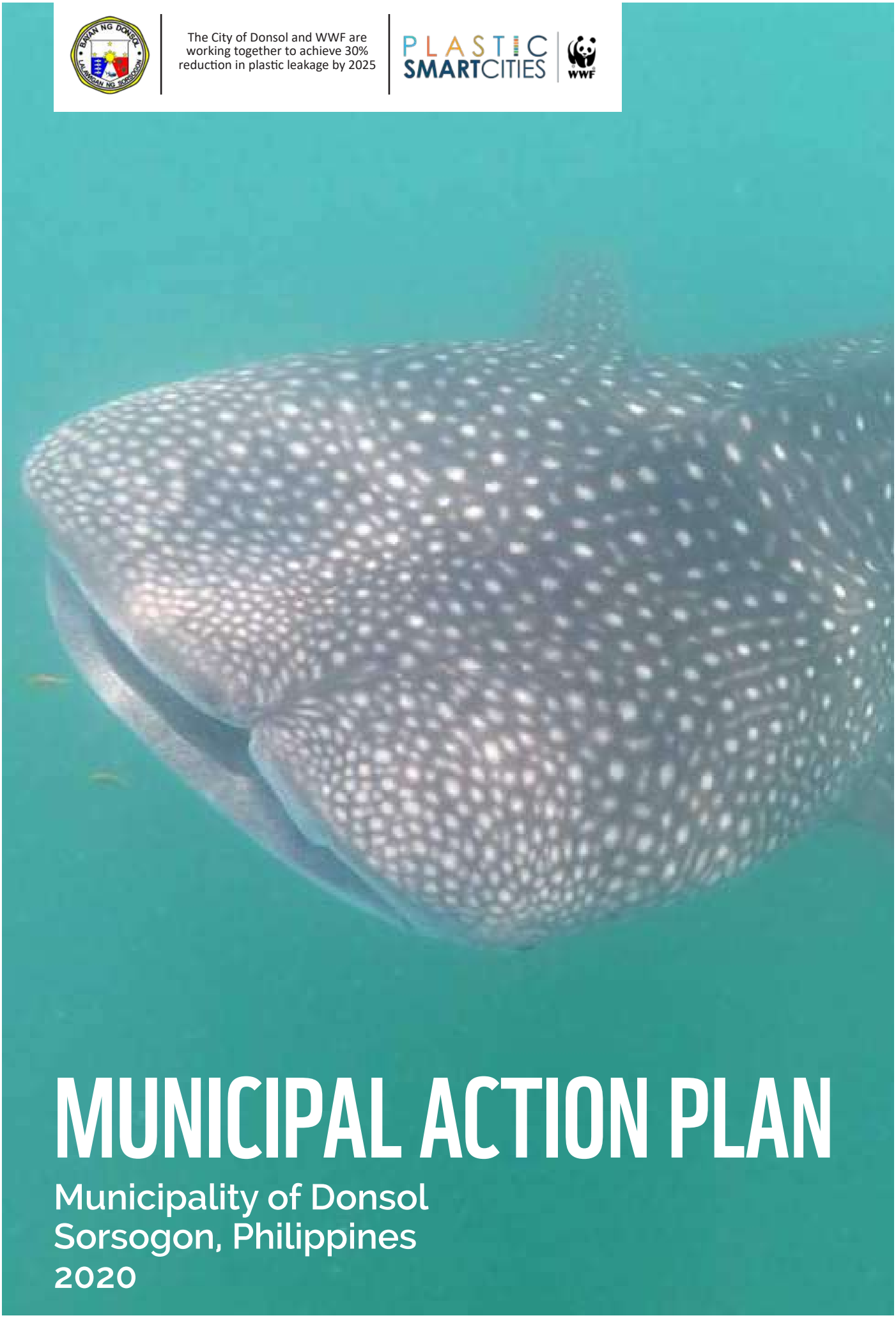
The City of Donsol and WWF are working together to achieve 30% reduction in plastic leakage by 2025

PLASTIC SMARTCITIES



MUNICIPAL ACTION PLAN

Municipality of Donsol
Sorsogon, Philippines
2020

About the PSC Action Plan

The Municipality of Donsol in Sorsogon province has the overall responsibility for the adoption and implementation of this PSC Action Plan which outlines key focus areas, measures to be implemented, and monitoring processes to measure successful outcome, as part of their commitment to the Plastic PSC movement signed during the PSC soft launch at the Business Forum on Sustainable Development in Singapore last November 2019. For its implementation, WWF supports and pushes for its integration in the municipality's 10-year Solid Waste Management (SWM) Plan, mandated under the Republic Act (RA) of 9003 or the Ecological Solid Waste Management Act of 2000.

Vision

WWF has a vision of an economy and a society that has zero tolerance for plastic pollution and all harm caused to the environment from such pollution – No Plastics in Nature. To successfully alleviate the potential harm that plastic pollution inflicts on our planet and its inhabitants, aligned actions at all stages of the plastic life-cycle are needed, with stakeholders working together in a concerted effort.

This Municipal Government of Donsol shares this WWF's vision, and hereby commits to:

- No Plastics in Nature by 2030;
- Launching a pilot within a designated area with a goal to reduce plastic pollution by 30% by 2025 and 100% by 2030;
- Appointing a lead person within the Municipal Government for the PSC Initiative; and
- Developing a monitoring plan that establishes baselines and annual targets.

Donsol envisions "A clean and peaceful place where a green environment is sustained enjoyed by
resilient community."

Main Objectives

The municipal government aims to reduce plastic pollution with the following:

- Eliminate the use of unnecessary plastics through waste prevention and reduction measures;
- Encourage communities to practice waste segregation at all sources;
- Increase plastic recovery for reuse and recycling for local revenue and entrepreneurship;
- Improve waste collection and management processes to minimize leakage; and
- Monitor municipality-wide activities aimed at reducing, minimizing and managing plastic waste, in an effort to optimize interventions.

MUNICIPAL ACTION PLAN
2020 - 2025

Foreword

Today, cities are home to more than half of the world's population, and they have a critical role to play in reducing ocean plastic and developing circular economies. We simply cannot win the fight against ocean plastic without collective action at the city level, realizing that 60% of ocean plastic derives from urban centers. By adopting and implementing this PSC Action Plan, the municipal government is delivering on its Plastic Smart Cities Declaration, and leading the fight against plastic pollution.

Background

Our growing waste stream is uniquely representative of the many challenges now facing our global community. With 8-12 million tons of plastic waste entering the ocean annually, and with global waste generation expected to increase by 70% over the next 30 years, plastic waste prevention and management programs are critical to the health and well-being of our urban populations. Poorly managed plastic waste affects human health and livelihoods, it affects our environment, living creatures, and economic opportunities. Therefore, a well-developed PSC Action Plan on plastic waste is critical to ensuring a sustainable, healthy, and inclusive global community.

First, we must take inventory by measuring and monitoring our local waste stream, collecting hard data to guide our strategy. Second, we must commit resources to educate, motivate and mandate - both individuals and industry - to adopt waste prevention strategies that reduce the volume of waste that must be collected and managed at the local level. Third, we must employ a scalable waste management program that adheres to the universal waste hierarchy, understanding that the largest gains in reducing pollution can often come from improving waste collection and processing methods.

Today an estimated 60% of plastic marine debris comes from urban centers, as polluted waterways carry plastic pollution to the ocean. While Cities will rapidly increase their population density to account for two-thirds of the global population by 2050, they must also continue to adopt smart solutions that reduce the collective impact of their prospering communities. This means preventing, minimizing and managing plastic waste.

There are many initiatives already underway at the international level. The UN Environment Programme launched Clean Seas in February 2017, with a goal to eliminate marine plastic pollution by 2022. The campaign contributes to the Global Partnership on Marine Litter as well as the UN Sustainable Development Goals, a collection of 17 global goals set by the United Nations General Assembly in 2015.

WWF has now launched the Plastic Smart Cities initiative, working directly with cities to prevent plastic leakage at the source. The Plastic Smart Cities initiative aligns with SDG 6 - Clean Water and Sanitation, 9 - Industry Innovation and Infrastructure, 11 – Sustainable Cities and Communities, 12 – Responsible Consumption and Production, 14 – Life Below Water, 15 – Life on Land, and 17 – Partnerships for the Goals.

Baselining

At the project onset, WWF establishes baselines on the waste generation, existing waste management system, and estimated plastic waste leakage into nature. A Waste Analysis Characterization Study (WACS) is implemented combined with GIS mapping. Outputs include waste volume and characterization of at-source and at-disposal wastes, an assessment of the current waste management system, priority areas for interventions, and Waste Flow Diagram (WFD).

For Donsol, baselining was conducted in 2020 by AMH Philippines and WWF Philippines. Results showed that the average daily tonnage of waste for 20 barangays was 6.45 ton/day. Biodegradables -- yard waste in particular -- comprise the majority of the wastes collected and disposed of at 47.79% or 3.87 tons. The second most prevalent type of waste was waste plastics at 16.3% or 2.58 tons, mostly in the form of low density polyethylene (LDPE) or plastic packaging such as food wrappers, plastic bags, and similar thin packaging films. Inland barangays that were inaccessible to the waste collectors disposed of their waste by buying or burning, feeding food waste to pets, or leaving the waste in their backyards to decompose. The full Baseline Study will be attached as Annex A.

This data does not take into account the peak tourism season. It has been estimated that tourists generate 10 times of wastes from local inhabitants (WWF EPR report, 2020).

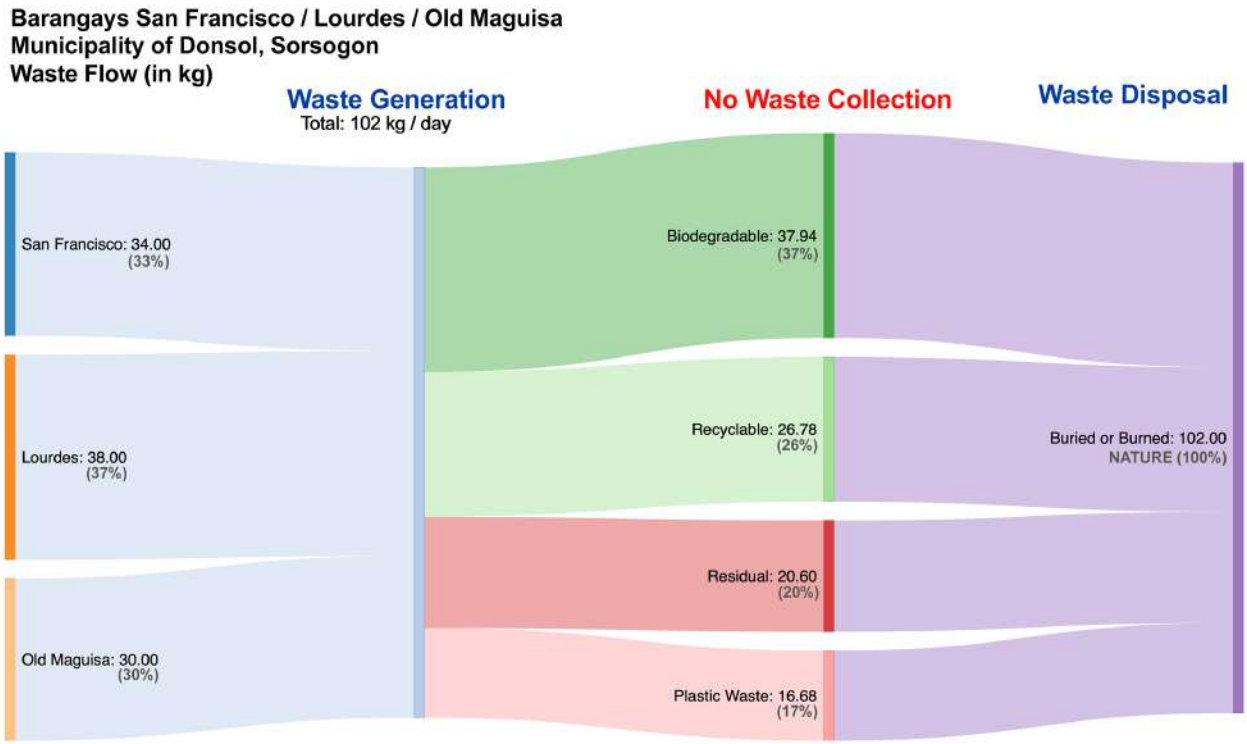


Figure 1. Waste Flow Diagram for the Municipality of Donsol

FOCUS AREAS AND MEASURES

I. Plastic Waste Prevention

Waste prevention depends fundamentally on changes in the attitudes and behavior of individuals and businesses, and on a transformative shift in industrial processes and product design. Waste prevention refers to practical actions that reduce plastic consumption to reduce plastic waste generation.

Waste prevention is fundamentally different from waste management activities, as waste management activities are implemented after materials become waste. Employing waste prevention strategies can effectively reduce the volume of waste that must be managed, placing less strain on local waste collection and management system.

Waste prevention includes **Avoidance** – eliminating the need for a product or material; **Source Reduction** – eliminating waste and pollution at source through process changes; and **Direct Re-use/Prolonging Use** – extending product life, serving as a diversion of waste flows.

Changing attitudes and behaviors requires a comprehensive strategy that educates, motivates and mandates, when necessary.

The Municipality of Donsol will:

- **Create Ordinances, Resolutions, Executive Orders and Implementing Rules and Regulations for new and old policies on plastic waste and strictly implement them.** This includes existing policies such as Municipal Ordinance No. 173, S-2018 - Regulating the use of Plastic Bags and Expanded Polystyrene (Commonly known as Styrofoam) as Packaging Materials, and Containers for Food and Beverages in the Municipality. The municipality has enacted this ordinance for the best interest of the health, safety and welfare of the people of Donsol to minimize the use of plastic cellophane and sando bags and the eventual prohibition, of the use, sale and provision of polystyrene as packaging materials for food and beverages.

- To assist in policy formulation, **Create an Executive Order for the Plastic Smart Cities Project.** Under this Executive Order, a Government Office must be assigned or appointed to focus on the program implementation and coordinate with WWF for policy formulation. Possible topics being include amending the business processing systems (MENRO Intervention), Pay-as-you-throw scheme, levy on plastics.

- **Ensure that each Barangay Solid Waste Management Committee (BSWMC) is active.** Although all barangays have BSWMCs, 24 out of the 51 Committees are inactive. Having a strong and organized foundation and commitment at the barangay level is essential to creating policies and changing behaviors leading to avoidance and source reduction. The inactive BSWMCs will be questioned as to their status and the roadblocks leading to their inactivity which information shall form the basis of a recommendation report or Action Plan to ensure their activity within a given time frame.

- **Educate through information education campaigns (IECs) to encourage behavioral change.** Increasing public and private sector awareness is essential in changing practices that are proven to be detrimental to humans and the environment; and changing attitudes about the way people consume resources and generate waste. IEC will be done through barangay assembly, school activities, training workshops, communication materials, and orientations. Customary paintings and announcements are displayed in public places as part of the usual IECs, with the aim to raise awareness on solid waste management.

II. Plastic Waste Collection

Waste collection rates are dependent on local factors – governance, geography, population density, consumption patterns, public awareness, amongst others.

A staggering 90% of waste produced in low-income countries are openly dumped or burned. These same cities are growing at a rapid pace, but without adequate waste management systems in place, the ocean and our global coastlines will only serve as a dumping ground for yet more plastic debris. The imperative is for cities and municipalities to develop waste management programs that increase collection rates and eliminate leakage during transport to reception facilities.

A recent study by the Ocean Conservancy and the McKinsey Center for Business and Environment found that focusing efforts on improving waste collection rates to 80 percent in just five Asian countries – China, Indonesia, the Philippines, Thailand and Vietnam – can reduce marine plastic pollution by 23 percent over the next 10 years. No other solution can promise such an immediate or lasting impact.

The Municipality of Donsol will:

- **Implement and sustain waste management – support programs such as NAKAMOTO that collect waste from isolated barangays.** With some barangays not accessible by the municipal waste collection, the NAKAMOTO program aims to reach such isolated areas via a motorbike to collect the waste on a periodic basis. The municipality aims to support the program's implementation while strengthening the current municipal waste collection system.

- **Strict implementation of the "no segregation, no collection" policy.** Proper waste segregation facilitates diversion through recycling, upcycling, and composting. The municipality aims to continue the strict implementation of this policy that includes scheduled collection of biodegradable, non-biodegradable and recyclable wastes to nurture stakeholder participation.

- **Establish Materials Recovery Facilities (MRFs) and collection points in all barangays.** The LGU of Donsol will establish MRF in 51 barangays and designate collection points for segregation, collection, and recovery of waste materials. These will be supplemented with manpower capacity-building, equipment for increased waste diversion, and other support that may be needed by the barangays.

- **Intensify Clean-up activities and awareness campaign both in upland and coastal communities.** Together with public and private sector, LGU Donsol will continue its waste recovery activities like nature clean-ups that contribute in increasing sector awareness and participation. Proper waste segregation is also communicated in these activities to facilitate waste diversion.

- **Provision of additional collection vehicle.** Despite being a 3rd Class Municipality, Donsol is still planning to procure additional collection vehicles such as, one (1) additional collection truck and five (5) eco-vehicles to strengthen the waste collection capability of the LGU.

III. Landfill Management

Half of the world's population does not have access to waste management services. This is largely a result of constrained municipality budgets, as waste management can often consume 50% of a municipality's total annual spend. While plastic waste represents a significant economic and environmental cost borne by cities (and municipalities) and society as a whole, plastic waste is also a largely untapped opportunity. Environmentally sound waste management is an opportunity to avoid the detrimental impacts associated with plastic waste in nature. It's also an opportunity to recover valuable resources that can add environmental, economic and social benefits. Advanced waste management processes can reduce costs, create local jobs, protect public health and ecosystem vitality.

Waste management is a cooperative process that requires multi-stakeholder engagement - the municipality government, businesses, NGOs, and individuals in the community all have an important responsibility to ensure environmentally sound waste management.

The Municipality of Donsol will:

- **Invest in Sanitary Landfill infrastructure.** The municipality will provide other safety features to their proposed sanitary landfill which include, provision of liner system, leachate collection and treatment system, gas control recovery, security fence, and groundwater and surface water monitoring.

- **Increase manpower and personnel deployment for landfill management.** The municipality will seek funding for hiring additional waste collection crews and will provide necessary training for all the sanitary landfill personnel to increase their capacity on waste and sanitary landfill management.

- **Seek partnerships within the private sector that see economic opportunities in the municipality's high value plastic waste stream.** Building a community of solution providers to help them increase plastic waste diversion with its economic value in mind.

IV. Plastic Reuse and Recycling

Plastic production is expected to double over the next 20 years. According to the Ellen MacArthur Foundation, only 14% of plastic packaging is collected for recycling. Plastic that is not collected is not only a lost economic opportunity, but its also a threat to the environment.

Plastic packaging valued up to USD 120 billion annually is leaked into nature after a single-use. Increasing plastic collection rates is first and foremost, in order to recapture valuable materials for reuse and recycling. Developing local recycling infrastructure and second use markets can extract value from materials that are often discarded.

The Municipality of Donsol will:

- **Invest in plastic recycling equipment for the municipality's Materials Recovery Facility.** LGU Donsol is currently providing each barangay with Material Recovery Facility (MRF). As of this writing, 98% percent of the 51 barangays have already an MRF.

  The municipality is looking to invest in appropriate circular waste management solutions and exploring alternative waste management technologies such as eco-brick and plastic pot making. They are now looking for the procurement of plastic pulveriser and other alternative equipment for residual waste management. A bio-shredder is being used by the LGU to process biodegradable waste into compost.

- **Seek partnership with private groups for recycling.** Donsol will explore possible partnership with private groups doing recycling initiatives like eco-bricks or eco-blocks making to learn the technology that will help them achieve their own target of 10% percent reduction on residual waste all towards reaching the final aim of the municipality of Donsol for reduction of 30% by 2025 and 100% by 2030.

- **Implement and sustain waste management mechanisms – support to livelihood programs like the Entre-Pinay of the women's group called Kababaihan ng Liping Pilipino (KALIPI).** With only approximately 25% of the total plastic waste collected, the municipality aims to build community-based livelihood activities to help provide additional income while increasing municipal waste collection. The municipality also seeks to partner with private sector to sustain these programs.

V. Plastic Monitoring and Evaluation

Monitoring local waste streams is critical to developing sound municipal strategies. Data on the types and volume of generated municipal wastes can help identify appropriate waste management programs, allocate resources to ensure appropriate collection infrastructure and scheduling, establish short and long-term targets for collection and diversion, and adapt as consumption patterns evolve. With good data, municipalities can better assess relevant technologies, applicable best practices given the local context, and identify strategic partners for service provisions.

The Municipality of Donsol will:

- **Institutionalize a Monitoring and Evaluation (M&E) team.** A task force solely dedicated for the clean and green program will be organized composed of selected members coming from the different related departments or units of the local government. They will be trained and conduct monthly and quarterly supervision of the solid waste management programs especially focused on the source minimization and large turnout of marketed recyclables.

- **Publicly report progress as part of the existing annual sustainability report.** LGU will prepare and submit weekly, monthly, and quarterly accomplishment reports of their programs related to waste reduction and management including the operation of MRF and the categorized disposal facility. Donsol will also submit the semi-annual Solid Waste Management Self-Compliance Monitoring and Auditing Report (SWM-SCMAR) to the Department of Environment and Natural Resources (DENR).

  As part of their PSC commitment, Donsol also shares their progress with WWF in achieving the reduction of plastic pollution of 25% by 2025 and 100% by 2030.

COMMUNICATION STRATEGY

With its brand of integrity and transparency, WWF has a unique value in the market which can be utilized by Plastic Smart Cities to positively influence stakeholders and mobilize communities to advance their efforts for a plastic free ocean.

Plastic Smart Cities as a key pillar of WWF's No Plastics in Nature initiative have established seamless collaboration with stakeholders since its inception. With its partnerships with city and municipality governments, capacitation to communities and local organizations, and engagements with local businesses, it shall continue on this path to achieve its vision of having no plastic leakage into nature by 2030.

Our municipality, together with Plastic Smart Cities as WWF's voice on plastics will:

- Influence stakeholders to take the lead on the municipality's plastic reduction and management;
- Develop a collaborative platform for stakeholder engagements and best practices knowledge sharing;
- Support new technology transfer and policy initiatives;
- Influence other cities to pledge commitments with WWF's Plastic Smart Cities; and
- Take the lead for No Plastics in Nature by 2030.

Communication Objectives

- Position Plastic Smart Cities as the leading initiative to stop the leakage of plastic wastes in nature with; wide resource of innovative solutions and best practices on waste management; and local governments and community organizations as collaborators towards achieving no plastics in nature by 2030;
- Raise awareness, through environmental education on the effects of poor waste management to the municipality's coastal ecosystem, marine biodiversity, and contribute to the worsening climate crisis;
- Feature the minicipality of Donsol as a model city for sustainability with its successes in implementing a community-led whale shark eco-tourism program and the community's innovative solutions to improve solid waste management;
- Encourage more citizens of Dosol to participate and contribute in implementing proper solid waste management in the municipality.

Target Audiences

- Local Government Units (Cities and Municipalities) - Responsible for local policies and implementation of proper solid waste management in the area.
- Local Businesses - Responsible for adhering to local plastic policies, and providing plastic free options to their customers.
- Local Organizations - Responsible for adhering to innovative solutions on plastic waste diversion and reduction.
- General Public - Responsible for bahevioral changes to reduce plastic use and better manage plastic waste.
- Solution Innovators - Responsible for developing global examples of best practice solutions to support Cities, Local Businesses, and the General Public.

ANNEX A
WACS Results

DONSOL WASTE ANALYSIS AND CHARACTERIZATION STUDY (WACS) BASELINE FOR PILOT SITES

Final Report

amh
PHILIPPINES, Inc.
ENGINEERS • CONSULTANTS

June 2020

AMH Philippines, Inc.
ENGINEERS | CONSULTANTS

Ref No: NP20.018.009

June 1, 2020

MR. JOSE ANGELITO M. PALMA
Executive Director
Kabang Kalikasan ng Pilipinas Foundation Inc. (World Wide Fund for Nature Philippines)
4F JBD Plaza, #65 Mindanao Avenue,
Project 6, Quezon City, 1105

Thru : **MR. MANUEL NARVADEZ, JR. and/or MR. LUIS S. CARAAN**
Project Manager

Subject : **FINAL REPORT**
Donsol Waste Analysis and Characterization Study (WACS) Baseline for Pilot Sites

Dear Mr. Caraan and Mr. Narvadez,

AMH Philippines, Inc. is pleased to submit this revised Final Report for the Donsol Waste Analysis and Characterization Study (WACS) Baseline for Pilot Sites. Included in this revised final report minor additions that were discussed during a phone call made last May 20, 2020. This report contains the activities that we have performed and the corresponding results and findings for the aforementioned endeavor.

Please feel free to contact our office should you have any questions regarding this report. We would be glad to discuss these with you.

Thank you.

Very truly yours,

MARIA ANTONIA N. TANCHULING, PhD
Principal Engineer

EXECUTIVE SUMMARY

World Wide Fund for Nature Philippines (WWF/Client) has contracted the services of AMH Philippines, Inc. (AMH/Consultant) to conduct a waste management analysis study (WACS) in Donsol, Sorsogon to serve as a baseline for pilot sites.

The objectives of this project are to: (1) orient the field personnel on the conduct of WACS; (2) conduct waste analysis and characterization study (WACS) in pilot sites of the 8 barangays—Dancalan, Sibago, Ogod, Poblacion-Market Site, Sta. Cruz, Banuang Gurang, Girawan, and Malinao; (3) generate stakeholders' perception on, and recommendations for, the effectiveness of waste collection system of the local government; (4) evaluate the existing solid waste collection system of Donsol and formulate recommendations for its improvement; and (5) prepare a WACS report which will serve as project baseline with recommendations toward monitoring plan for measuring impact.

To achieve these objectives, a 7-day fieldwork was conducted in Donsol, Sorsogon. Students from Donsol Community College were trained to perform WACS and to conduct surveys among the community residents. Interviews and visits to the 8 priority barangays were done to gain a better understanding of the current situation of waste management. Other stakeholders such as resort owners and junkshop owners were also interviewed.

The residual containment area (RCA), a site in Brgy. San Isidro where wastes from the 20 barangays that are serviced by the municipal garbage collection are brought to, was also visited by the team to perform WACS activities. The activities carried on for three days – capturing the different waste collection scheme. All data and observations made from the activities were processed to come up with appropriate recommendations. It should be noted that results (tonnage, volume, density, and waste generation rate) from this WACS activity that will serve as baseline only reflect the wastes collected from the 20 barangays and brought to the RCA facility. It should not be used to represent the waste generated of the entire Donsol Municipality. Results show that Biodegradables—yard waste in particular—comprise the majority of the wastes collected and disposed at the RCA. Next to biodegradables are plastic wastes. More than half of these plastic wastes are in the form of low-density polyethylene (LDPE) or those plastic packaging such as food wrappers, plastic bags, and similar thin packaging films.

Inland barangays that are not serviced by the collection truck dispose their residual waste by either burying them under the ground or burning them in a pit hole. Yard wastes are often left on the backyard to decompose. Leftover food is often given to pet animals or as feeds for backyard piggery. In a way, these can be considered waste diversion schemes.

From interviews and surveys with the locals, an estimated 1 bag of waste is disposed by each household per day. Barangay officials and beneficiaries of the 4Ps program are some of the main players in keeping the environment clean. Typhoons and strong rains bring wastes from the upland to the midlands and lowlands, thus polluting the coastlines of these areas. Floods brought by strong rains also cause wastes to move from one area to another and polluting the surrounding area.

As a recommendation, smaller utility vehicles may be used to be able to access the inland barangays to collect their waste. Acquisition of weigh pads or weigh bridge will also be helpful in capturing a closer estimate of the amount of waste collected. This will also help the municipality in monitoring its target diversion rates.

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I. INTRODUCTION

World Wide Fund for Nature Philippines has contracted the services of AMH Philippines, Inc. (AMH/Consultant) to conduct a waste management analysis study (WACS) in the Donsol, Sorsogon to serve as a baseline for pilot sites. This project is a component of the "Blueprint for a Circular Economy: Creating a Plastic Free Coastal Town" with the World Wide Fund for Nature Philippines (WWF) as the Client.

A. Project Site

Donsol is a 3rd class municipality located in the Province of Sorsogon, Bicol Region (Figure 1). It is composed of 51 barangays with a population of 51,413 residents (Bayan ng Donsol, 2018). Eight (8) barangays were chosen as priority sites – Dancalan, Market Site-Poblacion, Ogod, Sibago, Sta. Cruz, Girawan, Malinao, and Banuang Gurang. The first 5 barangays mentioned are coastal barangays, and the 3 remaining barangays are inland barangays. These barangays were visited and surveyed to gather information regarding their practices on solid waste management.

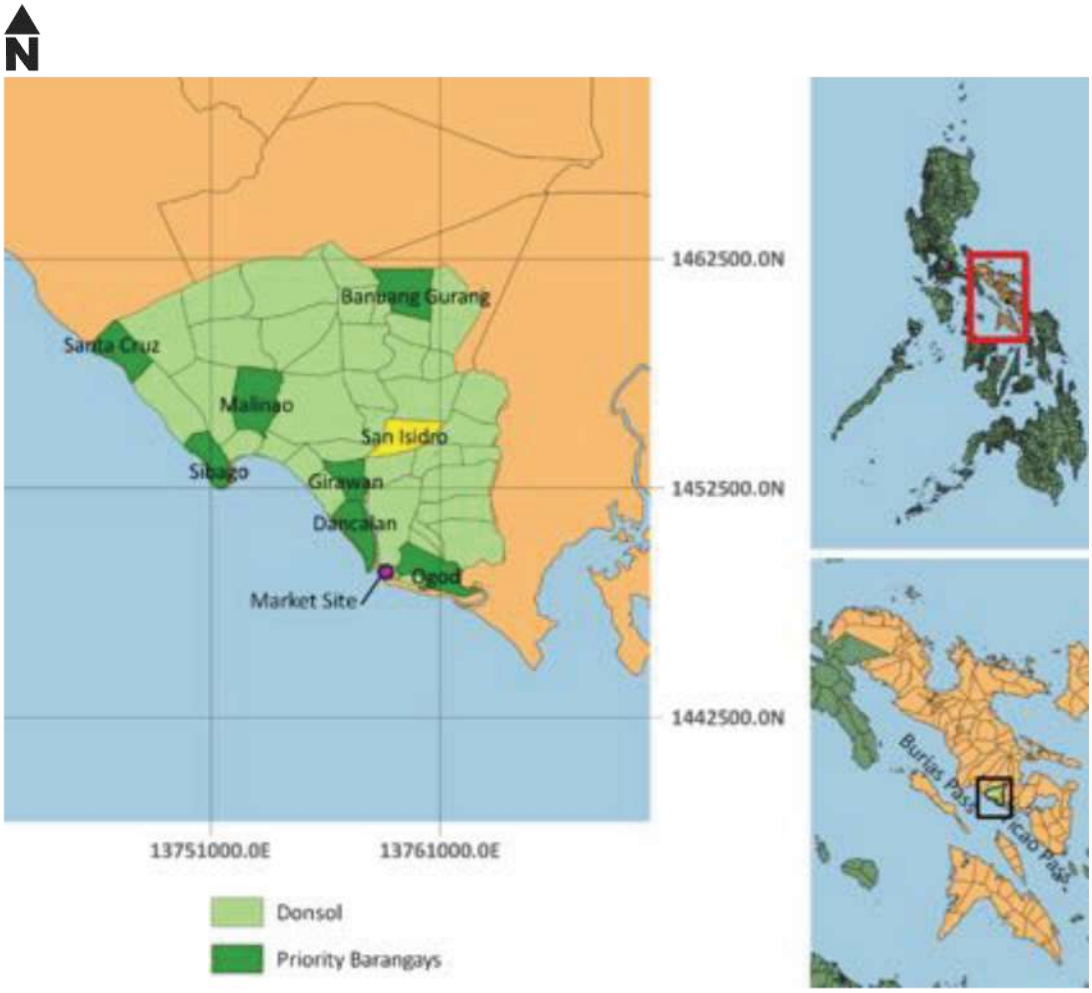


Figure 1. Municipality of Donsol and the 8 Priority Barangays

The Residual Containment Area (RCA) located in Brgy. San Isidro (Figure 1) was also visited to characterize the type and quantify the amount of waste it receives.

B. Objectives

The objectives of the study are to:

1. orient the field personnel on the conduct of WACS;
2. conduct waste analysis and characterization study (WACS) in pilot sites of the 8 barangays – Dancalan, Sibago, Ogod, Poblacion-Market Site, Sta. Cruz, Banuang Gurang, Girawan, and Malinao;
3. generate stakeholders' perception on and recommendations for the effectiveness of waste collection system of the local government;
4. evaluate the existing solid waste collection system of Donsol and formulate recommendations for its improvement; and
5. prepare WACS report which will serve as project baseline – with recommendations toward monitoring plan for measuring impact.

C. Project Professionals

AMH is in coordination with the University of the Philippines Institute of Civil Engineering (UP-ICE) team for this project (Table 1). Together with the enumerators from Donsol Community College (DCC), both teams conducted WACS Fieldwork from January 9 to January 15, 2020.

Table 1. Team Members from AMH and UP-ICE

Team Member	Affiliation	Position
Maria Antonia N. Tanchuling, PhD	UP – Institute of Civil Engineering AMH Philippines Inc.	Project Manager
Benedict Requejo, MS EnE	AMH Philippines Inc.	Project Engineer
Bea Lee, BS CE	AMH Philippines Inc.	Project Engineer
Ezra Osorio, MS EnE	AMH Philippines Inc.	Project Engineer
Ma Brida Lea Diola, MS EnE	UP – Institute of Civil Engineering	Consultant
Rosabelle Louise Caram, MS EnE	UP – Institute of Civil Engineering	Consultant

II. LOCATION PROFILE

A. Geography

Occupying 14,777 hectares of land in the Province of Sorsogon, the municipality of Donsol sits at the border of Albay and Sorsogon. To its north is the municipality of Jovellar, Albay, to its west is the Burias Pass and Ticao Pass, and to its east is the municipality of Pilar (Figure 1). Neighbor islands—Burias Island and Ticao Island— are located less than 30 km away from Donsol. This distance prohibits commercial fishing vessels from entering the waters of Burias Pass and Ticao Pass, and thus limiting fishing activity to domestic level.

Burias Pass and Ticao Pass are also regular pathways for migratory whale sharks. Sightings of these whale sharks usually occur from February to June, naming Donsol the Whale Shark Capital of the World. Consequently, visitors during this time also increase. Snorkeling and open diving are some of the most common activities tourists and locals alike do, which help the local tourism industry.

The municipal center is located in the Poblacion, a coastal area located near the west coast. Around seven (7) km north of the municipal center is the municipal RCA located in Brgy. San Isidro with geographical location 566751.58 E and 1431695.82 N (Figure 2). The facility sits on a 2.7-hectare government-owned property.

Figure 2. Location of Municipal RCA (Google Earth, 2012)

B. Demographics

The Municipality of Donsol consists of 51 barangays, of which 9 are urban barangays. Donsol has a recorded population of 51,413 (Bayan ng Donsol, 2018) with the following population distribution at the barangay level (Table 2). Brgy. Ogod has consistently ranked as the most populated. The other highly populated barangays are Dancalan, Santa Cruz, Vinisitahan, and Rawis.

Table 2. Projected 2019 Population per Barangay of Donsol (Bayan ng Donsol, 2018)

Barangay	Population	Barangay	Population
Alin	682	Pinamanaan	338
Banban	949	San Antonio	754
Bandi	397	San Isidro	927
Banuang Gurang	1,173	San Jose	494
Baras	382	San Rafael	1,282
Bayawas	493	San Ramon	566
Cabugao	796	San Vicente	658

Barangay	Population	Barangay	Population
Cristo	429	Santa Cruz	2,739
Dancalan	3,166	Sevilla	853
De Vera	550	Sibago	1,826
Gimagaan	1,912	Suguian	454
Girawan	351	Tagbac	334
Gogon	1,127	Tinanogan	2,092
Gura	1,196	Tongdol	658
Juan Adre	432	Tuba	878
Lourdes	353	Vinisitahan	2,907
Mabini	728	Awaii	817
Malapoc	580	Bororan	996
Malinao	249	Central	473
New Maguisa	326	Market Site	345
Ogod	3,884	Poso	156
Old Maguisa	250	Punta Waling-Waling Dalisay (PWWD)	2,068
Orange	403	Rawis	2,393
Pangpang	1,279	TMD	1,784
Parina	263	Tupas	2,003
Pawala	265	Total	51,413

C. Climate

The climate in Donsol falls under category Type III and Type IV (Figure 3). The western part of the municipality is categorized under Type III, which is characterized by the absence of pronounced maximum rain period, with a short dry season lasting only from one to three months, either during the period from December to February or from March to May. The eastern part of the municipality is categorized under Type IV, which is characterized by an even distribution of rainfall throughout the year.

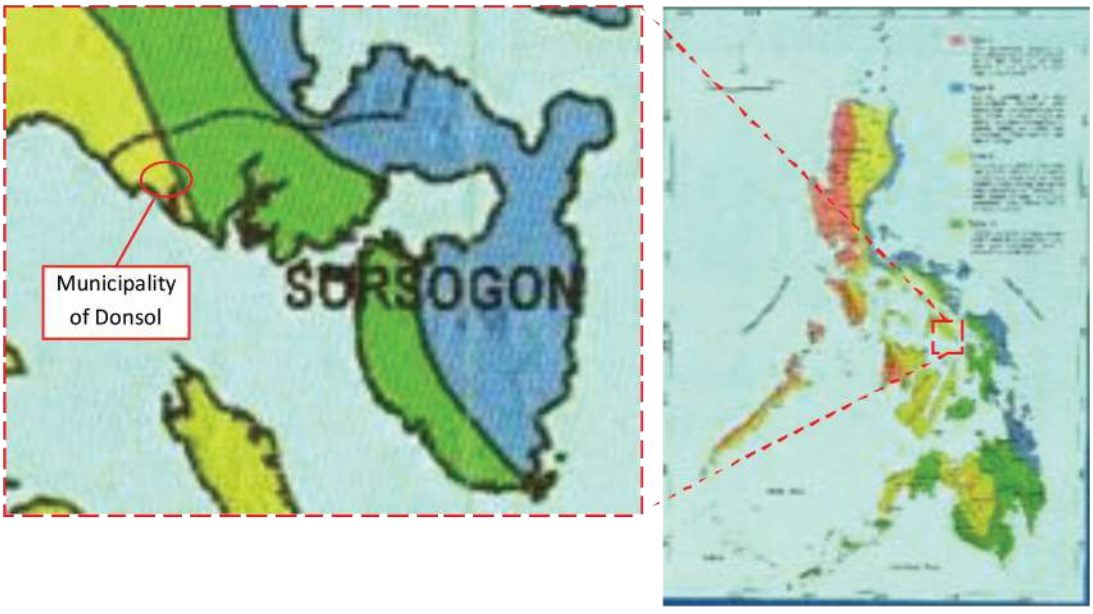


Figure 3. Climate Map of the Philippines 1951-2010 (DOST, 2014)

D. Plastic Smart City

The municipality of Donsol is the first municipality in the Philippines which committed to be part of the Plastic Smart Cities initiative by WWF. Signed last November 19, 2019 at the Responsible Business Forum in Singapore, Donsol declared its intent to be part of the aforementioned endeavor (Figure 4). Thus, with the support of WWF, the municipality has agreed to the following initiatives:

1. no plastics in nature by 2030
2. develop an action plan within 6-months (from date of signature) and launch a pilot within a designated area with a goal to reduce plastic pollution by 30% within two-years
3. appoint a Chief Plastics Officer as the City's lead person or the Plastic Smart Cities Initiative
4. develop a city monitoring plan that establishes baselines and annual targets, and shares annual progress on www. PlasticSmartCities.org.

The municipality has ordinances that support this initiative (Table 3).

Table 3. Municipal Ordinance Regarding use of Plastics

Ordinance	Description	
Municipal Ordinance No. 173, S-2019	Prohibits the use of non-biodegradable plastic bags on dry goods	No establishment shall utilize plastic bags as packaging materials on dry goods.
	Prohibition on the use of Styrofoam	No business establishment shall use the expanded polystyrene of Styrofoam and other similar materials as containers for food service like those in the food centers and catering services.

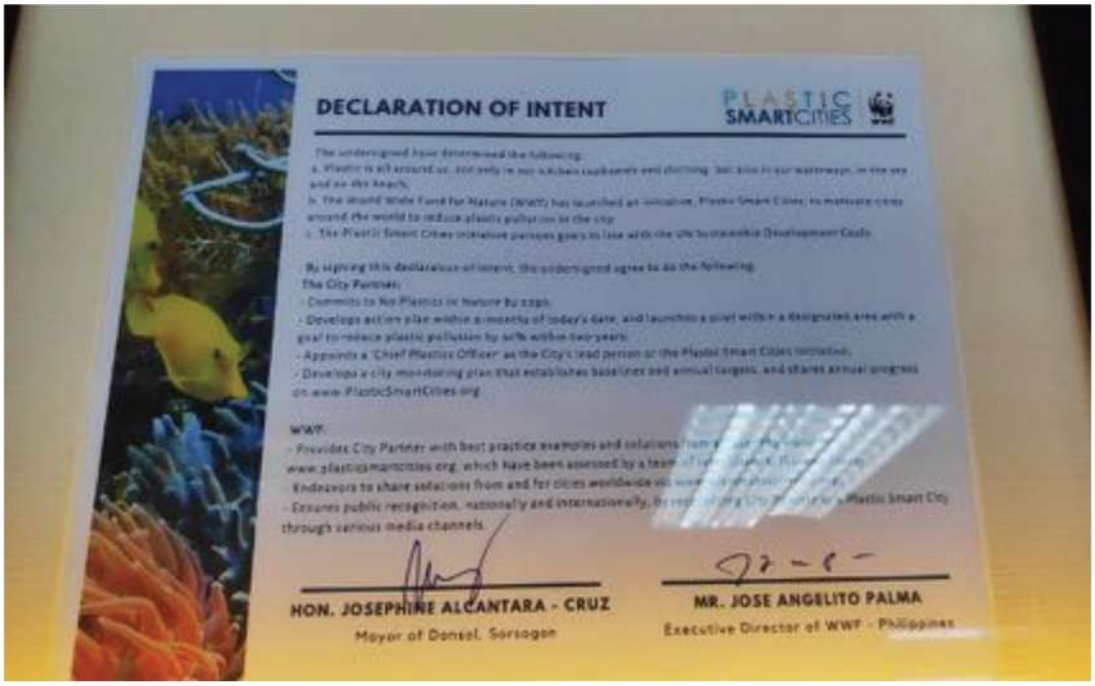


Figure 4. Donsol as a Plastic Smart City

III. METHODOLOGY

A. Itinerary

Activities were conducted during the 7-day site visit and fieldwork (Table 4).

Table 4. Schedule of Activities

Date	Activity
9 January 2020 (Day 1)	• Courtesy call with Mayor of Donsol- Hon. Josephine Alcantara - Cruz • Lecture on Waste Analysis and Characterization Survey (WACS) • Orientation of enumerators and WWF personnel on how to conduct WACS and perception/waste management survey
10 January 2020 (Day 2)	• WACS at Donsol Disposal Facility (Biodegradable Collection) • Interviews of Barangay Chairmen of 6 coastal and interior barangays • Survey of residents of Brgy. Ogod, Girawan, Sta. Cruz, Sibago, Dancalan, and Market Site
11 January 2020 (Day 3)	• WACS at Donsol Disposal Facility (Coastal Non-Bio Collection) • Interviews with selected resorts and junkshops
13 January 2020 (Day 4)	• Interviews of Barangay Chairmen of Brgy. Banuang Gurang & Malinao • Survey of residents and WACS • Pick-up of waste generated at source (from residents) and WACS
14 January 2020 (Day 5)	• WACS at Donsol Disposal Facility (non-coastal non-bio collection) • Initial analysis of data
15 January 2020 (Day 6)	• Presentation of initial results and observations

B. Orientation of Field Personnel on the Conduct of WACS

Orientation of Solid Waste Analysis and Characterization Study was delivered by the AMH—UP-ICE team to the 25 enumerators from Donsol Community College (DCC). The orientation started with a brief lecture by Asst. Prof. Ma. Brida Lea D. Diola on solid waste management, followed by a more detailed discussion by Engr. Benedict Requejo (Figure 5) regarding the proper conduct of WACS with focus on the waste categories. Lastly, a workshop on how to conduct an effective survey that aims to understand the generation of waste at source was delivered by Prof. Maria Antonia N. Tanchuling (Figure 6). During the workshop, the following 25 enumerators were asked to answer the survey questionnaire as a means of testing the instrument to be used. After which, they were also asked to interview their neighbors as a means of practice for the actual survey the following day.

- Wilfredo Magdamit
- Janella Macandog
- Babylyn Bandula
- Mary Ann Cortez
- Rodelyn Abordo
- Rommel Morada
- Ronalyn Gonzales
- Mariel Martinez
- Janine Clemente
- Ian John Michael Negrite
- Lara Locreta
- Marinella Occiano
- Aileen Latorme
- Gellie Melgar
- Riza Bitancor
- Marjorie Magdasol
- Jhozel Carido
- Earl Daryl Bayaborda
- Dennis Guiriba
- Jerice Cermanes
- Norelyn Cadag
- Sherryl Amaro
- Shiela Jane Triunfo
- Joseph Parquez
- Ian Carlo Cadag

Figure 5. Lecture on the Solid Waste Management and the Conduct of WACS

Figure 6. Workshop on the Conduct of Survey

C. Waste Analysis and Characterization Study (WACS) End-of-Pipe

At the time of the conduct of the WACS activity, the city operated two collection trucks that collect wastes from 20 barangays namely: Awaii, Central, PWWD, Rawis-Boang, Ogod, Gura, TMD, Cristo, Market Site, Tupas, Dancalan, Poso, Bororan, Pangpang, Gimagaan, Vinisitahan, Tinanogan, San Rafael, Sta. Cruz, Sibago (Bayan ng Donsol, 2018). Collection route of the trucks is presented in the following figures. Biodegradable wastes of non-coastal barangays or those inland are collected on Fridays with the first truck heading west and the second truck heading east (Figure 7).

Figure 7. Collection Route: Non-Coastal- Biodegradable

Non-Biodegradable waste of coastal barangays or those along the shore are collected on Saturdays with the first truck heading west and the second truck concentrated in the Poblacion (Figure 8).

Figure 8. Collection Route: Coastal- Non-Biodegradable

Lastly, non-biodegradable waste of non-coastal barangays are collected on Tuesdays with each truck taking two trips- one in the morning and one in the afternoon. Collection is concentrated in the area of Brgy. Dancalan and the Poblacion (Figure 9).

Figure 9. Collection Route: Non-Coastal- Non-Biodegradable

Schedule of collection varied per day (Table 5). Collected trash were brought to the RCA in Brgy. San Isidro, where the WACS activity was conducted. Only trucks arriving in the morning were weighed and sorted. Those that arrived in the afternoon were noted and incorporated in the total waste tonnage.

Table 5. Collection Schedule (Bayan ng Donsol, 2018)

Day	Collection
Monday – Wednesday — Friday	Biodegradable
Tuesday – Thursday	Non-Biodegradable
Wednesday — Saturday	Coastal Non-Biodegradable

At the RCA, drivers of incoming dump trucks were instructed to bring their trucks to the weighing station first for initial weighing (Figure 10). Available information on each truck, such as plate number, dimensions, and source of waste collected were recorded at this station. After which, approximately .750 m^3 (or five 0.15 m^3 boxes) of waste were taken from random areas of the truck to serve as the representative sample, which were segregated accordingly (Figure 11). Once all needed information about the truck were taken and waste samples were retrieved, the truck driver then proceeded to dump the collected waste at designated areas.

Figure 10. Weighing of Incoming Trucks using Weigh Pads

Figure 11. Representative Sample of Total Waste to be Segregated

Samples that were retrieved from the incoming trucks were brought to the sorting station. The 25 enumerators from Donsol Community College together with the AMH—UP-ICE team segregated and classified the wastes according to specified waste categories (Table 6). Once sorted, each waste category was weighed and recorded (Figure 12) for data processing and analysis.

Table 6. Waste Categories

Category	Materials	Category	Materials
Biodegradable	Food Waste	Plastics	PET
	Wet Paper		HDPE
	Yard Waste		PVC
	Fruit and Vegetable Peels		LDPE (Film Plastic)
	Textile, Cloth		PP (Hard Plastic)
	Other Organics		PS (Styrofoam)
Recyclables	Dry Paper/Cardboard		Others
	Metal		PU (Sponge, Foam)
	Glass	Residuals	Rubber, Tires
Special, Hazardous	E-Waste		Rocks, Stones
	Medical Waste		Ceramic
	Diapers and Sanitary Napkin		Concrete
	Mercury Content		Ash / Fines
	Fluid		Wax
	Hair		Others
	Others		

Figure 12. Weighing of Segregated Wastes

D. Waste Analysis and Characterization Study (WACS) At-Source

WACS was also conducted for wastes generated at source. Around 10 randomly selected household from each of the 8 priority barangays were selected to participate in this activity. For barangays accessible by road – Girawan, Dancalan, Market Site, Sibago, Ogod, and Sta. Cruz, the selected household were instructed to collect their waste over a span of approximately two days and put it in a plastic garbage bag. These garbage bags were then collected, sorted, and weighed in the same way as with the waste in the RCA (Figure 13).

Figure 13. WACS of Waste Collected at Source

Members of the AMH—UP-ICE team and students from DCC went to the barangays with limited road access— Brgy. Malinao and Brgy. Banuang Gurang— to conduct interviews and perform WACS activities. Again, random households of the barangay were asked to submit their waste for sorting and weighing onsite (Figure 14).

Figure 14. On-site Waste Segregation and Weighing at Brgy. Malinao

E. Interviews with the Different Stakeholders of the Municipality

Interviews with residents, barangay officials, resort owners, and junkshop owners were conducted to understand the solid waste management practiced by the municipality.

Barangay officials preferably barangay captains were interviewed (Figure 15) following a survey questionnaire (Appendix A). These questions aim to understand the general practices of the barangay as a whole with regards to solid waste management. This includes the challenges on waste management the barangay encounters.

Figure 15. Interview with Barangay Officials

With the help of the enumerators from DCC, interviews with residents were also conducted (Figure 16) following a survey questionnaire (Appendix B). These questions aim to understand the types of waste each household generates and their perspective on solid waste and the environment.

Figure 16. Interview with the Residents

Resorts, particularly those near the Whale Shark Interaction Center in Brgy. Dancalan, were also interviewed regarding how they manage the wastes generated by the guests of their resort. Lastly, three (3) junkshop owners were interviewed to cover the diversion of recyclables such as PET bottles, glass bottles, and metal.

IV. WACS RESULTS

A. At-Source

1. Coastal Barangays

The results from the conducted at-source WACS from the coastal barangays show that waste generation rates (WGR) per person ranges from 0.036 kg to 0.166 kg (Table 7). Residents from Brgy. Dancalan have the highest waste generation rate, followed by residents from Ogod and Sta. Cruz. Residents from Brgy. Market Site and Brgy. Sibago had low waste generation rates as compared to the other barangays.

Table 7. Waste Generation Rates and Estimated Daily Waste Generation of Coastal Barangays

	Ogod	Market Site	Dancalan	Sta. Cruz	Sibago
Waste Generation Rate (kg/capita/day)	0.084	0.076	0.166	0.083	0.036
Projected Population (2020)	3917	349	3193	2762	1842
Daily Waste Generation (tons/day)	0.328	0.026	0.531	0.229	0.067

Waste composition from the coastal barangays also vary with biodegradable wastes comprising majority of the wastes in Brgy. Dancalan and Brgy. Market Site, while plastic wastes have the highest share in Brgy. Sta. Cruz and Sibago. Special and Hazardous wastes, mostly diapers, have the greatest share in Brgy. Ogod.

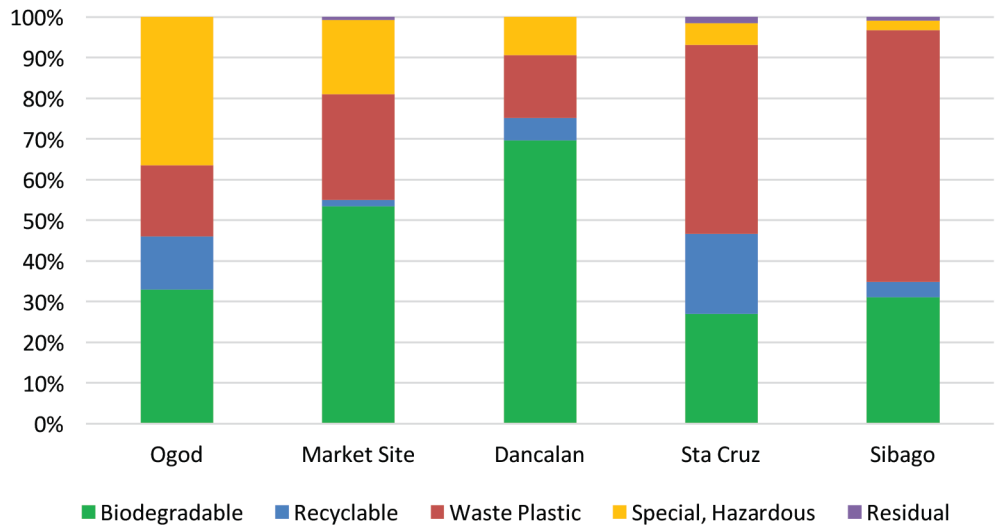


Figure 17. Waste Composition of Coastal Barangays

2. Inland Barangays

The results from the conducted at-source WACS from the inland barangays show that waste generation rates per person ranges from 0.0.56 kg to 0.109 kg (Table 8). Residents from

Brgy. Banuang Gurang had the highest waste generation rate, followed by residents from Brgy. Malinao, and lastly, Brgy. Girawan.

Table 8. Waste Generation Rates and Estimated Daily Waste Generation of Inland Barangays

	Banuang Gurang	Girawan	Malinao
Waste Generation Rate (kg/capita/day)	0.109	0.056	0.069
Projected Population (2020)	1183	354	252
Daily Waste Generation (tons/day)	0.128	0.020	0.017

Waste composition from the inland barangays also varied with biodegradable wastes having the highest share in the wastes of Brgy. Girawan and Brgy. Malinao, while recyclables dominate in n Brgy. Banuang Gurang. However, plastic wastes comprise similar fractions (15% - 19%) in the wastes of the barangays.

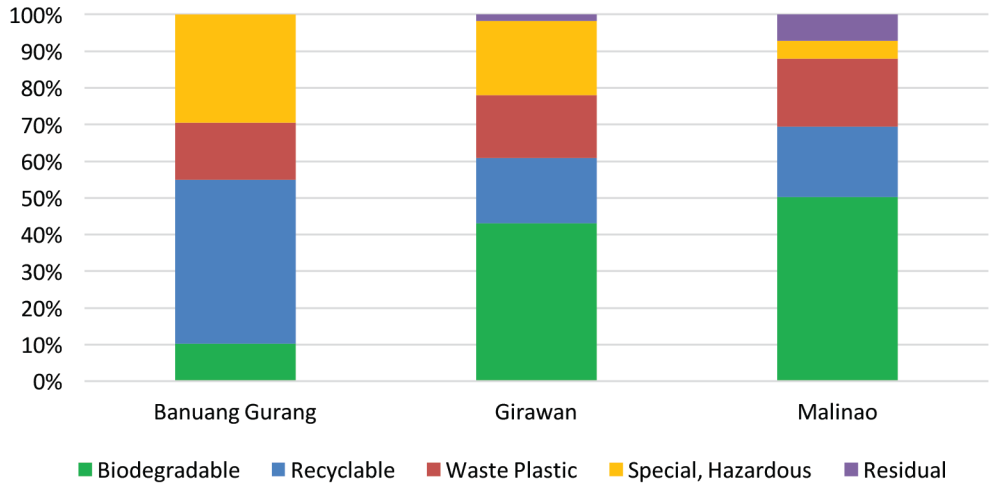


Figure 18. Waste Composition of Inland Barangays

B. End-of-Pipe

The daily amount and composition of wastes generated in Donsol are greatly affected by the "whale shark season". Tourism is at its peak during the months of February to May and at is lowest during the months of July to November. As such, the WACS conducted on January serves as a middle value, as the month is considered a non-peak season. The WACS conducted by the LGU of Donsol last July 2018 is also a non-peak season, and thus the results may be comparable.

It is important to note that results of the End-of-Pipe WACS only reflect the waste that is collected from the 20 barangays. Numerical values presented in this section only measure the wastes that are brought to the RCA from the 20 serviced barangay. It should not be used to represent the waste disposed by entire municipality of Donsol.

1. Tonnage, Volume, and Density

Average daily tonnage is computed by dividing the total weight of the collected wastes per week of the number of collection days, as measured from the weighing activity (Equation 1). Average

daily volume is computed in the same manner by dividing the total volume over the number of collection days (Equation 2). Average density is obtained by dividing the total weight of wastes over the total volume, which is the same as dividing the average daily tonnage by average daily volume (Equation 3).

$$Average\ Daily\ Tonnage = \frac{total\ weight\ of\ collected\ wastes\ per\ week}{total\ number\ of\ collection\ days}$$

(Equation 1)

$$Average\ Daily\ Volume = \frac{total\ volume\ of\ collected\ wastes\ per\ week}{total\ number\ of\ collection\ days}$$

(Equation 2)

$$Average\ Density = \frac{total\ weight\ of\ collected\ wastes\ per\ week}{total\ volume\ of\ collected\ wastes\ per\ week}$$

$$= \frac{Average\ Daily\ Tonnage}{Average\ Daily\ Volume}$$

(Equation 3)

For the case of Donsol, the weight and volume of wastes must be measured on all collection trucks over a six-days collection period so that complete data can be captured from biodegradable and non-biodegradable collection schedules. The project schedule, however, only allowed data gathering on one day each of biodegradable collection, non-biodegradable collection, and coastal non-biodegradable collection. Thus, the weight and volume of the wastes on the other collection days were assumed to be similar as those on the respective days where measurement was done. Equations 1 and 2 were then modified to account for the factor of each collection day (Equation 4 and 5). The computation of average density remains as is.

$$Average\ Daily\ Tonnage = \frac{\begin{pmatrix}(3\ days)(weight\ of\ Bio\ in\ 1\ day)\\ +(2\ days)(weight\ of\ Non-bio\ in\ 1\ day)\\ +(1\ day)(weight\ of\ coastal\ Non-bio\ in\ 1\ day)\end{pmatrix}}{6\ days}$$

(Equation 4)

$$Average\ Daily\ Volume = \frac{\begin{pmatrix}(3\ days)(volume\ of\ Bio\ in\ 1\ day)\\ +(2\ days)(volume\ of\ Non-bio\ in\ 1\ day)\\ +(1\ day)(volume\ of\ coastal\ Non-bio\ in\ 1\ day)\end{pmatrix}}{6\ days}$$

(Equation 5)

Results show that the Donsol LGU collects around 5.60 tons of solid wastes per day of biodegradable waste collection and 7.30 tons of solid wastes per day of non-biodegradable waste collection. Because there are separate collection days for biodegradables and non-biodegradable wastes per week, an average daily value of 6.45 tons was computed. This value, which accounts for the difference in properties of both types of wastes, is to represent the collection as if these wastes were not segregated and were collected as mixed waste. The average value of 6.45 tons/day is smaller than the reported value of 8.23 tons/day in 2017 (Bayan ng Donsol, 2018). Similar assumptions were made to compute the daily volume, which amounts to around 25.33 m^3/day. Dividing the average daily tonnage with average daily volume gives a bulk density value of 254.62 kg/m^3, which is considerably smaller than the previously

assumed bulk density of waste at 355.83 kg/m^3 (Bayan ng Donsol, 2018). Results are summarized in the following table (Table 9).

Table 9. Summary of Daily Tonnage, Daily Volume, and Average Density

Collection	Ave. Daily Tonnage (ton/day)	Ave. Daily Volume (m^3/day)	Average Density (kg/m^3)
Biodegradable	5.60	19.71	284.12
Non-biodegradable	7.30	30.95	235.83
Daily Average	6.45	25.33	254.62

2. Composition

The results show that biodegradable wastes comprise around 47.79% or almost half of the total wastes (Figure 19). Almost half of the entire biodegradable wastes are composed of leaves and grass at 23.15%. Other biodegradable wastes also show the following percentages: branches and twigs at 6.76%, textile and cloth at 5.59%, wet paper at 3.13%, food waste at 2.95%, fruit and vegetable peels at 2.22%, and other organics at 4.00%

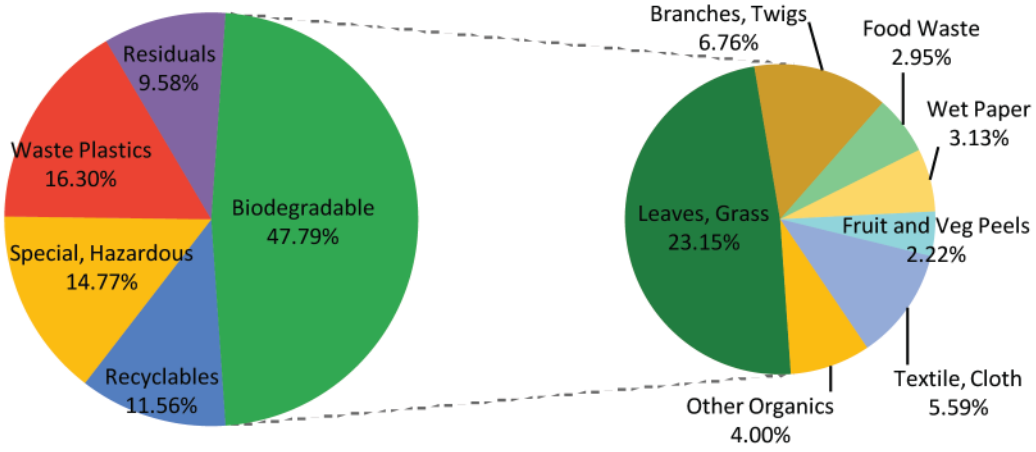


Figure 19. Composition of Biodegradable Wastes

Results also show that waste plastics are found at 16.30% of the total wastes collected (Figure 20). More than half of these plastic wastes are in the form of low-density polyethylene (LDPE) at 10.13% as evidenced by the prevalence of waste plastic packaging such as food wrappers, plastic bags, and similar thin packaging films. Composite refers to laminates that are typically in the form of sachets containing shampoo, powdered drinks, and other consumer goods in minimal amount are also found at 1.71%. Polypropylene (PP), commonly used in plastic containers and cutlery, is found in 1.56%. Other wastes in the form of high-density polyethylene (HDPE), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polystyrene (PS), polyurethane (PU), and other plastics are each found in less than 1% of the overall waste stream.

As a member of the Plastic Smart Cities initiative, the Municipality aims to decrease plastic waste by 30%— this is equivalent to around 0.31 tons of plastic waste.

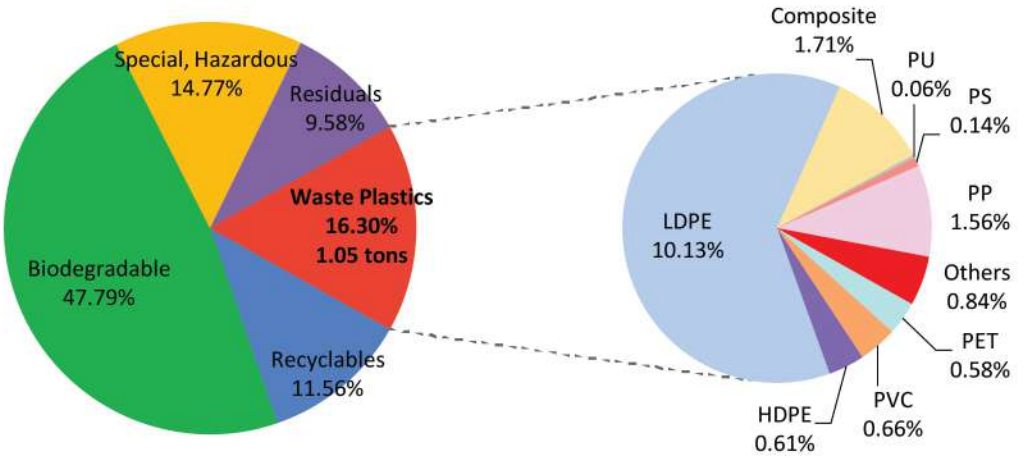


Figure 20. Composition of Waste Plastics

Recyclables, meanwhile, are found at 11.56% of the overall collected waste stream (Figure 21). Dry paper and cardboard at 6.20% compose more than half of the recyclables that are disposed. Metallic wastes and glass follow at 3.05% and 2.31%, respectively.

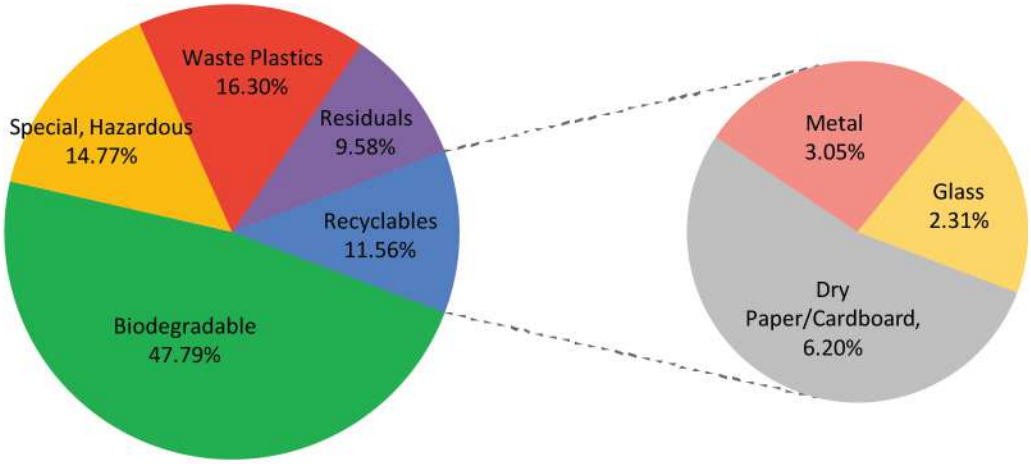


Figure 21. Composition of Recyclable Wastes

Special and hazardous wastes form 14.77%, wherein majority of these wastes are comprised of diapers and sanitary napkins at 12.27% (Figure 22). Medical wastes such as medicines, used syringes and needles, empty reagent containers, and used gloves and masks were found at 1.67%. Electrical and electronic wastes such as copper wires, toys, and old appliances are found at 0.65%.

Lastly, residual wastes such as stones, ceramics, concrete, and wastes that are too small to be distinguished and classified comprise 9.58% of the waste collection.

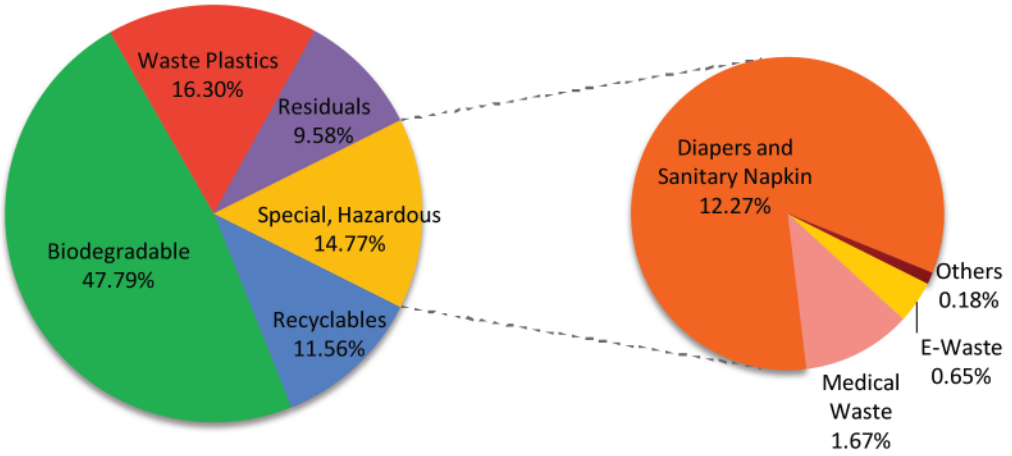


Figure 22. Composition of Special and Hazardous Wastes

C. Comparison

From the waste composition taken at source (Figure 17 and Figure 18), there is no trend that suggests which particular waste category dominates over the other categories. Based on ground observations and interviews with the locals, biodegradable wastes particularly food waste and backyard waste are not considered as wastes by the residents. In barangays with open area, food wastes are typically composted in the backyard, while yard waste are usually left to naturally degrade on the ground. These biodegradables do not end up in the trash bags of the residents, thus excluding it from the waste generation at source. Moreover, in places where burying and burning of waste is practiced, diapers and sanitary napkins are usually immediately buried or put in a bin for burning. These personal hygiene products generally do not end up in the trash bags of the residents as evidenced by the minimal amount of such products from At-Source WACS.

The computed average waste generation rate from the 8 barangays is 0.098 kg/cap/day. Multiplying this value to the projected population for 2020 will yield a daily generation rate of around 5,100 kg/day or 5.1 tons/day. Despite covering the entire population, 5.1 tons/day is smaller compared to the 6.45 tons/day collected at the RCA. This may be due to the assumed absence of biodegradable and personal hygiene product wastes that comprise around 60% of the 6.45 tons of waste collected per day. The projected amount of 5.1 tons/day is assumed to be heavily composed of plastics and other residual wastes only.

In numbers, 60% of 6.45 tons accounts to 3.87 tons. It is assumed that 3.87 tons of the total collected are biodegradable and personal hygiene product wastes, while the remaining 2.58 tons is assumed to be composed of plastics, recyclables, and plastic wastes. This may explain the smaller waste generation rate (At-Source) compared with the amount collected at the RCA.

V. GENERAL OBSERVATIONS ON SOLID WASTE MANAGEMENT PRACTICES

A. Collection Operation and Practices

A total of 20 barangays are currently being serviced by the municipal garbage collection. Due to limited road access, the remaining 31 barangays are not serviced and are tasked to manage their own waste in accordance with the guidelines of RA 9003. The 8 priority barangays were visited to interview barangay officials and residents. Observations and response to the survey questionnaire were

gathered and summarized (Table 10 and Table 11). More detailed description for each barangay are also presented in the following subsection.

Table 10. Summary of Observations for Coastal Barangays

	Dancalan	Sta. Cruz	Sibago	Ogod	Market Site
2019 Population	3,166	2,739	1,826	3,884	345
Daily Average Waste Volume (plastic bag)	1	1	1	1	2-3
Waste Diversion Schemes	Ecobrick and/or Sold to junkshop	Sold to junkshop	Ecobrick and/or Sold to junkshop	Ecobrick	Ecobrick and/or Sold to junkshop
Collection	In certain areas	Yes in Purok 1-4 No in Purok 5-6	Yes	Yes	Yes
Segregation	Yes	Yes	Yes	Yes	Yes
Clean-Up	Yes	Yes	Yes	Yes	Yes
Waste Management Practices	Yard waste from coastal cleanup are buried or burned.	Yard waste are buried or burned.	Yard waste are burned. Diapers and napkins are buried.	Biodegradables are buried. Some other wastes are burned.	None
IEC	Regular meetings with the different stakeholders	Information is shared through Barangay Assemblies	None	None	Meeting amongst market vendors
Ordinances and/or Programs	Cleanup by barangay officials, 4Ps beneficiaries, and other volunteers	Cleanup by barangay officials, 4Ps beneficiaries, and other volunteers	Cleanup by barangay officials, 4Ps beneficiaries, residents, and other volunteers	River/Ocean Cleanup by barangay officials and 4Ps beneficiaries	Cleanup by barangay officials, 4Ps beneficiaries, women's group, and market vendors

Table 11. Summary of Observations for Inland Barangays

	Banuang Gurang	Malinao	Girawan
2019 Population	1,173	245	351
Daily Average Waste Volume (plastic bags)	1	1	1
Waste Diversion Schemes	Sold to junkshop that goes to the barangay	Ecobrick and/or Sold to junkshop that goes to the barangay	Ecobrick and/or Sold to junkshop that goes to the barangay
Collection	Yes in 4 Puroks None in 2 Puroks	Residuals are brought to a collection point	None
Segregation	Yes in household level None in public trash bins on the streets	Yes	Yes
Clean-Up	Yes	Yes	Yes

	Banuang Gurang	Malinao	Girawan
Waste Management Practices	In puroks without collection, wastes are buried or burned. Wastes brought by disaster are burned.	If not brought to the collection point, residuals are buried or burned. Biodegradables are buried.	Buried under the ground or burned
IEC	None	None	None
Ordinances and/or Programs	Cleanup by barangay officials and 4Ps beneficiaries	Cleanup by barangay officials and 4Ps beneficiaries	Cleanup by barangay officials, residents, and other volunteers

1. Coastal Barangays

a. Barangay Dancalan

Brgy. Dancalan has a population density of only 13 persons per hectare wherein most of the respondents have been residing in the barangay for about 5 to 54 years. These surveyed residents have household income ranging up to ₱25,000 generated from various sources, but mostly from the agricultural livelihood (fishing, farming, piggeries) and other business (sari-sari store, karinderia, etc.).

Ninety percent of the respondents answered that they throw away 1 bag of waste per day. Most of the wastes are comprised of plastics, cans, glass bottles, papers and yard wastes. The barangay captain, Mr. Ariel Cha, claimed that around 500 kg of wastes is collected every day, but this could go up to 600 kg to 700 kg during the whale shark season.

The residents usually use sacks and plastic *sando* bags as storage for their waste. With regards to the collection, some have stated there is no clear schedule of the waste collection as noted during survey. Few respondents have said that collection is scheduled on Wednesday and Friday and/or Tuesday and Thursday. However, majority answered that there is no collection in their area within the barangay. The barangay captain claimed that the collection of wastes is daily— with Monday, Wednesday, and Friday delegated for biodegradable wastes, while Tuesday, Thursday, and Saturday for non-biodegradable wastes. These discrepancies in collection schedules may be due to the limited collection along the highway, thus leaving residents in secluded or areas with narrow roads with uncollected wastes.

About 40% of the collected wastes are plastics, and most of them are brought directly to the dump trucks; except for PET bottles, which some residents either reuse or sell to the central junkshop in Dancalan. The barangay also has an initiative that encourages residents to repurpose their PET bottles by stuffing them with laminates or *sando* bags to make eco bricks. The residents could then exchange ten ecobricks for a food package. The ecobricks that the barangay collects will be used as construction materials for the walls around their playground. Food wastes are frequently used to feed their animals. Cans and glasses are collected and sold to the junkshop, while cloths are re-used as rags. Other types of wastes such as paints, medicines, batteries, diapers and napkins, and e-wastes are buried or disposed of to the RCA together with the other waste collected by the dump truck.

Being a coastal barangay, Dancalan also has a lot of waste brought to their coastline as typhoons, floods, and water flow continue to bring upstream wastes to their areas. The barangay captain along with the barangay utility staff/street sweepers, 4Ps beneficiaries, and volunteers do monthly coastal clean-ups to try to keep their beaches clean. During the summertime, they can fill half a truck with the collected wastes. During habagat, it goes up to 1 truck of trash from the coastline. Wastes found on the coastline are composed of biodegradables, non-biodegradables, special wastes, all types of plastics and diapers, but about 70% of the total wastes are made of plastic laminates and food wrappers. The wastes collected during the coastal clean-ups were brought to the RCA by the garbage trucks. Some residents who do regular clean-up of the beach near their homes either bury or burn these accumulated wastes. 70% of the respondents have observed that wastes in these waterbodies were caused by typhoons, floods, and the lack of discipline of the residents.

All of the respondents have practiced waste segregation in accordance to the "No Segregation, No Collection" policy. The barangay captain also conducts barangay SWM meetings twice a month to reiterate the importance of segregation and the minimization of plastic use. He invites the barangay officials, junkshop owners, 4Ps members, and purok leaders, as well as other constituents to these meetings. This has helped people become aware of the programs being implemented in their barangay like waste segregation, coastal clean-up, recycling, and the "Tungod Ko, Linig Mo" program. With the regards to the effectiveness of these programs in the barangay, 50% of the respondents have agreed that these programs reduced the waste generated and the waste being brought to the RCA. The other half disagreed saying that these programs are not effective as there are some residents who still resort to burying.

Asked about the observations of the residents on their environment since residing in the barangay, 8 out of 10 do not think that their environment has become polluted. However, there are current problems such as improper waste disposal, lack of roads for the access of the dump trucks, and even the abundance of plastic and yard wastes that are still unresolved.

The respondents have recommended the following ways to improve the waste management in their barangay: (1) construction of a Materials Recovery Facility, (2) teaching the residents on how to properly segregate their wastes, (3) giving warnings for those who violate the ordinance like "No throwing of garbage to the seas and rivers.", and (4) collection of wastes should be every day. The barangay captain believes that wastes could be better managed if they had more trucks, especially those that could be used for clearing operations, and eco-trikes that could reach areas with small road networks. He also recommended the implementation of an ordinance banning single-use plastics and that existing barangay ordinances like the illegal dumping of wastes into the sea should be revised to carry heftier penalties.

b. Barangay Sta. Cruz

Brgy. Sta. Cruz has a population density of only 3 persons per hectare with 200 households belonging to the 4Ps program, while another 200 households are part of the Indigenous Group (Tabagnon, Aeta, Simaron). The respondents have been residing in the barangay for about 9 to 67 years. These surveyed residents have household income ranging up to

₱10,000 generated from various sources, mostly from the small-scale business (sari-sari store, eatery, piggeries, etc.).

Eight out of ten of the respondents have produced 1 bag of waste per day mainly comprised of plastics and cans. For every collection of dump truck, an estimate of 30-40 sacks of waste are collected in the barangay wherein about 20-25 kg are diapers while 5-10 kg are plastics. The residents primarily use plastic films and sacks as storage for their waste. The barangay captain, on his private initiative, also collects non-biodegradable materials such as plastic, glass bottle, light bulb, tin cans and diapers every Friday using his personal pick-up truck. The collection vehicle can access Purok 1 to 4, but the residents from the remaining purok (Purok 5 and 6) of the barangay are asked to bring their wastes along the road. These are collected every Saturday by the municipal dump truck.

There is currently no MRF in the barangay. All 7 types of plastics are found in the collected waste. These plastics are either brought to the junkshops (PVC, PET, HDPE, PP), reused (PVC, PET, LDPE, PP), or collected by the dump truck (all plastics). Food wastes are generally used as feeds for pigs and dogs, while yard wastes are burned or buried. Cans, glasses, papers, and cardboard are usually brought to the junkshop, while cloths are reused as rags. Other type of wastes such as paints, medicines, diapers and napkins, and e-wastes are collected and brought to the RCA.

Yard wastes like coconut husks, leaves, wood, and even plastics are accumulated along the coast of the barangay after typhoon and flooding. This then causes inconvenience to the residents, as such, they either bury or burn these wastes.

Waste segregation is being practiced in the barangay. Most of the respondents are aware of the policies and programs being implemented in their barangay like “No Segregation, No Collection” policy, “No throwing of trash in the seas and surroundings” and community clean-ups. The barangay also obligates the convenience store or “sari-sari store” to have their own trash bins outside the store. A fine of ₱200.00 is charged to residents who will be reported throwing their garbage to the waterbodies.

Eighty percent of the respondents have agreed that these programs and policies are effective and greatly help in making their barangay clean.

Regarding the observations of the residents on their environment since residing in the barangay, 8 out of 9 have disagreed that their environment has become polluted. However, problems such as lack of trash bins, dengue, and the accumulated waste after typhoon and floods still exist.

Residents are also asked about the quality of the waterbodies as the barangay is surrounded by 5 streams and the sea. 8 out of 9 have observed solid wastes in these waterbodies are transported by typhoons and floods. There is a regular clean-up every month along the coast which involves the barangay officials, 4Ps beneficiaries, and other volunteers.

The respondents and the barangay captain have recommended the following ways to improve the waste management in their barangay: (1) Construction of MRF in the barangay, (2) Installation of CCTVs along the coast to identify those who throw their

garbage onto the sea, (3) Storage bins for both biodegradable and non-biodegradable, (4) Provide livelihood training to the residents on how to utilize the wastes, and (5) Promote the proper waste segregation.

c. Barangay Sibago

Brgy. Sibago has a population density of 100 persons per hectare wherein most of the respondents have been residing the barangay for about 2 to 50 years. Surveyed residents have household income ranging from ₱1,000 up to ₱25,000 generated from various sources, mostly from the agricultural livelihood (fishing, farming, piggeries) and other business (sari-sari store, karinderia, etc.).

Eight out of ten of them have produced 1 bag of waste per day, while the remaining have produced 2-3 bags of waste per day. Their waste are mainly comprised of plastics, cans, left-over food, glass bottles, papers and yard wastes.

The schedule of the collection of non-biodegradable wastes is every Saturday. The waste stored in sacks or large *sando* bags (Figure 23) from the households are collected by a dump truck along the national road (Figure 24). However, there are instances where the barangay officials have door-to-door collection especially in the secluded areas. More or less 20 sacks of waste are collected in the barangay for every trip of dump truck.

Figure 23. Waste of the Respondent are Stored in *Sando* Bags

Figure 24. Collection Point of Waste to be Picked up by the Dump Truck

Most of the plastic waste from the respondents are usually collected by the dump trucks. There are only few residents who have brought recyclable plastics such as PVC, PET, HDPE, and laminates to the junkshops (Figure 25).

Figure 25. Junkshop in Brgy. Sibago

It was also observed during ocular inspection that some residents reuse hard plastics as pots for plants (Figure 26). In terms of paper and cardboard waste, most of the residents either burn these and use these as source of fire for cooking or bring these materials to junkshops in exchange for money. Glass bottles, cans, and e-wastes are mostly brought to junkshops.

Figure 26. Reuse of Hard Plastics as Pots for Plants

Wood, branches, twigs, and leaves are used for burning or siga to repel mosquitoes in the area (Figure 27). Diapers are either directly disposed for collection as part of the residuals or buried under ground as these wastes create a foul odor knowing that the collection is only once a week. Batteries and medicines are also disposed for collection by the dump trucks. However, these types of waste are only applicable for few residents.

Figure 27. Burning of Leaves, Twigs and Branches to Drive Mosquitos Away

Disaster waste mostly comprised of coconut husks and plastics are found along the coast especially after the typhoon or flooding (Figure 28), making it difficult for the residents to store these waste and wait for the collection on Saturday. Hence, they immediately bury or burn these wastes.

Figure 28. Waste mostly Comprised of Coconut Husks and Plastics along the Coast

All of the respondents segregate their wastes in response to the ordinance of "No Segregation, No Collection" of the municipality of Donsol. However, some of the residents are not knowledgeable whether certain objects such as tissue, napkin, and diapers are part of the non-biodegradable, making them resort to burning and burying. Forty percent of the respondents are aware of the programs being implemented in their barangay like the ecobrick project and coastal clean-up, aside from waste segregation. Ecobrick project is the use of 1.5L PET bottle filled with laminates and films that can be exchanged for gift packages.

Currently, there is no penalty for those who violated the ordinance.

Six out of ten have disagreed that their environment has become polluted as compared to the past years. However, problems are still encountered such as waste from upstream accumulated along the coast and river mouth after typhoon and flooding, obstruction of the pile of recyclables from the junkshop, and the pollution brought by the piggeries. Some lightweight wastes such as plastic films and sachets were left at the collection point after the garbage collection, and some of which were blown towards the street gutter (Figure 29).

Figure 29. Left-over Waste Blown Towards the Street Gutter after Collection of Dump Truck

Residents are also asked about the quality of the waterbodies surrounding their barangay. Only 3 out of 10 have observed the wastes in these waterbodies (Figure 30) caused by the typhoons and floods and from improper disposal of the residents from both uplands and lowlands.

Figure 30. Wastes Settled at the Bottom of the River

Majority of the respondents have seen the improvement of the water bodies because of the monthly regular clean-up along the coast. This clean-up involves the barangay, 4Ps beneficiaries, residents and other volunteers. At every cleanup, collected wastes are estimated to be around more than 20 sacks consisting mostly of coconut husks and plastics such as laminates and *sando* bags.

The respondents have recommended the following ways to improve the waste management in their barangay: (1) storage bins for biodegradable and non-biodegradable in every purok, (2) frequent collection of waste at around 2-3 times a week especially after typhoon and incessant raining, and (3) strict implementation of warnings and penalties for those who violate the municipal and barangay ordinance.

d. Barangay Ogod

Barangay Ogod is the largest barangay in the municipality of Donsol in terms of population. According to Philippine Statistics Authority, it has a projected population of 3,884 in 2019. It has 7 purok/district with more than 900 households. The barangay is located near the mouth of Ogod River that empties out to the northern part of Ticao Pass.

Figure 31. Yard Waste at the Banks of the Ogod River

According to the barangay captain, the barangay disposes around 20 sacks of municipal wastes per week. The residents segregate their wastes into biodegradables and non-biodegradables. The barangay is included in the door-to-door solid waste collection route of trucks deployed by the municipality. The residents practice burying of wastes in open pits especially for food and yard wastes. The barangay or residents do not practice composting. Some plastic wastes can be observed littered on the ground. Some of the wastes are also burned.

Figure 32. Residual Waste Buried Under the Ground

The most common type of wastes disposed are yard wastes, diapers, and plastic laminates. Some of the plastic wastes generated are used for ecobricks. The ecobricks can be exchanged for packages such as paper, pencil, and grocery among others provided by the municipality. The ecobricks are also used for fences, Christmas trees and as decors.

The most common type of plastic wastes in the barangay are PET bottles, LDPE, HDPE and laminates. A few polypropylene such as plastic spoon and fork, polystyrene such as cups and containers are generated when there are parties and other celebrations.

The barangay council regularly conducts river/ocean clean-up participated mostly by the more than 300 beneficiaries of 4Ps. They recently conducted a river clean-up at Ogod River. They were able to collect 30 sacks of wastes. Around 6 sacks were plastic wastes. The wastes were collected by trucks from municipal council and were disposed at the municipal RCA. The most common type of wastes collected were diapers, coconut husks, plastic bag carriers, and laminates from *chichiria*.

The barangay council has a Committee on Environment headed by a barangay councilor that implements environmental programs and projects by the barangay ang municipality. Eighteen (18) utility workers are employed to do street sweeping thrice a week.

The barangay does not conduct regular seminars for residents about waste management. There are no information drives nor any IEC materials related to waste management that are given to the residents.

Some recommendations for the Municipal council for waste management are as follows.

- Implement regular collection of wastes
- Provide vehicles at the barangay for waste collection
- Conduct trainings for composting

Another concern of the barangay is the indiscriminate dumping of sacks of wastes— mostly diapers and polystyrene "styro" containers— from an unknown vehicle during wee hours. It is suspected that the van came from the población area.

During typhoons, wastes accumulate on the shores brought by waves. These wastes are typically coconut husks, plastic wastes and small bamboos.

The municipality is planning to provide each barangay a Materials Recovery Facility (MRF) using the ₱100,000 grant for barangay projects. The MRF will consist of steel waste segregation stand. The plan is for the barangay to manage the collection of wastes from their residents and implement segregation and recycling/waste utilization. All the residual wastes will be collected from the MRF by the collection trucks provided by the municipality. Brgy. Ogod already has a possible location for the MRF. However, the barangay chairwoman is worried that this proposed waste management plan will be a heavy load for the barangay council because of lack of budget, equipment and manpower to implement waste collection and utilization.

As for the residents' survey response, twenty households participated in the perception survey. The average household size is 4.4 with most of the household members within the 13-50 age bracket. Forty-five percent (45%) of the respondent earns an income of ₱1000 to ₱10,000 per month. Sources of income are varied: employment with 2 respondents, business such as carinderia, room/house rental with 6 respondents, and fishing with 5 respondents. Ten of the respondents generate 1 bag of wastes everyday while 6 respondents produce 2-3 bags per day. The wastes are mostly composed of plastics, tin cans, food wastes, bottles, paper, diapers, and yard wastes which are mostly leaves. Majority of the respondents, 16 out of 20, practice segregation. Majority of the residents reported that there is collection of wastes at least once a week. Only 2 residents said that their wastes are not being collected which lead them to burning the wastes.

Many of the respondents answered that the quality of their environment has not degraded much since they started living in the Barangay. According to them, one of the environmental problems in the community is accumulation of wastes, especially plastics and yard wastes, along the streets because of lack of discipline and indiscriminate disposal by people and typhoons. Among the solutions identified by residents are to conduct clean-up, improve waste collection coverage to reach all houses, and educate the residents about waste management. Majority believe that the river near them has poor quality because of the presence of wastes thrown directly by houses near the river.

Firefly watching along Ogod River is one of the popular activities in Donsol. Currently, the Visitor Center and Landing Area is not reached by the regular waste collection trucks because of its far distance. There is one sari-sari store inside the center that sells mineral water in plastic bottles and junk foods in plastic laminates.

There is one utility worker that maintains the cleanliness in the area. The wastes are just stored in sacks until the municipal waste collection trucks arrive, which is usually once or twice a year only. Some of the wastes are buried in open pit. The center produces half a sack of wastes per week which are typically plastic bottles, beer cans, plastic carrier *sando* bags, and plastic laminates.

According to the security guard at the Center, wastes sometimes accumulate along the river. During one river cleanup, 3 sacks of wastes were collected.

The barangay is proposing to station one barangay *tanod* that will supervise the area and one utility worker for river cleanup especially during the Firefly festival in December where many tourists are expected to visit.

Figure 33. Firefly Watching Visitor Center and Landing Area

e. Barangay Market Site – Poblacion

Brgy. Market Site is one 8 barangays that compose the Poblacion, or downtown area, of Donsol. The barangay is further divided into 4 smaller administrative zones, or puroks. Barangay Market Site is the smallest barangay in terms of land area, as it occupies only 2.05 hectares of land. However, it is also a barangay with a high population density of 163 people per hectare, based on the 2015 Census.

Many commercial establishments such as shops are found in the barangay, hence its moniker. Houses are mainly made out of concrete, although huts are also prevalent as a form of housing especially along the mangrove area of the barangay. A waterway also passes through the barangay and drains to the estuary of the Ubod river leading to Burias Pass.

The barangay, being part of the Poblacion, is included in the barangays whose wastes are regularly collected by the LGU. Wastes are collected at a designated collection point in the barangay and are sent to the RCA in Barangay San Isidro.

Fourteen (14) residents from the 4 puroks were interviewed to gather information regarding the solid waste management practices in the barangay. The respondents have

been residing the barangay for as short as 2 years to as long as 81 years. Surveyed residents have varying livelihoods, with 5 shop owners, 4 public vehicle drivers, 4 laborers, and 1 fisherman.

Almost all respondents segregate their wastes, as they have uses to specific waste components. Residents reuse food wastes as feed to their livestock, sell PET bottles and cans to junkshops, and use old clothes as rags. Some residents even make ecobricks from PET bottles and discarded plastic wrappers and sachets, which they can bring to the Municipal Environment and Natural Resources Office (MENRO) in exchange for groceries or school supplies (Figure 34).

Figure 34. Ecobricks Made by a Resident

A prevailing issue in the barangay, however, is improper waste disposal, which is evident in the waterway and mangrove area (Figure 35). To address this issue, the barangay organizes a clean-up drive at the waterway and the mangrove area of the Ubod River every last Saturday of the month. The cleanup is led by the barangay officials and participated by Pantawid Pamilyang Pilipino Program (4Ps) beneficiaries, women's groups, and market vendors. Around 15 sacks of garbage – mainly comprised of plastic wrappers, market wastes, or food wastes wrapped in plastic – are collected every time the cleanup is conducted. Unfortunately, the residents are oblivious to the efforts of the barangay, as the waterway becomes littered again as early as the afternoon or evening of the day that the cleanup was conducted, as mentioned by the respondents.

Figure 35. Condition of the Waterway leading to Ubod River at the Time of Visit

Recommendations provided by the respondents to improve the environment of the barangay were to provide individual receptacles for biodegradable and non-biodegradable wastes, to further promote and strengthen cleanup efforts and involve other residents to participate, and to enforce cleanliness and discipline to the residents.

2. Inland Barangays

a. Barangay Banuang Gurang

Barangay Banuang Gurang is composed of 258 Households. The wastes are collected at drop-off points in 4 Puroks. These are collected once a week by 5 utility workers using a wheelbarrow and brought to a pit where it is burned. Approximately 20 sacks are collected every week. For public trash bins located along street, there are no separate bins for biodegradable and nonbiodegradable wastes, so wastes are not segregated. In 2 Puroks there are no waste collection and waste management is done on a household basis. The wastes are either burned or buried within each household's property.

The most common plastics that are found in the wastes are PET, LDPE, HDPE, PU, and laminates. PET, HDPE, glass bottles, and tin cans are sold to the junkshop which comes to the barangay. Diapers and sanitary napkins are burned.

There is no clean-up done in the Jovellar River. The barangay conducts a clean-up twice a year, and these are done by the beneficiaries of 4Ps. There are 90 households who are 4Ps beneficiaries in the barangay. Many of the 4Ps beneficiaries also collect 1.5L PET bottles to make ecobricks. These ecobricks are brought to the municipality in exchange of gift packages.

There is a committee who is in charge of SWM in the barangay. There are no information drives nor any IEC material that is given to the residents. The captain suggests to have an MRF within the barangay.

The disaster commonly experienced in the barangay is flooding. The wastes from the disaster is mostly composed of wood (yard waste) and plastic and these are disposed by burning.

Based on a survey participated by 9 residents in the barangay, the average household size is 5.2 with most of the population within the 13 – 50 age bracket. Majority of the respondents earn an income of ₱5,000 to ₱10,000 per month, with employment as source of income. Three of the respondents work in the copra industry.

Five of the residents generate 1 bag of wastes every day. These are mostly composed of plastics, tin, bottles, paper and yard wastes, which are mostly leaves. Majority of the respondents, 8 out of 9, practice segregation. Five of them reported that there is no collection while 4 said there is a weekly collection.

b. Barangay Malinao

Brgy. Malinao is a rural barangay with a population density of about 0.8 persons per hectare and is composed of around 60 households that are distributed to 3 puroks. The barangay can only be accessed through a narrow access road branching from the Donsol-Pio Duran National Road. Thus, residents usually ride motorcycles to enter and exit the barangay.

Because the barangay is not accessible to the dump truck, wastes are dropped off at a designated collection point along the national road. The wastes that are deposited here are collected by the LGU once every Saturday only. Mostly residual wastes are disposed by the residents, as most residents either bury or reuse their biodegradable wastes and sell or reuse recyclable wastes. However, the responsibility to bring the wastes to the collection point still lies to the residents.

The barangay has issues in maintaining the cleanliness of their environment. A small stream runs through the barangay, although it was observed during the previous visit that it was littered with waste (Figure 36). The barangay, through the help of the barangay kagawads and 4Ps beneficiaries, regularly conducts a cleanup activity every 15th and 30th of the month. Plastics wastes such as sachets and wrappers are usually found during this activity and are included in the regular waste collection once concluded. However, residents seem to be oblivious to the effort, as the stream becomes littered again as soon as the day after the cleanup.

Figure 36. Current Condition of the Waterway in Brgy. Malinao last 13 January 2020

Surveys involving 10 residents were also conducted. The respondents have been residing the in barangay for 2 to 62 years. Surveyed residents have household income of up to ₱10,000 generated mostly from the farming (50%) and sari-sari store (30%).

Ninety percent of the respondents have produced of only 1 bag of waste per day mainly comprised of plastics, cans, glass bottles and papers. All of them have practiced waste segregation. At the center of the barangay, there are bins assigned for cans, plastics and biodegradables (Figure 37). However, some of the residents did not find this practice useful since there is no collection of waste in their barangay.

Figure 37. Bins Categorized for Cans and Bottles, Plastics and Biodegradables

The waste in every household are usually stored in sacks or in large *sando* bags (Figure 38). Due to the limited road access for the dump truck, the residents bring along their waste using a motorcycle to the waste collection or drop-off point (along the national road) anytime. Bringing their wastes to the collection point takes a lot of resources such as time, effort, and fuel. Hence, some residents resort to burying and burning their plastic, paper and yard waste.

Figure 38. Sacks are Used for Storage of Waste

Figure 39. Collection point for the Waste in Upland Barangays

Despite the lack of collection, there are still ways the residents in the barangay manage their waste. Food waste are utilized as feeds for animals and as organic fertilizers. There are also instances where a junkshop representative visits the barangay and buy the recyclables (PVC, PET, HDPE, PP, glass bottle, can, and paper) from the residents. Other residents re-use plastics as pots for their plants (Figure 40 and Figure 41).

Figure 40. Container of Paints was Used as Pots for Plants

Figure 41. Plastic Films were also Utilized as Pots for Plants

The respondents were asked about the condition of the waterway in the barangay. According to them, wastes are accumulated along the banks of the waterway after flooding and typhoon. During site visit in the barangay, plastics and other yard wastes are seen in the waterway. Evidence of buried waste was also found out.

Half of the respondents are aware of the programs implemented in the barangay. These programs include the Ecobrick project, Participation of 4Ps beneficiaries in clean-up and the Clean and Green program.

The residents recommend the LGU to provide bins for biodegradable and non-biodegradable waste and to promote the clean-up activities in order for the other residents to participate.

c. Barangay Girawan

Girawan is an inland barangay that is not covered by the municipal garbage collection system due to limited road access. Residents are tasked to manage their own waste. Biodegradables like food waste are given to pet dogs or cats or used as feeds for backyard piggery. Yard wastes such as branches, leaves, and coconut husks are left to decompose. Some recyclables such as PET and glass bottles are sold by the residents to individual collectors who come to the barangay. Residual wastes such as single-use plastics and diapers are first collected in a common container, like a drum. Once the container is full, the wastes are then thrown to a 2m deep pit on the ground- burying the wastes under the ground (Figure 42).

Figure 42. Wastes Buried Under the Ground

In other areas of the barangay, open pit burning of residual wastes is practiced (Figure 43). The most common residual wastes are plastic sachets. Products that come in sachet packaging are sold in sari-sari stores located in the barangay (Figure 44). In public washing areas, a garbage bag to collect sachet from shampoos, soaps, and etc. is set in place (Figure 45).

Figure 43. Open Pit Burning

Figure 44. Sari-sari Store in Brgy. Girawan

Figure 45. Garbage Bag Located at the Public Washing Area

The barangay officials also perform river and creek clean-up. Families residing near the Donsol river and creeks help out the barangay officials in cleaning these water bodies. There is no reported fixed schedule on the clean-up. However, when there is a typhoon or heavy rainfalls, wastes particularly tree leaves, branches, coconut husks, and other household wastes are transported downstream through the river. Also, when flooding occurs, some wastes that were already buried under the ground overflows to the land (Figure 46). There is currently no barangay ordinance pertaining to the solid waste management of the barangay.

Figure 46. Overflow Waste

A survey with 10 residents of Brgy. Girawan as respondents was conducted. The 10 respondents come from different parts of the barangay such that the entire barangay may be represented. The average household size is 5.3 with most of the population within the 13 – 50 age bracket. 9 out of the 10 respondents earn a monthly household income of ₱1,000 to ₱5,000. Their livelihood varies from fishing, farming, animal husbandry, running a small enterprise, and employment. On average, one household produces 1 bag of waste per day containing mostly plastics and papers– based on 9 out of 10 respondents. Tin cans and bottles are also common. Other waste such as yard waste was also indicated. Majority of the respondents segregate their waste.

In terms of waste produced, plastics – film and laminates in particular – are present in every household surveyed. Most common means of disposing these plastics is by burning or by burying it under the ground. The same practice is applied for diapers and napkins. PET bottles on the other hand, are either sold to junkshops or reused. Glass bottles are often sold to junkshops, while textile or cloth oftentimes are reused. There is almost no reported food waste as leftover food are most likely given to pets served as pig feeds.

Many of the respondents mentioned that strong rains and typhoon cause flood to their barangay, allowing wastes from other areas to flow to their barangay. Flood also causes the wastes that were already buried underground to overflow and be scatter all over the place. Beneficiaries of the 4Ps program participate in the Clean and Green Program where barangay surroundings are cleaned and trash bins are set in place. As for the water bodies such as the creeks, half of the respondents mentioned that clean-up is performed at least once a month or whenever there is an instruction from the officials. The other half recorded a response that no clean-up activity is conducted.

There are several recommendations suggested by the respondents. One respondent suggested that cleanup activity should be done weekly and for their barangay to be included in the list of barangays serviced by the municipal garbage collection. This way, segregation of waste will have a purpose. A few suggested that residents should be responsible enough and take initiative to clean their surroundings. One respondent also suggested to establish a program that encourages kids to collect their waste and not throw them around.

3. Resorts

Four (4) resorts located along the coast of Brgy. Dancalan near the Whale Shark Interaction Center were interviewed.

a. Amor Farm Beach Resort

Figure 47. Interview with the Owner of Amor Farm Beach Resort

Amor Farm Beach Resort was first established in 1998, making it the first resort in the area. It started with open huts where people could secure their belongings before swimming, and grew to its current size of 28 rooms. The resort is often fully-booked during summer, Holy Week break, and Christmas break, when local and foreign tourists go to the beach to swim, and see the whale-sharks. The resort also offers beach access for those who would like to spend the day in the open huts by the beach. The resort charges ₱50/head for beach access, and ₱300 for whole day use of their huts. Naturally, with the influx of tourists the volume of wastes produced also increases, so the management team has provided multiple trash cans for the rooms and near the open huts.

An estimate of 0.5 sacks of non-biodegradable wastes are produced during the lean season of the resort, however, it can increase up to 2 sacks of non-biodegradable wastes during the tourist season. Majority of the non-biodegradable wastes produced in their vicinity are plastics. From the collected wastes in the trash cans, the management officers collect sachets from coffee, candies, and shampoo among others to make ecobricks, which they bring to the barangay in exchange for food items. They seldom segregate and collect PET bottles, glass bottles and tin cans to sell to collectors. Aside from non-biodegradables, they are also able to collect about 3 sacks of biodegradable wastes every day. Most of these wastes are leaves or yard wastes from their property, and vegetable and fruit peelings, since most of the food wastes in the kitchen are fed to their pigs or to their pets. Wastes that are not sold or used to feed their animals are placed on the curb for the daily collection of wastes.

The resort owners also conduct their own clean-up of the beach fronting their resort at least twice a week. The type and volume of wastes are dependent on the wind directions.

During "Habagat" there are a lot of wastes coming from the river compared to the wastes during "Amihan". Most of the wastes that they collect along the shoreline are mixed wastes that are placed in a shallow hole and burned.

The management believes that the scheduled collection is very helpful in keeping their areas clean. Though it would be better to have more trucks, especially to remove the wastes that have been brought in due to the storms that pass through their area. After the recent storm, they have had to resort to burning these wastes on a rice field because there was no collection of disaster/ calamity wastes for over a month.

b. Vitton Beach Resort

Figure 48. Interview with the General Manager of Vitton Beach Resort (Narvadez Jr., 2020)

Vitton Beach Resort, established in 2002, is a resort with 45 rooms that can accommodate around 75 to 150 guests during peak season. It accommodates a wide range of guests, local or foreign, from young couples to whole families to retirees. The resort is closed during the months of July to October during off-season.

Due to its sizeable capacity, the resort collects around 5 to 10 garbage bags per day. Recyclable wastes such as cans, PET bottles, and glass bottles are usually collected by its hotel staff, who themselves sell these to junkshops. Biodegradable wastes such as food waste and yard waste are collected to be turned into compost, as the resort is currently exploring the possibility of using homegrown vegetables and fruits in the dishes that they serve. Other wastes are collected in front of the property by the LGU during their regular collection.

The resort conducts regular clean-up of the beach within the property only as part of its maintenance activities. The management also observes that during "Habagat" more wastes are being brought to the shorelines of the resort than in any other period of the year.

The manager believes that limiting the use of single-use plastics could help in addressing solid waste management problems in Donsol. With these, the resort provides only metal straws to their guests, and only upon request. There was also one recommendation to provide large dispensers for shampoo in every room instead of providing small individual shampoo bottles to each guest, although some guests are still not open to the idea.

c. Dancalan Beach Resort

Figure 49. Interview with the Restaurant Manager of Dancalan Beach Resort (Narvadez Jr., 2020)

Dancalan Beach Resort, having begun its operations in 2010, has 18 rooms that can accommodate up to 45 guests and a restaurant. Types of guests also vary, although foreigners more than locals are the usual guests. The resort is usually closed in the months of June to November during off-season, although it still accommodates guests who book through online booking platforms.

The resort collects one garbage bag of wastes per day on the average. Wastes are usually segregated, as recyclable fractions such as PET bottles and cans are collected and sold to junkshops while leftovers are used as feed for pigs and other livestock. Non-recyclable wastes such as sachets and *sando* bags are collected by the LGU as part of the LGU's regular collection.

The resort does not provide plastic straws anymore by virtue of the municipal ordinance. The beach front is also cleaned as part of its usual maintenance.

d. Elysia Beach Resort

Figure 50. Interview with the Supervisor of Elysia Beach Resort (Narvadez Jr., 2020)

Elysia Beach Resort, established in 2009 by a Korean couple, is among the high-end resorts in the area. It can accommodate a maximum of 40 guests, who are usually foreign young couples spending their vacation in the area.

The quantity of wastes generated from resort usually amounts to five (5) trash bags. These wastes are segregated by the resort staff. Most of the plastic products such as PET bottles, shampoo bottles, styrene foam, and metal cans are collected and sold to junkshops. Food wastes, meanwhile, are used as feed to various livestock. E-wastes are returned to hardware stores where respective e-wastes were bought. Other wastes are collected by the LGU as part of its regular collection.

The resort is one of the more active proponents in taking care of the beach environment. The resort has initiated and regularly conducts regular beach cleanups every 15th and 30th of the month from 8:00 AM to 9:00 AM. From this endeavor, resort staff are able to collect arounds 15 kg of waste, which are mostly in the form of PET bottles, tin and aluminum cans, shampoo bottles, and sachets. They wish that the other resorts also cooperate in the regular cleanup. The resort also does not provide plastic straws. Instead, they offer bamboo straws for sale to the guests.

The management believes that the best way to address the solid waste management problems in Donsol is to instill discipline and right attitude to the people of Donsol, as wastes come from the residents themselves.

B. Waste Diversion Schemes

1. Material Recovery at RCA

Personnel at the RCA regularly recover materials that still have a market value such as PET bottles, clear glass bottles, and metals among others. These recyclables are sold to a junkshop in Brgy. Dancalan. A staff of the junkshop goes to the RCA on a weekly basis to buy the recyclables. The price at which these materials are bought vary based on the current market price. Recyclables recovered from the RCA and sold to the junkshop from April 6, 2018 to May 27, 2019 were recorded by the staff of the RCA and MENRO (Table 12). Clear glass bottles

recorded the highest amount in terms of weight, but plastic PET bottles remain to be the most profitable.

Table 12. Materials Recovered and Sold from April 6, 2018 to May 27, 2019 at RCA

Recyclable Material	Collected (kg)	Typical Market Value ₱	Total ₱
Plastic (PET)	5,448	7/kg	38,136
Carton	6,293	1 - 2/kg	8,784
Lata (Ferrous Tin Can)	5,637	2/kg	11,274
Bottle (Clear Glass Bottle)	11,054	0.9/bottle	10,305
G.I. Sheet	26	2 - 2.5/kg	55
"Lutong" (Hard Plastic)	27	2/kg	54
Metal	552	5 – 6/kg	2,761
Aluminum (Non-Ferrous Tin Can)	12	15/kg	185
Total	29,048		71,554

The number of recyclables recovered were compared with the amount disposed at the RCA (Table 13). Only less than half of the recyclables disposed is recovered, with PET bottles being the most recovered at 35%. Glass bottles recorded a recovery rate of 17% at the disposal site; however, it should be noted that not all disposed glass is recyclable. For example, glass medicine bottles or colored glass bottles are disposed but are not considered recyclable by the junkshops. Amount of colored glass bottles such as wine and beer bottles are usually expected to increase during the whale shark season alongside the increase in tourists. As such, disposed glass bottles to the RCA may likely increase, but does not suggest an equal increase in recovered glass bottle.

Table 13. Comparison of Recyclables Recovered with Recyclables Disposed

	Recovered at RCA* (kg/day)	Disposed at RCA** (kg/day)	% recovered at RCA
Plastic (PET)	13	37	35%
Karton	15	359	4%
Lata (Ferrous Tin Can)	13	162	8%
Bottle (Glass Bottle)	26	149	17%
"Lutong"/Hard Plastic	0.06	100	0.06%

*April 6, 2018 to May 27, 2019

**January 10 - 14, 2020

WACS was conducted in January— an off season in terms of tourism for Donsol. Amount of glass collected at the time was found to be at 2.31% of the entire waste composition. To project an estimate for the peak season, literature data is used. A study by Razon (2017) conducted in the island of Boracay suggests that 6.5% of the entire waste composition is glass bottles— this includes colored and clear glass bottles.

2. Junkshops

a. Junkshop at Brgy. Dancalan

The establishment started 6 years ago but only became a legal entity a year later because they needed to build up capital for their business. It is also recognized by the barangay and the RCA as one of the few junkshops in their area that is authorized to purchase and collect recyclables. Aside from going to the RCA at least once a week to buy the segregated and cleaned materials that are considered to be recyclable, the junkshop also employs a *maglilibot* to drive their tricycle around accessible areas in Donsol one to two times a day, to purchase recyclables from "sari-sari stores" and other establishments. Some households also bring their recyclables to the junkshop throughout the day. The *maglilibot* and junkshop owners ensure that the recyclables are segregated and cleaned before they are weighed and bought. The junkshop collects these recyclables until they have enough to fill an Elf truck that will transport the materials to their buyer in Camalig, Albay.

The price of the junkshop for each recyclable item is about 50% of how much their buyer in Camalig is willing to pay. Although prices vary monthly, the average selling prices of the junkshop to their buyer in Camalig were recorded (Table 14).

Figure 51. Accumulated Recyclables at Brgy. Dancalan Junkshop

Table 14. Brgy. Dancalan Junkshop Price List

	Recyclable Waste	Unit	Buying price, ₱
1	Karton (dry)	kg	2 (currently not collecting because of low prices)
2	Plastic (bottles)	kg	12
3	Bote (glass)	pc	1.3
4	Bakal	kg	10
5	Aluminum (cans)	kg	25
6	Lata	kg	2
7	E-waste (tanso)	kg	120

On average, the junkshop is able to deliver the materials to Camalig twice a month, earning them a net income of about ₱10,000/month. However, they experience difficulties in classifying composite materials which forces them to turn away possible clients. They also have difficulties trying to access far-flung areas, especially in the mountains. The junkshop owners also suggested that wastes be segregated at home to avoid contamination of the recyclable materials, and for more government cooperation in the enforcement of segregation policies within the barangay.

b. Magdamit's Junkshop at Brgy. Tupas

The junkshop has been operating for about 10 years. It applied for a business permit just last year.

The junkshop buys recyclable materials from *mangangalakal* and also conducts door-to-door collection/buying in various barangays in Donsol using a *padyak*. Some residents also go directly to the junkshop to sell or give their recyclables. The recyclables collected are not necessarily clean prior to collection (Figure 52). In the past, all the recyclables were brought using an elf truck and sold directly to a bigger junkshop in Legaspi City. However, due to budget limitations, all the recyclables are now bought by another junkshop owner in Donsol and then brought to the junkshop in Legaspi City. The junkshop is selling around 1 pick-up load of recyclables every 2 weeks and is earning around ₱5,000.

The junkshop is currently not accepting paper wastes because of their low selling value. There is also a "stop buying" policy for cardboards. Recyclables such as glass, metal, and plastics are accepted and bought according to the current market price (Table 15).

Figure 52. Accumulated Recyclables at Magdamit's Junkshop

Table 15. Brgy. Tupas Junkshop Price List

	Recyclable Waste	Unit	Buying price, ₱	Selling price, ₱
1	Metal	kg	6.00	7.00
2	Clear PET bottle	kg	3.00	
3	"good" plastic (HDPE)	kg	6.00	12.00
4	Tin cans and yero	kg	2.00	
5	Clear glass bottles			
6	"malutong" – plastic ng TV	kg	2.50	
7	"malutong" – plastic ng TV (whole)	pc	~80.00	

c. Junkshop at Brgy. Banuang Gurang

The junkshop accepts all the recyclables from residents of the barangay (Figure 53). It also conducts door-to-door collection/buying. The junkshop stores all the recyclables until a buyer comes which may be once a year (or longer). Similarly, the list of accepted recyclables and current market price were recorded (Table 16).

Figure 53. Accumulated Recyclables at Brgy. Banuang Gurang Junkshop

Table 16. Brgy. Banuang Gurang Price List

	Recyclable Waste	Unit	Buying price, ₱	Selling price, ₱
1	Clear PET bottle	kg	5.00	
2	Clear glass bottles (round or square bottom)	pc	0.50	1.00
3	"good" plastic (HDPE)	kg	5.00	7.00
4	Tin cans and yero	kg	1.00	2.00

d. Junkshop at Brgy. Punta Waling-Waling

This junkshop is located at the residence of its owner and operator, Ms. Lorena Narvaez. The junkshop only accepts specific recyclables from the residents, and does not conduct door to door collection. At present, only clear glass bottles (round and square base), 1.5-liter PET bottles, and metals are accepted and bought by the junkshop (Table 17). Cartons used to be collected in the past, but because of the present low market value, cartons are not accepted at the time of the interview. These recyclables brought by the residents need not be cleaned before selling to Ms. Narvaez' Junkshop (Figure 54). When the storage area is almost full the owner would arrange a collection pick-up with the hauler. These recyclables are brought to Camalig, Albay.

Figure 54. Accumulated Recyclables at Ms. Narvaez' Junkshop

Table 17. Brgy. Punta Waling-Waling Junkshop Price List

	Recyclable Waste	Unit	Buying price, ₱
1	Clear PET bottle (1.5L)	kg	3.00
2	Clear glass bottles (round or square bottom)	pc	0.50
3	Tin cans and G.I Sheets (yero)	kg	2.00

3. Backyard Composting

Another means of waste diversion is through backyard composting. In areas where there is sufficient land, residents compost their biodegradable wastes such as leftover food, fruit and vegetable peels, and yard waste among others. This practice is common especially in rural barangays that are not serviced by the garbage collection. Moreover, in rural barangays where the backyards are filled with trees and plants, the amount of yard waste is expected to be high. Managing these yard wastes can be challenging, so as a result, some of the yard waste are just left on the ground to decompose by itself.

4. Others

The municipality of Donsol runs a program that encourages its citizens to collect film plastic and PET bottles to create ecobricks, similar to that shown in Figure 34. These ecobricks are brought to the municipal hall in exchange of some products. For example, last Christmas season, for every 20 ecobricks collected, a Noche Buena package consisting of spaghetti noodles and tomato sauce is given. In another occasion, these bricks can be exchanged for school supplies.

C. Other Observations

Presence of medical waste such as syringes and intravenous tubes were found at the RCA alongside municipal wastes (). These wastes might be from the nearby health clinics, laboratories, or other medical related institutions. Each medical institution is responsible for the proper storage, handling, and disposal of these pathogenic wastes.

Figure 55. Medical Waste found during WACS at the RCA

Many coconut husks lined along the shore were observed at the time of visit (Figure 56). Some locals also mentioned this problem. Since there is an abundance of coconut trees in the municipality, there are many coconut husks that are not collected. With heavy rains, there is a huge possibility that these coconuts are washed towards the shore and towards the lowlands – polluting the barangays located downstream.

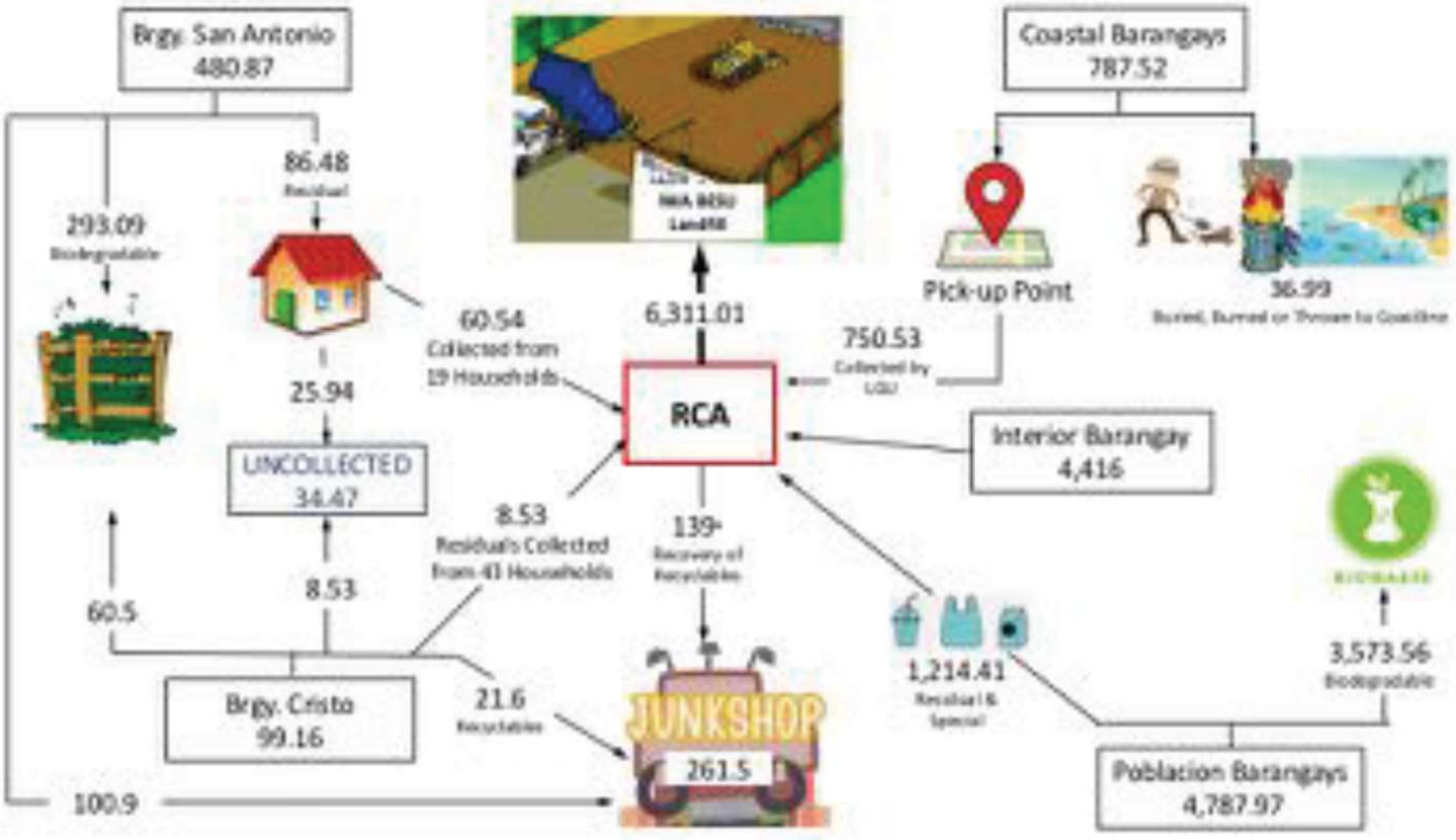
Figure 56. Coconut Husks along the Shoreline

Products packaged in sachets are found in every sari-sari store that is spread across the different barangays (). There was almost no product packaged in a bottle that was sold in a sari-sari store. This suggests the reliance of consumers in products packaged in single-use plastics as these are cheaper than products in bulk sizes.

Figure 57. Products Packaged in Sachet in Sari-Sari Stores

D. Waste Map

A waste map courtesy of Ms. Jean Rose Cadag of the Donsol MENRO is presented in the next page (Figure 58). This waste map was developed during the Waste Management and Plastic Smart Cities Action Planning Workshop held last November 2019. A value of approximately 139 kg/day of recyclable wastes recovered from the RCA by the RCA personnel is added to the map. This value is computed by averaging the recyclables collected by the RCA personnel from April 2018 to May 2019.



*Computed from Record of sold recyclables from the RCA (Donsol MENRO, 2020)

Figure 58. Waste Map of Donsol (Cadag, 2019). Unit: kg/day

VI. RECOMMENDATIONS FOR IMPROVEMENT OF SOLID WASTE MANAGEMENT

The following measures are recommended based on the observations and data gathered

Due to the limited or narrow access roads to the barangays, a smaller utility vehicle such as tricycle may be deployed to reach the inner barangays. The rough terrains and uphill slope to the inner barangays must also be considered when choosing the appropriate utility vehicle. With collection scope reaching the inner barangays, burying of residual waste under the ground can be significantly reduced. Consequently, this reduces the possibility of leachate from permeating the soil and eventually contaminating the ground water. This is critical as many of the residents rely on ground water as their main source of water.

To capture a better estimate of the amount of waste collected by the municipality, the procurement of weigh pads or weigh bridge is recommended. This will allow the municipality to determine how much waste (tonnage) is disposed to the RCA. Moreover, as the city has established target diversion rate in the coming years, the weigh pads or weighbridge can serve as an instrument in monitoring the achievement of these target rates.

As medical wastes were found alongside municipal waste at the RCA, a firm reminder regarding proper disposal of medical waste must be forwarded to health clinics, laboratories, and other medical related institutions.

From the perception surveys conducted, many of the respondents particularly those from inland barangays, are not aware of the IEC of their barangay should there be any. A more active information and education campaign is recommended. Such campaigns may be directed towards the youth and young professionals aged between 10 and 35 as they make up around 60% of the population based on 2015 census (PSA, 2017) adjusted to present year. Another note taken from field observations and interviews, some residents consider diapers and sanitary napkins as biodegradable as these products are mostly made of cotton. Together with the unpleasant smell brought by soiled diapers and napkins, residents tend to immediately bury or burn these wastes. As part of the IEC, it can be mentioned that personal hygiene products should not be treated the same way as biodegradables. Still, collection of these wastes remains to be the most proper way.

VII. RECOMMENDATIONS FOR FURTHER STUDIES

Further studies to utilize the data gathered from the WACS activity is recommended. A study to understand the materials flow analysis (MFA) of plastics including the possible utilization of the said plastics may be conducted to provide a wholistic solution. For the MFA, volume of waste plastic buried or burned or those diverted to the nature through other means should be quantified. This will allow a better picture of the movement of plastic from source to disposal.

Recommendations for the utilization of each type of plastic should also be included. Existing technology to treat each type of plastic should be determined to come up with the appropriate means of utilizing the waste. A social enterprise focusing on the utilization of waste plastics can then be developed. One example of which is processing of waste plastics to produce commercial products based on the existing technology.

This study can then serve as a guide or direction for the local government on how it can fully utilize the waste plastics that will involve and benefit the community.

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Appendix A. Survey Form for Barangay Officials

Donsol Waste Analysis and Characterization Study (WACS) baseline for pilot sites
Survey for Barangay Officials

Petsa at oras: _____ Barangay na kinabibilangan: _____
Pangalan ng tagasagot: _____

Panimula:
Ang survey (sarbey) na ito ay bahagi ng isang proyekto na isinasagawa ng WWF Philippines sa pakikipagtulungan ng LGU ng Donsol, Sorsogon. Ang sarbey na ito ay nagtatangkang tantyahin ang mga basura, aralin ang pangongolekta at pangangasiwa ng mga basura sa munisipalidad ng Donsol, Sorsogon at sa mga barangay nito, at alamin ang kamalayan ng mga myembro ng pamunuang baranggay sa mga isinasakatuparang polisiya ng bayan. Hinihiling namin ang inyong kooperasyon. Ang lahat ng impormasyong makukuha sa sarbey na ito ay pananatilihing lihim at hindi gagamitin laban sa mga sumagot.

Bahagi 1. Mga Basurang Kinokolekta

1.1. May koleksyon ba ng basura sa inyong barangay? [ ] Meron [ ] Wala
1.2. Anong sasakyan ang ginagamit para mangolekta ng mga basura sa inyong barangay?
[ ] Truck [ ] Kariton [ ] Padyak [ ] Iba pa: _____
1.3. Paano kinokolekta ang mga basura sa inyong barangay?
[ ] Sa tapat ng bahay [ ] Sa isang nakatakdang lugar [ ] Iba pa: _____
1.4. Saan dinadala ang mga nakolektang basura?_____
1.5. Meron bang MRF? [ ] Meron [ ] Wala
1.6. Tuwing kailan at gaano kadalas mangolekata ng mga basura sa inyong barangay? _____
1.7. Gaano karami ang naiipong basura ng barangay sa isang araw/koleksyon (o ilang sako)? _____
1.8. Hinihiwalay ba ang inyong basura depende sa klase? [ ] Oo [ ] Hindi
1.9. Ano ang komposisyon ng basura ?_____
1.10. Ano ang karaniwang ginagawa sa nakokolektang basura (plastik, bakal, nabubulok, atbp.)?
_____
1.11. Sa mga nakokolektang basura, ilang porsyento ang plastic?_____
1.12. Ano ang karaniwang uri ng plastic na inyong nakukuha? Pakilagyan ng tsek (✓) kung alin sa mga nakasaad ang mayroon.

Uri ng Plastic	Halimbawa	Mayroon?
PVC		
PET		
LDPE	 	
HDPE	 	

PP		
PS	 	
PU		
Laminates	 	
Others	 	
Diapers/Napkin		

Bahagi 2. Sa mga Basurang Naiipon sa mga estero/ilog

2.1. Nagsasagawa ba kayo ng paglilinis sa estero sa inyong barangay? [ ] Oo [ ] Hindi
2.2. Gaano kadalas ang paglilinis ng estero sa inyong barangay?_____
2.3. Gaano karami ang naiipong basura?_____
2.4. Ano ang komposisyon ng basura?_____
2.5. Saan dinadala ang mga nakolektang basura?_____
2.6. Sa mga nakokolektang basura, ilang porsyento ang plastic?_____
2.7. Ano ang karaniwang uri ng plastic ang inyong nakukuha?_____
2.8. Ano ang karaniwang ginagawa sa nakokolektang plastic?_____
2.9. Mula malinis ang estero, ilang araw itong nananatiling malinis bago muling maipon ang basura?
_____

Bahagi 3. Kamalayan ukol sa kapaligiran

3.1. Sino ang nangangasiwa sa pagpapanatili ng kalagayan/kalinisan ng kapaligiran sa inyong barangay?
_____
3.2. Ano ang mga kasalukuyang problema sa inyong kapaligiran?_____
   a. Ano ang sanhi/pinagmulan nito?_____
   b. Ano sa tingin nyo ang solusyon sa problemang ito?_____

3.3. Mayroon bang mga ginaganap na seminar ukol sa pangangasiwa ng basura? Sinu-sino ang dumadalo? _____
3.4. Mayroon bang mga ginaganap na seminar ukol sa pangangasiwa ng plastik na basura?

[ ] Meron [ ] Wala

3.5. Mayroon bang ipinapamahaging babasahin ayon sa pangangasiwa ng basura?
[ ] Meron [ ] Wala

3.6. Mayroon bang ipinapamahaging babasahin ayon sa pangangasiwa ng plastik na basura?
[ ] Meron [ ] Wala

3.7. Ilang bahagi ng populasyon ng barangay ang nakikiisa sa paglilinis ng mga estero? _____

3.8. Ano ang mga hakbang na ginagawa ng pamunuang baranggay upang mapabuti ang kalidad ng tubig sa mga estero sa inyong barangay? _____

3.9. Mga mungkahi/rekomendasyon sa Munisipyo (LGU) para mapabuti ang pangangasiwa ng basura.
_____
_____

May mga batas o ordinansa ba na ipinapatupad ang barangay na may kinalaman sa pangangasiwa ng basura o pangangalaga ng kalikasan? [ ] Meron [ ] Wala

Anu-ano ang mga ito? _____

3.11. Ano-ano ang mga sakuna/disaster na nararanasan ng barangay? _____

3.12. Uri ng basura na nakukuha mula sa sakuna? Saan posible galing?
_____

3.13. Gaano ito karami? _____

3.14. Paano ito kinokolekta, tinatapon, at minamanage? _____

Maraming salamat sa inyong pakikilahok!

Appendix B. Survey Form for Residents

Donsol Waste Analysis and Characterization Study (WACS) baseline for pilot sites
Survey para sa mga Kabahayan (Residents)

Petsa at oras: _____ Barangay na kinabibilangan: _____
Pangalan ng tagasagot: _____

Panimula:

Ang survey (sarbey) na ito ay bahagi ng isang proyekto na isinasagawa ng WWF Philippines sa pakikipagtulungan ng LGU ng Donsol, Sorsogon. Ang pagsusulit na ito ay nagtatangkang tantyahin ang mga naiipong basura, aralin ang pangongolekta at pangangasiwa ng mga basura sa munisipalidad ng Donsol, Sorsogon at sa mga barangay nito, at alamin ang kamalayan ng mga myembro ng pamunuang baranggay sa mga isinasakatuparang polisiya ng bayan. Kami ay humihiling ng inyong kooperasyon. Lahat ng impormasyong makukuha sa sarbey na ito ay pananatilihing lihim at hindi gagamitin laban sa mga sumagot.

Bahagi 1: Tanong tungkol sa Pamamahay

1. Kailan kayo nagsimulang tumira dito (Isulat ang tantyang taon)? _____
2. Bilang ng mga nakatira sa pamamahay: _____
3. Gaano karami ang napapabilang sa mga sumusunod na edad sa inyong pamamahay?

Edad	Bilang
0-3	
4-12	
13-50	
50-pataas	

4. Magkano ang kinikita ng inyong sambahayan kada buwan? ~Php (pakilagyan ng check)
   [ ] 0 – 1,000
   [ ] 1,001 – 5,000
   [ ] 5,001 – 10,000
   [ ] 10,001 – 25,000
   [ ] 25,001 – pataas
5. Mga pinagkukunan ng kita/pera? (Pakilagyan ng check lahat ng naaangkop sagot)
   [ ] Pagiging empleyado, anong industriya: _____
   [ ] Negosyo (paupahan / tindahan / kainan o carinderia / iba pa: _____)
   [ ] Pag-aalaga ng hayop (baboy / manok / pato / bibe / iba pa: _____)
   [ ] Pagpapaarkila/driver (kotse / van / jeepney / multicab / tricycle / bangka)
   [ ] Iba pa: _____
   [ ] Pagsasaka
   [ ] Pangingisda

Bahagi 2: Paglalarawan ng Kalinisan at Pangangasiwa ng Basura

6. Humigit-kumulang gaano karaming basura ang inyong naitatapon sa isang araw?
   [ ] 1 bag/supot ng plastic kada araw [ ] 2-3 bags/supot ng plastic kada araw [ ] Iba pa: _____
7. Ano ang komposisyon ng inyong basura? (Pakilagyan ng check lahat ng naaangkop na sagot)
   [ ] Plastic [ ] Lata [ ] Tirang Pagkain
   [ ] Bote [ ] Papel [ ] Iba pa: _____
8. Hinihiwalay ba ninyo ang inyong basura depende sa klase? [ ] Oo [ ] Hindi

9. Kung ang kasagutan ay hindi, ano ang pangunahing rason kung bakit?

[ ] Dahil wala namang silbi ang paghihiwalay ng basura kasi pinagsasama-sama naman ito ng mga basurero

[ ] Dahil walang lugar para sa hiwalay na basurahan

[ ] Dahil hindi ko alam ang kagandahan ng paghihiwalay ng basura

[ ] Iba pang dahilan _____

10. Tuwing kailan kinokolekta ang basura sa inyong lugar?

[ ] Araw-araw

[ ] Tuwing: _____

[ ] Nabubulok, tuwing:_____

[ ] Di-nabubulok, tuwing:_____

[ ] Walang Koleksyon

11. Saan kinokolekta ang basura?

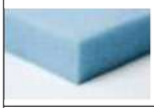
[ ] Sa tapat ng bahay

[ ] Sa isang nakatakdang lugar

[ ] Iba pa: _____

12. Paano ninyo tinatapon ang inyong basura? (Pakilagyan ng tsek (✓) ang lahat ng naaangkop na sagot)

Klase		**Paraan ng pagtatapon ng basura**							
		Binebenta sa junkshop o nangangalakal	Sinusunog	Ibinabaon sa lupa	Ginagamit muli (Specify)	Kinukulekta ng mga basurero	Itinatapon sa:		
							Tambakan ng basura	Estero / Ilog	Kalsada
Plastik	 PVC								
	PET 								
	LDPE 								
	HDPE 								
	 PP								

	PS 								
	PU 								
	 Laminate								
	Iba pang uri ng plastik								
Tirang pagkain									
Papel / karton									
Glass bottle									
Lata									
Pintura									
Gamot									
Baterya									
Tela									
Diaper/Napkin									
E-waste									

Bahagi 3: Kalagayan ng Kapaligiran, Kamalayan at Pangangalaga

13. Masasabi niyo bang lumala, pumangit o dumumi ang inyong kapaligiran mula nang kayo'y nanirahan sa barangay na ito? [ ] Oo [ ] Di-gaano [ ] Hindi
14. Ano ang mga kasalukuyang problema sa inyong kapaligiran?

    _____
    _____
15. Ano ang sanhi/pinagmulan nito?

    _____
16. Ano sa tingin niyo ang solusyon sa problemang ito?

    _____
17. May alam ka bang programa sa inyong barangay na may kinalaman sa kapaligiran?
    [ ] Meron [ ] Wala
    Kung meron, pakisulat kung anu-ano ang mga ito:

    _____
18. May alam ka bang ordinansa o batas tungkol sa pagreregulate ng plastic bags sa inyong barangay o municipality? [ ] Meron [ ] Wala
    Kung meron, anu-ano ang mga ito:

    _____

19. Sa tingin mo ba ay epektibo ang pag-iimplement ng mga regulasyon na ito? [ ] Oo [ ] Hindi
Bakit?_____

20. Paano niyo ilalarawan ang kalagayan ng mga anyong tubig (estero, ilog, dagat atbp.) malapit sa inyong lugar?

_____

21. May napapansin ba kayong mga basura sa mga anyong tubig malapit sa inyong lugar?
[ ] Oo [ ] Wala
Kung Oo, ano o saan ang posibleng pinagmulan ng mga basura?

_____

22. Gaano kadalas isinasagawa ang paglilinis ng estero sa inyong barangay? _____

23. Mula nang malinis ang estero, ilang araw ito nananatiling malinis bago muling maipon ang basura?

_____

24. Sa karaniwan, ilang araw nagtatagal ang mga basura sa mga estero? _____

25. Mga mungkahi/rekomendasyon sa Barangay o Munisipyo (LGU) para mapabuti ang pangangasiwa ng basura.

_____

_____

26. Mayroon bang kubeta at posonegro sa bahay inyo? [ ] Meron [ ] Wala

Maraming salamat sa inyong pakikilahok!

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ANNEX B
Key Points for Policy Makers

Plastic is a global transboundary problem which requires a systematic and holistic response for all stages of the life cycle of plastics.

Plastic pollution has reached gigantic dimensions worldwide. Approximately 4.8 to 12.7 million tonnes of plastics are entering the ocean yearly. This has been attributed to continuous plastic production and the lack of sound waste management, especially in low- and middle-income countries, such as the Philippines - the top 3rd country in the world for plastic leakage. [Jambeck et al., 2015]

Plastic holds the third largest share in the overall generated waste in the Philippines at 2,150,000 tonnes p.a. in 2019. (WWF, 2020)

The country's plastic recycling rate is low at 9%, with 35% leaking into the open environment and 33% disposed of in sanitary and unsanitary landfills (WWF, 2020)

62% of the plastic we consume annually is low value plastic (e.g. all kinds of flexibles like sachets) while high value plastics (e.g. PET, PP, HDPE) constitute about 37% of the plastic consumed. (WWF, 2020)

The goal is to:

- Reduce the production and use of unnecessary plastics;
- Shift to sustainable inputs;
- Increase reuse, recycling and recovery; and
- Ensure there is no plastic leakage into the environment.

To achieve this goal, it is key to develop circular economy models and system solutions that allow developing the full spectrum of solutions from materials use and product design, to waste management and oceans health.

A circular economy is a regenerative system, functioning within planetary boundaries and driven by renewable energy, that replaces the current linear take-make-dispose industrial model. Materials are instead maintained in the economy and resources are shared, while waste and negative impacts are designed out. (EMF. 2015)

In a circular economy, the value of products and materials is maintained for as long as possible. Waste and resource use are minimized, and when a product reaches the end of its life, it is used again to create further value. This can bring major economic benefits, contributing to innovation, growth and job creation.

Any laws or regulations on plastic should include the following:

A **definition of terms** aligned with globally accepted definitions:

- Single Use Plastic - a product that is made wholly or partly from plastic and that is not conceived, designed or placed on the market to accomplish, within its life span, multiple trips or rotations by being returned to a producer for refill or reused for the same purpose for which it was conceived

- Unnecessary Plastic - plastic not required for product integrity

- Circular Economy - a circular economy is one that is restorative and regenerative by design. It looks beyond the take-make-waste extractive industrial model, and aims to redefine growth, focusing on positive society-wide benefits. It is based on three principles: design out waste and pollution; keep products and materials in use; and regenerate natural systems.

- Prevention - measures taken before a substance, material or product has become waste, which reduces quantities of waste and includes re-use of products and the extension of the lifespan of products. Also reduces amounts of hazardous substances being used and the adverse impacts of the generated waste on the environment and human health

- Recovery - describes any operation in which waste serves a useful purpose by replacing other materials or using its material properties (includes preparation for reuse, recycling as material or feedstock recycling and energy recovery)

- Diversion - any combination of waste prevention (source reduction), recycling, reuse and composting activities that reduces waste disposed

- Mismanaged waste - plastic left uncollected, openly dumped into nature, littered, or managed through uncontrolled landfills.

- Biodegradable Plastics - plastics which can be degraded or composted by microorganisms under specific, environmental conditions. Biodegradable plastics can be made both of bio-based as well as fossil-based plastics.

- Bio-based plastics - plastics which are manufactured from renewable sources; for instance, sugar cane (as opposed to fossil-based plastics, which are derived from fossil fuels). The term bio-based doesn't necessarily imply bio-degradability.

- Compostable plastic - plastic that undergoes degradation by biological processes during composting to yield carbon dioxide (CO2), water, inorganic compounds, and biomass at a rate consistent with other known compostable materials and that leaves no visible, distinguishable, or toxic residue.

- Oxo-degradable plastic - oxo-degradable additives are substances added to conventional plastics to promote oxidation.

- Oxidation brittles and fragments the material with the intention to be digestible by microorganisms, but evidence shows that this desired effect is not achieved.

- Plastics which quickly fragment into micro-particles in the presence of warmth, light and oxygen but do not degrade in the environment, thereby becoming a source of environmental pollution in the form of microplastic.

Cautionary notes on other types of plastic:

Single-use packaging can never be sustainable due to its frequent use and disposable nature. We highly encourage businesses to prioritise reusable packaging where possible, and only use single-use packaging where absolutely necessary. The tool guides businesses to choose the material with the lowest possible footprint for single-use packaging.

Before shifting to alternatives for single-use products, the full product life cycle of such alternatives must be analyzed to determine if the alternative truly has a lesser impact. The life cycle assessment for environmental impact must cover extraction, manufacturing, and waste treatment in the country where the alternative packaging material will be used.

Biodegradable plastics are still materials that should not end up in nature. Even coupled with proper infrastructure, biodegradable plastics are just as harmful if they enter natural ecosystems.

Bio-based plastics are only potential solutions if sourced and managed properly. However, without such systems or infrastructure, they face the same end-of-life challenges as regular fossil-fuel based plastics.
Compostable plastic may be appropriate for specific uses, but it will only be advantageous if collection and processing is sufficient to recover the material.

Oxo-degradable plastics should be prohibited. They result in worse environmental outcomes and contribute to microplastic pollution when they degrade.

Multi-stakeholder involvement and engagement, especially from minority groups such as the informal waste sector, women, and other groups with unique social, religious, ethnic, racial beliefs or practices.

Targets for the reduction, prevention, control, and removal of unnecessary plastics which should be adjustable every few years based on waste data and existing progress.

Incentives rather than penalties for reaching the targets or complying with the laws. Positive reinforcement through incentives is more likely to lead to long lasting behavioral change.

Coordination **framework for reporting and review** on all levels

Dedicated multidisciplinary team made up of multiple stakeholders (government, private individuals, NGOs, scientists, experts, and businesses) for **monitoring and evaluation** of efficacy of solutions and policies.

Standards and regulations on all types of materials, and the exemptions for such

Implementation support mechanism for waste management infrastructure and systems including **financial support.**

Focus on use of **existing infrastructure and scaling up** until capacity increases

All actions must be done in relation to the Sustainable Development Goals and shall be conducted in an environmentally **sustainable manner**

Plastic crediting activities should only be an **additional approach** to waste reduction strategies and not the end strategy. **Extended Producer Responsibility** is a more long-term solution which can work alongside plastic crediting and creates systemic and behavioral change.

WWF believes only credible plastic crediting systems that contribute to transformational change should be pursued. Plastic crediting activities may serve as an ADDITIONAL approach to robust plastic waste reduction strategies if a strong and credible standard for crediting exists and is adhered to, prerequisites are defined and met, and strong social and environmental safeguards are upheld.

WWF calls for crediting systems to contribute to meaningful, systemic change through continuous improvement, support of circular systems, and progress towards comprehensive Extended Producer Responsibility.

Plastic credits, if a credible standard is developed, may provide a temporary method of communicating a company's involvement in plastic recovery activities but they should not serve as a way for companies to buy a clean image, free of environmental damage.