Now, owing to the slow growth of coral reefs, their catch dropped to two 2 to three 3 kilograms daily using spears—the use of the fishing net renders no more catch nowadays, they lamented, so many of them choose to use the *pana* (spear) in fishing, especially in catching fishes hiding and living inside coral reefs.

The 37 fisherfolk respondents from Barangay Tagpuro, ten 10 of whom do pangangawil, said that they were able to make five 5 kilograms of catch in a day during pre-Yolanda time, and even twenty 20 kilograms during lucky days. In post-Yolanda time, same species of fish are caught but in lower quantity. New batches of fishers from San Jose and downtown area compete with them, hence the decreased quantity of fish caught, they inferred.

They also expressed a few sentiments. Their fishing territory had been reduced—they are no longer aloud to fish in some parts of San Juanico Strait leading to Babatngon and Sta. Rita, Samar because of the existence of fish cages in said areas. The fish supply in the strait had never been enough even before typhoon Yolanda destroyed the coral reefs—the situation worsened after the typhoon left catastrophic devastation on natural habitats and man-made structures.

They spoke too of season related factors affecting San Juanico Strait. According to them, the water has turned too murky for bangus to eat feeds and survive on rainy seasons. Seaweeds also show signs of disease and damage due to the very hot weather. The respondents of Old Kawayan mentioned that during months when the temperature is high—March, May, and September—the

seaweeds wither and die. They also experience loss in profit during the months of November and December when the water is cold, because the rains during the rainy season increase the flow of waste water and solid wastes into the strait. Tay Roms mentioned that when it rains, nothing flows from the upper land but the rainwater makes the seawater turbid—Tay Roms calls it *pag-gatas*—this is the effect of the agricultural soil used for landfill; he claimed that such kind of soil is responsible for the rise of problems concerning fish cage and seaweeds.

When asked about the impacts of rehabilitation, recovery, and development efforts in Tacloban North, the participants relayed that feeds and seaweeds from mariculture are attracting more fish into the strait. According to Tay Roms, cleaning of the seaweeds is done alternately, while changing of fish net of fish cages is done two to three times. USAID gave them the fish cages—each unit (5x5 meters) of fish cage was assigned to one team composed of 9 fishers. Those who are not members of the association resort to forming a group of 3 who use the traditional *pukot* to catch *masag.*[16] However, *masag*-catching will not sustain a family's daily expenses because crabs only breed on a particular season. The presence of algae, which depends on the season, also affect the fish catch. Tay Roms also mentioned that they were given 48 fish cages and 7,000 fingerlings for capital which will be recovered upon harvest and be used for the purchase of feeds and bamboo. They had been using fish cages even before typhoon Haiyan struck the region, only that each unit was shared by 28 members. Currently, there are 128 fish cages in Barangay Tagpuro.

In Old Kawayan, there are 5 private fish cages whose owners come from Davao City, one 1 owned by Old Kawayan Association, and 4 from San Jose. The cages house both bangus and

[16] Crabs

Figure 4. *Members of Women Seaweeds Farmers and St. Vincent Women's Association of Old Kawayan talk about the impacts of waste water on the local fishing industry*

lapu-lapu, but most of them contain bangus. The USAID donated lobsters, crabs, and lapu-lapu to be bred. Each fish cage, which is a meter away from another one, unlike the ones sponsored by BFAR which are connected to each other, contains 5,000 fingerlings. The fisherfolk believe that the fish cages prevent fish kill as the nets hinder the penetration of solid waste into the cage; however, they fear that solid waste releases chemicals which contaminate the water, therefore they still harm the living organisms which inhabit it.

After the fish cage season, which runs from January until October, the fishers rely on BFAR and City Agriculture for supplies as the Association of Old Kawayan is not financially capable to lend its fisherfolk funds for purchase of feeds and fingerlings.

Seaweeds were given along with the fish cages. The office of the City Agriculture started giving out seedlings of seaweeds in 2011 and has consistently done so. BFAR and other non-government organisations also partake in the giving of seedlings. According to Tay Roms, when they plant fifty 50 kilograms of seaweeds on 100 square meters of seabed, they can harvest approximately 300 kilograms. The respondents of Old Kawayan expressed that seaweeds, which are inhabited by squids, were used to be ignored before typhoon Yolanda. Since they did not know how to catch squids, they opted not to pursue growing and maintaining seaweeds.

They were also provided markers, sinkers, and floaters, but sometimes the ropes get severed because people accidentally damage the markers. Logs and other debris carried by the water also affect the seaweeds. At present, the fisherfolk in their area attend to their respective fish cages; no issue regarding the cages' security has surfaced so far. Tay Roms added that in the meantime, they are using the feeds given by Save the Children while they wait for the provision of the City Agriculture office which will lend them feeds enough for two months. He added that the amount of feeds provided increased from 100 to 300 sacks. To gain income, some fishers work at construction sites while waiting for the fingerlings, which rapidly grow during the hot season—the bangus fingerlings' appetite is poor during the wet season. No history of fish kill has ever been recorded until this time.

The residents, in general, relayed that here has been lesser fish catch because more settlers are fishing. On the other hand, Tay Roms stated that there is no considerable difference between the catch before and after typhoon Yolanda in terms of amount and size of fish caught; on average, they are able to catch 2 kilograms of fish daily.

Other fishers from the transitional shelters of San Jose resort to catching crabs. The post-Yolanda quantity of crabs caught did not vary from that of the pre-Yolanda's—this is according to Tay Roms. In two days, 10-15 kilograms of crabs are caught and sold in the local market at the downtown area of Tacloban City.

Lack of properly built septic tanks or drainage system, according to the residents of Barangay Tagpuro, will increase the flow of septage/sewage into the strait through creeks and canals on the long run. Though still optimistic about the state of the water of San Juanico strait in terms of suitability for mariculture as tested and proven by BFAR, Tay Roms predicted that the real and grave effects of waste water will be greatly felt when the other families from the transitional houses in Barangay San Jose are transferred to Barangay Tagpuro—adding to the 28 families currently residing in the area. He supposed that a new batch of families will be relocated to their barangay within the month.

The respondents from Old Kawayan opened up about the measures undertaken by BFAR to address the problem on the presence of debris—auto parts and robber materials seriously damaged the reefs after the typhoon. The aforementioned agency created artificial reef and did coral rehabilitation in the affected are. They also included mangroves in the rehabilitation efforts, which, at this point, is already finished.

Table 3. *Issues raised by the fisherfolk of the two participating barangays*

Research Site	Themes	Sub themes
Barangay 108 (Tagpuro) **Barangay 102 (Old Kawayan)**	Pollution in the strait	- Water turning murky from effluents and upland floodwater - Trash stuck in fishing nets - Sewage damaging the seaweeds - Trash and wastes seen in mangrove areas - Wastes stuck in seaweed beds - Increase in the volume of trash and sewage when people started moving to the area - Organic load from neighboring communities pollute the strait
	Changes in San Juanico Strait after typhoon Haiyan	- Displaced and damaged corals in the strait - Larger fish species caught due to halt in fishing activities after typhoon Haiyan - Debris submerged in the water serving as “artificial reef” - Crabs and fishes affected by the damages in the mangrove areas

Research Site	Themes	Sub themes
	Season related factors affecting San Juanico Strait	- Water too murky for bangus to eat feeds and survive on rainy seasons - Seaweeds showing signs of disease and damage due to the very hot weather - Rainy season increasing the flow of waste water and solid wastes into the strait
	Factors and impacts related to rehabilitation, recovery, and development efforts in Tacloban North	- Feeds and seaweeds from mariculture attracting more fish from the strait - More settlers fishing, therefore lesser catch - Lack of properly built septic tanks or drainage system increasing septage/sewage flow into the strait through creeks and canals on the long run

Proposed Solutions and Recommended Policies

Proposed solutions and suggested policies by the fisherfolk

During the focus group discussion, the participants from Old Kawayan recommended means by which the different problems concerning the mariculture industry and the state of the water in San Juanico Strait will be mitigated, if not entirely solved. Because the strait has become the catch basin of garbage originating from the downtown area of Tacloban and nearby barangays, they strongly suggested that concerned agencies provide artificial reefs and conduct coral rehabilitation to maintain capture fisheries in the area. BFAR, by this time, is done placing artificial reef in the area and doing mangrove rehabilitation. The fisherfolk demanded that monitoring of the status of the water in the strait be continuously done by the responsible agencies.

The respondents from Tagpuro suggested that a waste treatment facility that will filter waste water be built in the area to prevent pollution in the strait. They asked for additional septic tanks or disposal tanks as their current septic tank is not capable to serve all 28 families in the barangay. They proposed that resettlement of families to their area be stopped temporarily until ample facility is built in the place. They heard that two or three months from the time of the interview, a new batch of residents from Barangay 88 will be transferred to their barangay.

Worried about trespassers stealing and destroying their equipment, the fisherfolk of Old Kawayan requested that coast guards constantly and strictly man the fishing sites. They also mentioned their problem regarding the navigation lane that BFAR implemented. They reported that fishers who do not come from the locality and fish in the strait at nighttime, unaware of the

purpose of such lane, cut it—most of these fishers come from the island of Samar. Some even steal fishing gears and use fishing nets that damage the seaweeds. This problem has existed for quite a long time, but local authorities, specifically FLET, has not paid it much attention.

Stronger security in the fishing ground will be achieved by augmenting the number of FLET members and Bantay Dagat. It should be made sure that law enforcers are equipped with enough training and be provided with the right equipment. And more importantly, it is about time to set the boundaries of Tacloban municipal waters from that of adjacent municipalities by putting up visible and permanent markers.

The respondents from Tagpuro, during the discussion, came up with the idea of maintaining sanitation in fish cages to preserve the seaweeds and safeguard production. They reported that waste polluted the creek when resettlement sites were established in the area; consequently, fish ponds were contaminated and eventually neglected. Developers promised to provide filtering facility in the area—this should be fulfilled and maintained when the developers leave, asserted Tay Roms. He added that a home owners association be established to oversee the operation of the facility.

Their other requests include regular garbage collection in every barangay so that the residents will be prevented from throwing their garbage to the strait; provision of treatment for seaweeds when they acquire diseases; life insurance for the fisherfolk to cover for expenses incurred for medical treatment of injuries and death benefits; and fishing gears which include life jackets. They also ask for supply of feeds for the fish cages.

Table 4. *Proposed solutions and recommended suggested policies by the fisherfolk of the two barangays*

Focused Group Discussion Participants	Themes	Sub-themes
Barangay 108 (Tagpuro) **Barangay 102 (Old Kawayan)**	Solid waste and sewage management	- Building of a waste water treatment facility - Regular schedule of waste collection and desludging in barangays
	Management of fishing activities in and monitoring of the status of the San Juanico Strait	- Strengthening of fishery law enforcement in Tacloban North - Monitoring of water quality in the strait
	Resettlement	- Suspension of the transfer of people to resettlement sites

Actions and plans by concerned government agencies

The City Health and the City ENRO are presently holding meetings to solve and manage the waste water issue—the implementation of any preventive measure or solution to the problem will be done by a different agency though. Currently, the city has a septage treatment facility — the Tacloban City Septage Treatment Facility —located in Barangay Sto. Nino, Tacloban North near the sanitary landfill. Constructed in March 2015, the project was funded by UNICEF and implemented by the organisations Samaritan's Purse and USAID. The facility was designed to collect, treat, and dislodge waste from septic tanks of residential buildings in Tacloban North. When interviewed, the Technical Working Group of the septage treatment facility, composed of Dr. Gumagay from City Health, OXFAM, City Housing, CENRO, City Health's Environment

and Occupational Health Section, stated that the operation and maintenance of the facility, which started treating sewage on the 15th of February 2016 and included septage on the 26th of April 2016, will persist until their objectives are met. Their objectives include the passing of an ordinance implementing the use of such facility— absence of an ordinance hinders them from offering treatment of private household wastes—and maintenance of treatment facilities. The group also explained how the facility works: first the subdivision requests the City Health to collect and dislodge waste, and then CENRO will treat the collected and dislodged waste from the subdivision for discharge. They plan to lobby for the inclusion of the existence and use of such facility in the Building Code of the City and to privatise septage, this way, the facility would be efficient.

At present, the city of Tacloban is securing a Certificate of Non-Coverage of the facility from the Environmental Management Bureau-Region VIII and an Environmental Sanitation Clearance from the Department of Health-Region VIII.

Table 5. *Plans and actions of the key informant interview participants*

Key Informant Interview Participants	Themes	Sub-themes
City Health Office **City Environment and Natural Resources Office** **City Planning and Development Office**	Solid waste and sewage management	- Clear and well executed plan on solid and sewage management - Formation of technical working group on seepage and sewage management - Fixing of the sewerage system in Tacloban North - Establishment of septage treatment facility in Tacloban North - Drafted ordinance on septage and sewage management system for the city - Movement of the dumpsite away from the highway and populated barangays
BFAR RO8 **City Agriculturist's Office**	Management of fishing activities in and monitoring of the status of the San Juanico Strait resettlement	- Regulate mariculture activities in designated zones - Activate management council for mariculture activities - Draft ordinance protecting mariculture areas in the city - Strengthen law enforcement in Tacloban North - Permitted and monitored establishment of structures in mariculture zones

References

Alegre, J. D. (2015). On the lips of the surge: History, Myth and Memory. In Lunop: Haiyan Voices and Images (pp. 10-11). Tacloban, Philippines: Leyte-Samar Heritage Society, and National Commission for Culture and the Arts.

Haiyan (Northwestern Pacific Ocean): Evidence of Destruction in Tacloban, Philippines. (2013, November 20). Retrieved October 8, 2016,

from https://www.nasa.gov/content/goddard/haiyan-northwestern-pacific-ocean/#.WADhNFeO7Vo

Harress, C. (2013, November 11). Typhoon Haiyan Financial And Economic Impact: Devastation To Cost Up To $14 Billion But Markets Remain Largely Unaffected. Retrieved October 8, 2016,

from http://www.ibtimes.com/typhoon-haiyan-financial-economic-impact-devastation-cost-14-billion-markets-remain-1463994

Perlah, J. (2013, November 27). After Typhoon Haiyan, Philippines Economy Grows At Slowest Pace In Over A Year. Retrieved October 8, 2016,

from http://www.ibtimes.com/after-typhoon-haiyan-philippines-economy-grows-slowest-pace-over-year-1489028

San Juanico Strait: Philippines. (n.d.). Retrieved October 14, 2016, from www.geographic.org/ geographic_names/name.php?uni=-3375232&fid=5003&c=philippines

The Typhoon Haiyan in the Philippines. (n.d.). Retrieved October 8, 2016,

from http://www.fao.org/emergencies/crisis/philippines-typhoon-haiyan/intro/en/