
STEPS FOR WASTE MANAGEMENT IN AGONDA

Steps to Waste Management for Agonda

I Introduction

This is a document which explores the existing waste streams in Agonda, and offers possible steps and processes which will allow Agonda's waste to be handled in a sanitary and environmentally friendly way. Waste has been identified by the community as a major problem in Agonda in the 2009, 2010, and 2012 Pratt Institute, Sustainable Goa studio. Waste management is not a unique problem to Agonda, many municipalities of all sizes in India and around the world struggle with ways to effectively manage waste.

This document is intended to be used by the Panchayat of Agonda in conjunction with the working citizens group identified at the end of the 2012 community workshops along with any involved NGO's.

Steps to Waste Management for Agonda provides information on how Agonda could develop a Solid Waste Management Plan (SWM). These steps include: identifying what data is necessary for a SWM and how to collect it, existing conditions of population growth, density, road conditions and existing waste management practices. The major limitation of this plan is the lack of concrete data on waste in Agonda, and Goa. A waste survey must be conducted within the village of Agonda in order to accurately understand the amount and type of waste generated by residents and businesses.

The steps and recommendations in this document are based on the development of a decentralized SWM where all waste would be transported outside of Agonda, except for wet (organic) waste. Currently, Agonda does not have a landfill or waste transfer station, aside from the Panchayat office where plastic is collected and transported to Panjim. Ideally, recyclables would be transported out of Agonda to mills where they can be sold and processed into new materials. This would leave a smaller portion of non-biodegradable and non-recyclable waste that would be transported to sanitary landfills or waste to energy stations for proper disposal. Organic and bio-degradable waste would be processed in Agonda through anaerobic digestion or composting.

Up to date information on the monetary value of recyclables, waste, and compost must be collected to assess the costs and potential benefits of transporting waste outside Agonda. An index of recycling and waste facilities in the region must also be developed in order to understand where different waste streams can go upon transfer from Agonda.

Steps involving community engagement should also be taken, ensuring that any waste management plan that is developed is suitable and usable for the people of Agonda. Stakeholder groups, public meetings and other types of community engagement could be held in order to develop a waste management plan. Any plan that is developed must be approved of by the community before implementation.

II Waste Stream

This document refers often to what is called the "waste stream". The waste stream is the flow and composition of all material that is discarded by humans in one form or another.

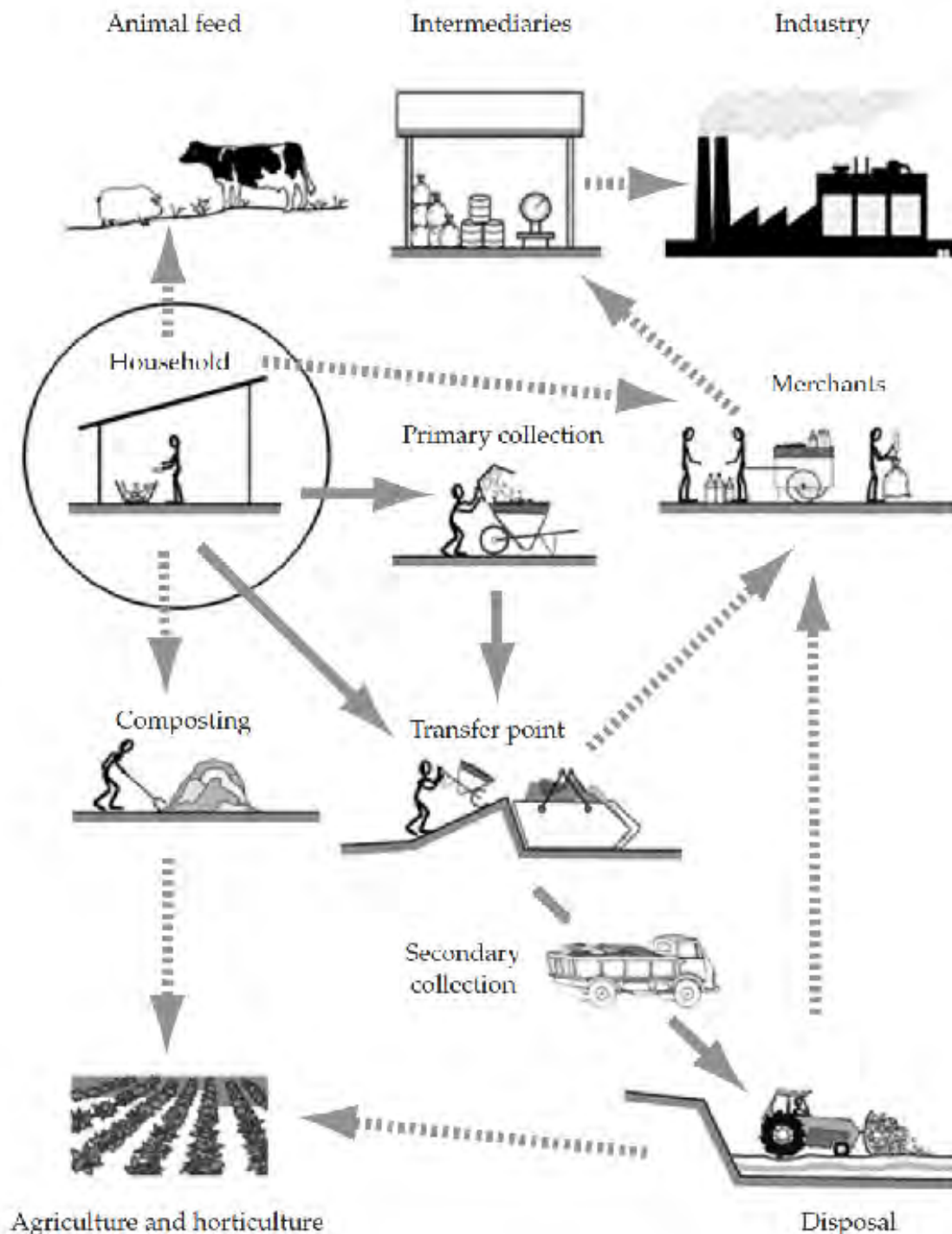
The waste stream is fed by the production and consumption of goods. Those goods could be anything from clothing and food to household cleaners and construction materials. When the goods are

consumed to a point where they no longer are valuable or provide a service they are discarded and enter the waste stream. What happens to those goods after they enter the waste stream is what a solid waste management plan aims to address.

100% sustainability would be a result of a circular waste stream, where all discarded materials are able to be transformed into another use and then recycled again. Products and materials that are unable to be reused would be excluded from entering the market.

Chart 1: The Waste Stream

Taken From "Improving Municipal Solid Waste in India" Zhu, 132.



Source: Sandec 2004.

1. Waste Survey

1.1 Purpose of Survey

The first step to implementing a waste management plan is developing and implementing a waste survey. A waste survey aims to quantify how much waste is generated over a certain time period in a given population, and what the waste composition is. In Agonda, this information can be used to inform decisions such as: type of vehicle(s) to be used in collection and transportation of waste, frequencies of pick up, sizes and types of storage units at transfer stations, and needed capacity for municipal land fill. A waste survey provides the existing conditions of the waste stream for a geography or population.

The survey should be administered by the Panchayat of Agonda in conjunction with the working citizen's advisory board identified at the end of the 2013 community workshop.

1.2 Waste Survey Methodology

1.2.1 Design of Survey

The survey accompanying this report could be used by the village of Agonda to collect waste data. It allows for responses of households, hotels, retail locations, and restaurants. It is designed to gather data on weight of waste by type and location of respondent. It also includes questions on preference of disposal of wet waste ie. kitchen waste. The data regarding type and weight of waste will inform the previously mentioned decisions regarding transportation, capacity of storage sites, and frequencies of pick up. The information regarding preferences on disposal of wet waste will help guide the Panchayat in when considering how to best deal with wet waste. If one method of wet waste disposal experiences more positive reaction than the other, it may be an indicator that the method will be used more by the community.

1.2.2 Timeframe

Each household survey respondent will be asked to hold and separate all waste generated for a week. Each respondent should only be surveyed one time. After the week period each type of waste will be collected by a member of the administering group and transferred to a central processing location where each type of waste will be weighed and recorded individually.

In order to facilitate efficient collection and recording of waste, the administering group of the survey may consider staggering the days that individuals begin collecting their waste. For example, if there are 50 households ready to engage in the survey, the administering group could choose to have 10 begin collecting waste on Monday, 10 on Tuesday and so on. When the week has passed for the first group, the next group will still have one more day. In this way the administering group can better deploy resources and time to ensure prompt collection, recording and disposal of the waste.

For restaurants and hotels the survey may need to be administered in a shorter timeframe as storing larger quantities of waste for an extended period of time could be unsanitary. An adequate time period should be discussed with business owners prior to administering the survey. A similar staggering technique could be implemented with restaurants and hotels.

1.2.3 Population Sample

The current population of Agonda is estimated at 3,600. The waste survey should aim to include a representative population of Agondan households and commercial establishments.

Table 1: Required Household Sample Size Allowing a 95% Confidence Level

Source: Decentralised Composting for Cities of Low and Middle Income Countries 22

Total Number of Households in the Community	Respondents Needed for Low Sampling Error	Respondents Needed for Medium Sampling Error	Respondents Needed for a Still Acceptable Sampling Error
100	50	50	49
250	152	110	70
500	217	141	81
750	254	156	85
1,000	278	164	88
2,500	333	182	93
5,000	357	189	94
10,000	370	192	95
25,000	378	194	96
50,000	381	195	96
100,000	383	196	96
1,000,000	384	196	96
100,000,000	384	196	96

To establish this representative sample size we can calculate what number of respondents are needed in order to provide results that are indicative of the larger population. According to the Indian census average household size is 5, so we can divide the estimated population of Agonda, 3600, by 5 to get an estimated number of households, 720. Using table 1 above we know that in order to get a 95% confidence level of the amount of waste generated by households with a low sampling error, the size of the sample would need to be between 217 and 254.

Accuracy could be further increased by stratifying the sample by geography. See section 2.4 on population density of Agonda. Ensuring a representative percentage of each ward is included in the survey based on population density could be done by multiplying 254 by the population percentage of each of the seven wards.

1.2.4 Participation and Facilitation

Participants for the survey should be briefed on the process prior to the week they collect their waste. The physical collection of the waste could be done with plastic buckets or large bags, labeled for each type of waste, which could be cleaned and reused. The collection receptacle should be weighed prior to use in the survey and that weight should be subtracted from the total weight of waste after collection.

Collecting survey waste and bringing it back to a central location may be the best option for weighing as it will allow the administering group to get a feel for how much time collection takes and what local

challenges may be presented. It will also expose Agonda's to what having a collection system would be like, which may help increase use and productivity of the SWM when enacted. Returning waste to a central location will allow for a controlled environment for weighing of waste which may improve accuracy, as opposed to weighing waste in the field.

1.2.5 Field Testing the Survey

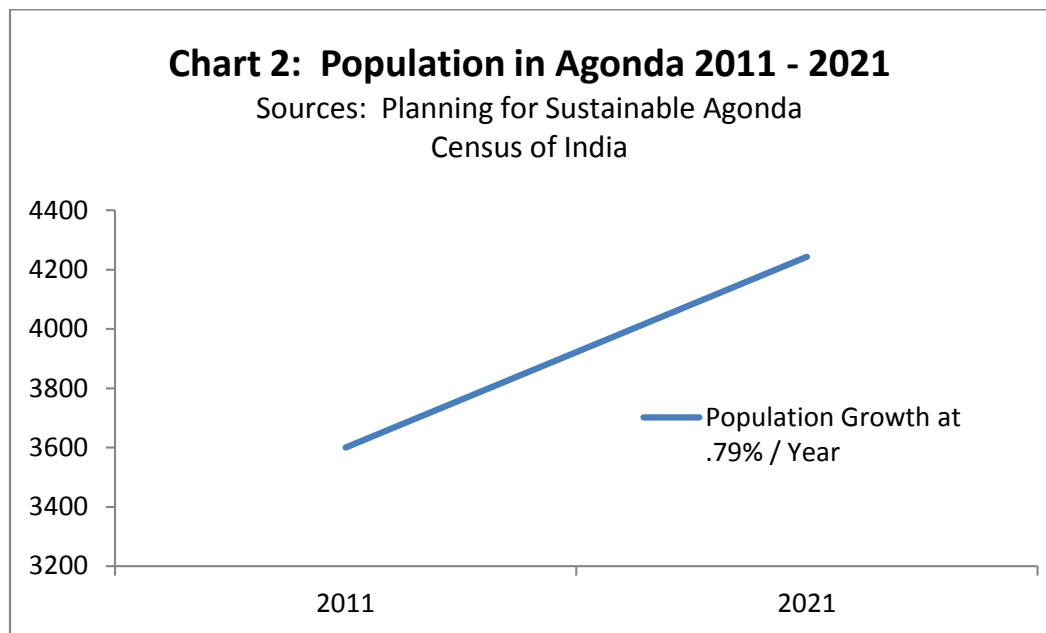
In order to ensure the survey is functional to its purpose prior to wide use, it is recommended that it is piloted with a small population first. The citizens advisory group could act as the first round of participants and take note of any faults or shortcomings in the survey and make adjustments as needed.

1.2.6 Collection and Analysis

The information collected from the Waste Survey should be entered, coded, and stored in the digital spreadsheet that accompanies this document. A codebook detailing how to enter the data can be used during input. Individual survey responses can be aggregated and analyzed based on type of respondent, geography, amount of waste generated and so on. This collection and analysis will lead to the development of mean percentages of waste stream makeup by waste type. Further, it could be used to assess preference of wet waste disposal type by geography.

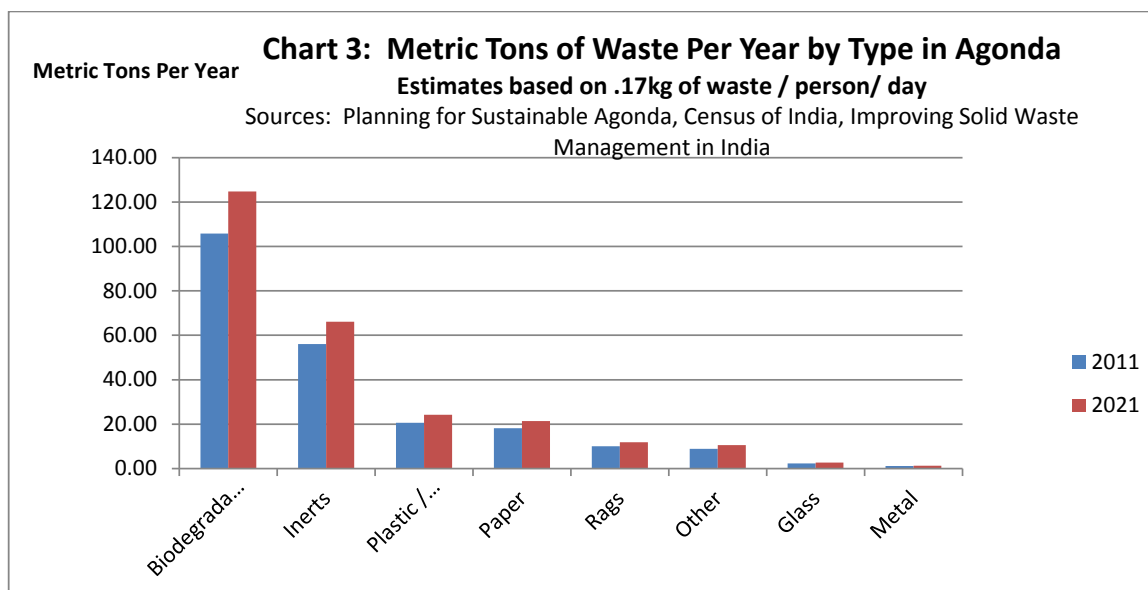
2. Existing Conditions

2.1 Population:



According to Census of India data, exponential growth rate of Goa was .79%. If we accept this number as a representative measure of growth for all towns and villages in Goa we can estimate the population in Agonda will grow from 3600 in 2011 to 4,244 in 2021.

Waste Stream



Using the population projection above and estimates on solid waste composition from the World Bank it is possible to estimate the quantities of waste by type generated now and in the future. The waste composition estimates from the World Bank are representative of an urban population, which may have different waste streams and compositions than that of Agonda, which is a rural population. They are used here to illustrate estimates of waste generation by type and to give a sense of how much waste could possibly be generated each year in Agonda. Estimates that Agonda's generate .17kg's of waste a day are based on preliminary research done by the 2011 Pratt Studio. When developing an official municipal waste plan for Agonda, the waste survey results should be used to identify kilograms of waste by type by day. The graphics and charts here are for illustrative purposes only.

Table 2: 2011 Estimates based on Agonda Population of 3,600				
Source: 2011 Planning for Sustainable Agonda, 45				
Improving Municipal Solid Waste Management in India				
Based on x kg/day per person (x*3600*365/1000)				
Does not account for hotels or institutions				
Waste Type	% If Waste Stream (World Bank 2005)	Metric Tons / Year (Based on .6kg/day/person)	Metric Tons / Year (Based on .4kg/day/person)	Metric Tons / Year (Based on .17kg/day/person)
Biodegradable	47.43%	373.75	249.01	105.77
Paper	8.13%	64.06	42.68	18.13
Plastic / Rubber	9.22%	72.65	48.41	20.56
Metal	0.50%	3.94	2.63	1.12
Glass	1.01%	7.96	5.30	2.25
Rags	4.49%	35.38	23.57	10.01
Other	4.00%	31.52	21.00	8.92
Inerts	25.16%	198.26	132.09	56.11

Total	100.00%	788.00	525.00	223.00
Table 3: 2021 Estimates based on Population of 4,244				
Source: 2011 Planning for Sustainable Agonda, 45				
Improving Municipal Solid Waste Management in India				
Based on X kg/day per person (x*4244*365/1000)				
Does not account for hotels or institutions				
	% Of Waste Stream (World Bank 2005)	Metric Tons / Year (Based on .6kg/day/person)	Metric Tons / Year (Based on .4kg/day/person)	Metric Tons / Year (Based on .17kg/day/person)
Biodegradable	47.43%	440.62	294.07	124.74
Paper	8.13%	75.53	50.41	21.38
Plastic / Rubber	9.22%	85.65	57.16	24.25
Metal	0.50%	4.65	3.10	1.32
Glass	1.01%	9.38	6.26	2.66
Rags	4.49%	41.71	27.84	11.81
Other	4.00%	37.16	24.80	10.52
Inerts	25.16%	233.74	155.99	66.17
Total	100.00%	929	620	263

2.3 Road Conditions

Infrastructure must be taken into consideration when developing a waste management plan. Road widths and conditions along with topography and settlement patterns may determine what sort of collection vehicle can be used.

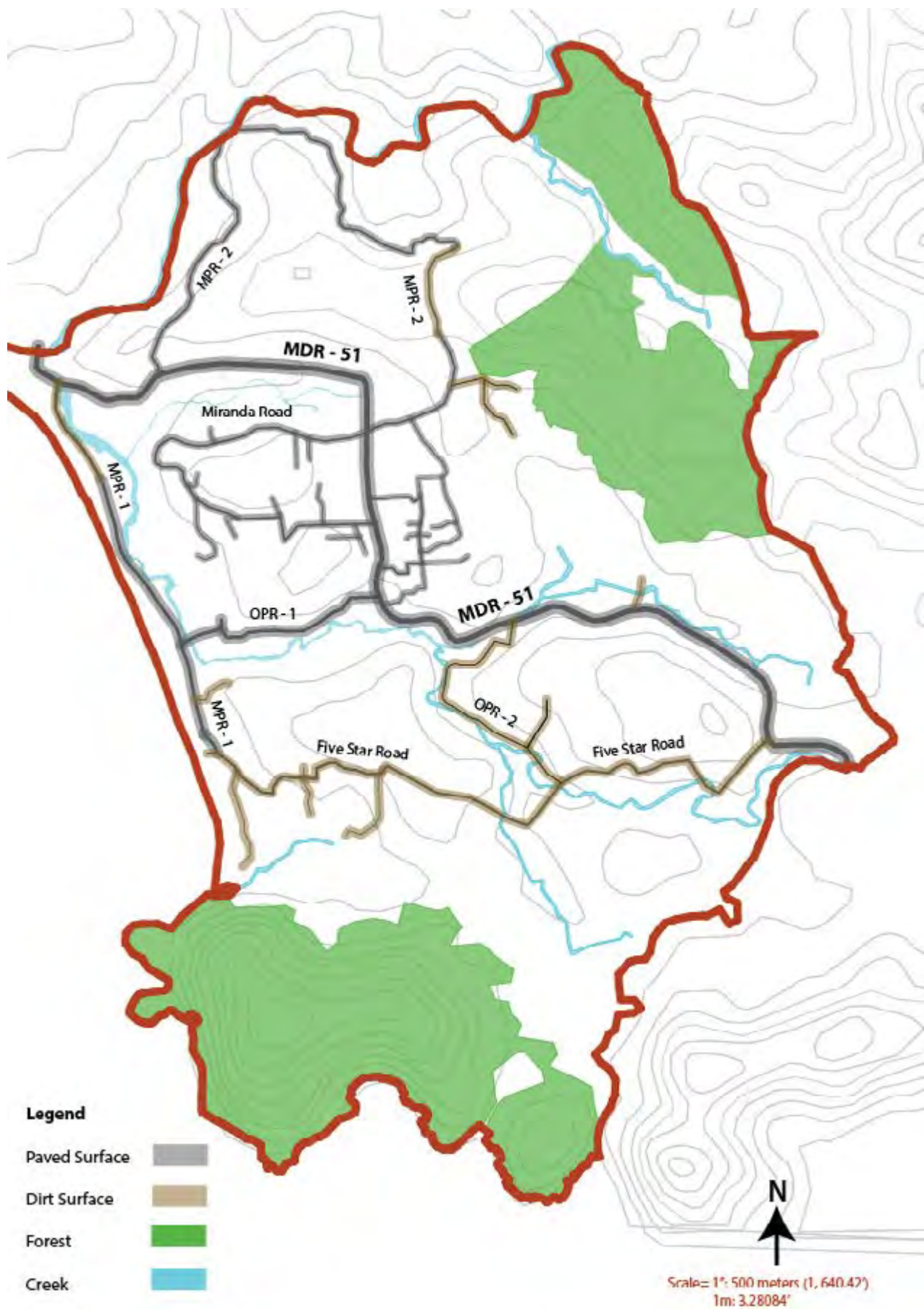
In Agonda the Main Panchayat Roads (1 and 2) measure between 3-4 meters wide for two way traffic (Sustainable Agonda 41). The Other Panchayat Road widths are unidentified, but are presumably as narrow or narrower than the Main Panchayat Roads. Non-paved roads, like the northern end of MPR-1 and Five Star Road, are narrower than 3 meters at certain points (Sustainable Agonda 28). A complete survey of road conditions and widths may be advisable in the future. See Chart 5 for graphic representations of road types.

Topography is important to consider when selecting a vehicle to collect waste as well. Areas with drastic topography may not be conducive to human powered vehicles as once the vehicles are loaded with waste they will be heavy and possibly difficult to control when descending steep inclines. Sections of Agondan roadways where topography could be an issue are along the Five Star Road and MPR 2 (See Chart 5).

Waste collection vehicles should be of appropriate size so they do not block traffic during collection runs. They should also be able to navigate unpaved and sometimes rough roads. Possible collection methods could be small tipper trucks, handcarts, tricycle units, or mid sized tempo trucks. Table 4 gives estimated costs of vehicles and equipment from 2006. Some Indian municipalities use handcart and tricycles to collect waste door to door and then transport the waste to neighborhood containers which are then emptied by a motorized vehicle (such as a truck or auto-rickshaw) and taken to a storage location (Solid Waste Management in India, 53). Whatever the transportation method, Indian law requires that vehicles engaged in the transportation of waste must have a cover preventing waste from falling out of the vehicle (Solid Waste & Waste Water Management 27).

Table 4: Waste Management Vehicle and Equipment Costs, 2006	
Source: Solid Waste Management in India, 54 (Based on cost estimates of the central workshop of the Ahmedabad Municipal Corporation.)	
1 lakh equals 100,000 Rs.	
Equipment or vehicle	Approximate cost per unit (2006)
3.0 cubic meter garbage container	Rs 20,000
Twin-container dumper placer (Light Commercial Vehicle)	Rs 8.5 lakhs
Twin-container dumper placer Heavy Commercial Vehicle)	Rs 10 lakhs
Tractor with lifting device	Rs 3.75 lakhs
1.1 cubic meter garbage container (Galvanized Steel):	Rs 19,000
1.1 cubic meter garbage container (Mild Steel):	Rs 9,000
14 cubic meter refuse collector	Rs 18 lakh
2 cubic meter ride-on road sweeper	Rs 15 lakhs
Truck-mounted road sweeper	Rs 30 - 45 lakhs
Tractor-attached road sweeper	Rs 11 lakhs without tractor
Large hauling vehicle 30 Cubic Meter Capacity with Truck:	Rs 20 lakhs
Large hauling vehicle 20 Cubic Meter Capacity with Truck:	Rs 14 lakhs

Chart 5: Agonda, Road Types and Topography



2.4 Population Density

Population density is an important component of a waste management plan as it helps to inform the collection capacity, routes and amount of area that can be covered by a collector depending on type (hand cart, tricycle, auto-rickshaw, truck, or other).

The higher the population density in a given area, the more waste is generated. Agonda is composed of 7 wards, which could be used as natural geographies for waste collection. The best approximation available for population density by ward is the 2009 Sustainable Agonda Economic Survey. The survey attained 2700 respondents of Agonda's approximate population of 3600. The limitations of using this survey to approximate population density are that it is not a complete count of residents in Agonda, and some wards may have had higher response rates than others, which would skew the data. In the future, a more complete count of Agonda's residents by ward may be advisable to better inform decisions based on population density.

However, for the purposes of this document we can use the 2009 economic survey as a way to estimate population density.

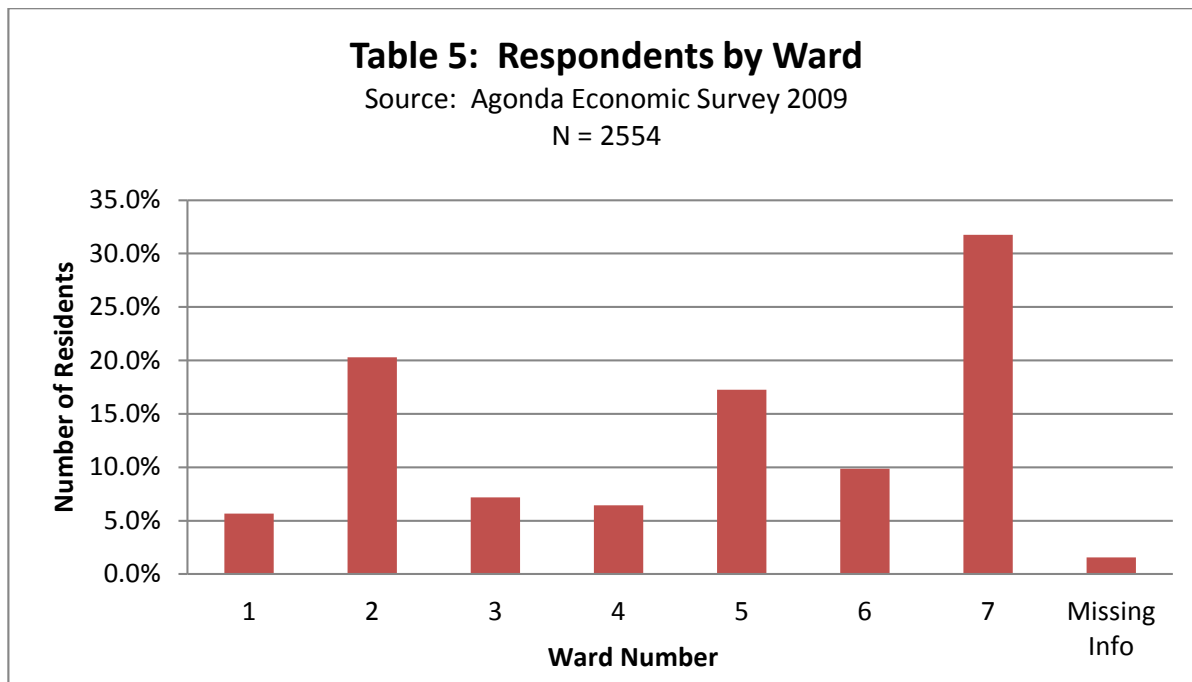
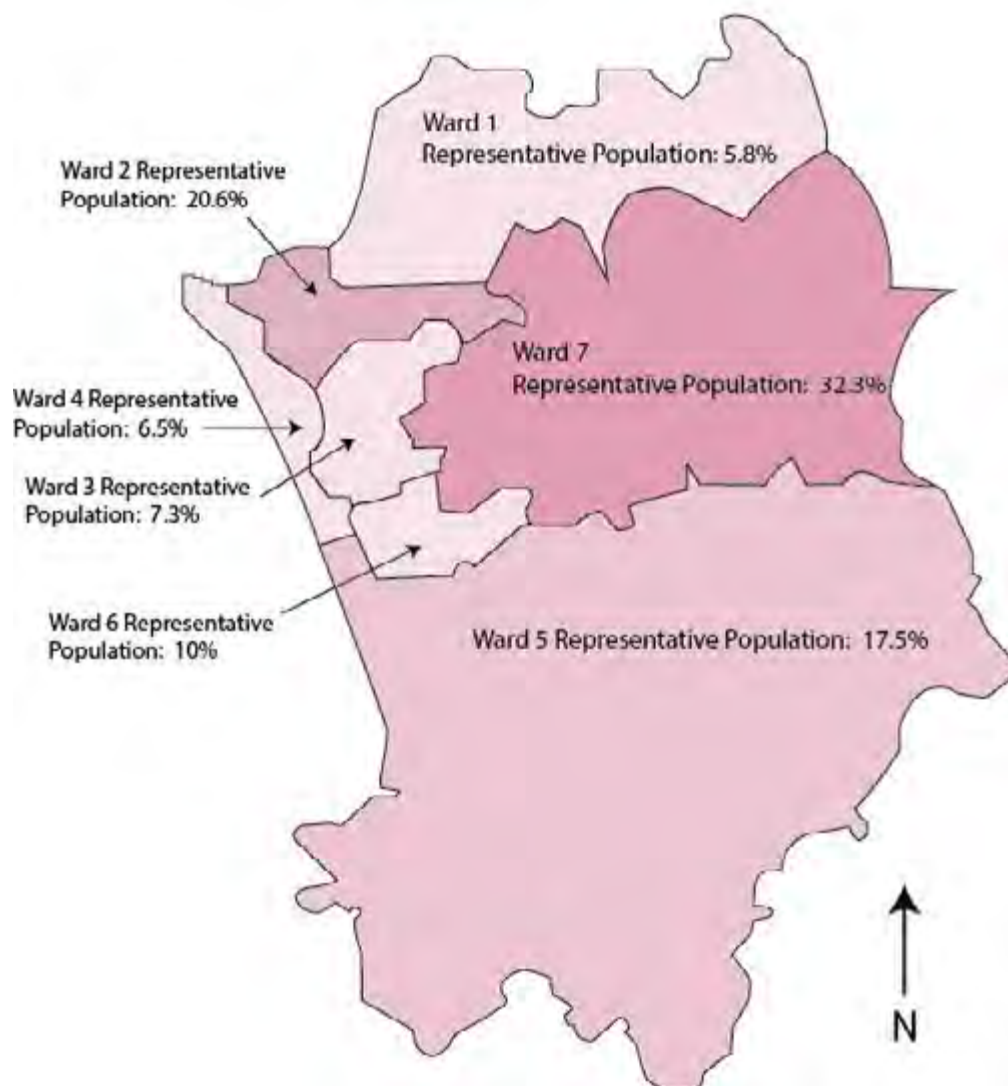


Chart 6:

Agonda Population Density by Ward

Source: 2009 Agonda Economic Survey



2.5 Regional Waste Facilities

Further research should be undertaken to understand where the closest recycling and garbage facilities are located in relation to Agonda. The Panchayat currently sends the plastic it collects to be processed in Panjim (72Km north of Agonda), and there is anecdotal evidence of a garbage dump in Chaudi. Using the internet to locate recycling and garbage facilities in the area revealed possible locations in Margao, however they should be site verified in order to understand capacity and type of waste that can be handled.

Sustainability should be the primary factor in choosing location for disposals. If recycling facilities for waste generated in Agonda are accessible they should be first choices in transfer over a landfill or waste to energy.

2.6 Current Waste Management Practices

Plastic and glass bottles are the only types of waste that have a formal disposal system in place to deal with them. The Panchayat collects plastics from households and businesses for transportation to a

recycling center in Panjim (72 Km North of Agonda). According to the Sarpanch's office the trucks come to Agonda four times a week but it was unclear what the frequency of plastic pick up per household or business was. The Sarpanch's office stated that the plastic collection service has been in operation for 3 years. The Panchayat pays 2 garbage men R9,000 per month (R4,500 per garbage man) to provide this service.

Despite the service provided by the Panchayat plastic bottles are easily spotted in drainage ditches, on the sides of roads, and other visible areas throughout Agonda.

In addition to the Panchayats service, some plastics are collected by distributors. For example the large kingfisher water jugs are collected for re-use. Similarly, glass bottles (ex. Beer bottles) are collected by distributors for re-use.

Some hoteliers have taken it upon themselves to hire private waste collectors to pick up trash and recyclables. However, they do this at their own initiative and not because of any mandate for a cleaner Agonda. These business owners are the minority in Agonda, as the free method of dump and burn is economically preferable to paying for a service but degrades air quality and causes other health issues for residents and visitors.

Additionally, what appears to be an informal recycling collection and transfer station exists at the intersection of OPR-1 and MDR-51. Metal, rubber and other types of waste materials were observed to be segregated and organized at the site. Investigation into the operation of this facility should be undertaken by the Panchayat or working citizens group to understand the destination of the materials viewed here and there value.

3. Plan

Agonda's rural composition and low population density must be accounted for in determining a waste management plan. Because of scale, it may be impossible for Agonda to develop the facilities necessary for waste processing within the village. Until the construction of a sanitary landfill occurs, all waste generated in Agonda must be taken outside the village for proper disposal and recycling, except for wet waste which can be handled locally.

An essential component of a waste management plan is waste segregation (Solid Waste and Waste Water Management 22). Containers must be provided to households and businesses in Agonda for wet waste, recyclables, and non-recyclables. Separating these waste streams at the source allows for easier transfer, disposal, and resale if applicable to the waste type. Once properly segregated all waste streams should be brought to a waste transfer location for storage until appropriate time for transport to an end stream facility.

Agonda has identified a site to be used as a waste management location in the south-east section of the village along the Five Star Road. This location should be reviewed and analyzed taking into account the results of the waste survey and SWM. If this location is to be kept as the village's waste management site upgrades to the road may be necessary in order to accommodate increased vehicle traffic. A more centrally located site along the MDR 1 may be a better location as it is on a major road connecting to larger towns and cities where waste may ultimately need to be taken.

3.1 Wet Waste / Kitchen Waste

Wet waste / kitchen waste is the waste left over from cooking and eating in households, restaurants and hotels as well as any organic material byproducts from agriculture or livestock. Estimates from the world bank are that wet waste makes up approximately 50% of waste composition in India (see table 2). Because wet waste is bio-degradable it is the one waste stream that could be handled locally by either composting or bio-digestion in Agonda. This is because the processing of wet waste does not require machinery for chemical or physical transformation, the transformation occurs naturally. Either method of composting or bio-digestion turns organic waste into a useful substance by returning it back to the natural cycle and avoiding landfills. Composting produces fertile compost to be used in agriculture, and bio-digesters produce bio-gas that can be used to power stoves as well as nutrient rich sludge that can be used in agriculture.

Determining whether to participate in composting or bio-digestion should be based on Agonda's preferences and ability to pay.

	Bio Digester	Compost
Byproduct	Bio Gas, Nutrient Rich Sludge	Compost
Benefits	Reduces need for cooking fuel, sludge can be used as fertilizer in agriculture	Low Cost to install, compost can be used in agriculture
Challenges	Higher cost to implementation	Labor intensive

3.1.1 Bio - digesters

Bio-digester units could be installed at individual households, restaurants and institutions in Agonda which would allow them to be self-sufficient in cooking fuel. Handling wet waste on site with bio-digestion units would drastically reduce the amount of waste to be managed by the Panchayat, as it is presumed that the majority of waste produced in Agonda is wet waste.

Installing household bio-digesters to every home in Agonda (R18,000 per unit, including installation) will be more costly than creating municipal or ward level composting stations.

However, household bio-digesters make homes self-sufficient in terms of cooking fuel. These savings will eventually pay for the cost and installation of the bio-digester unit (The current price of subsidized LPG is R 406/14.2Kg of LPG. Average annual use of lpg per household in India is 140.4kg annually (Chandrasekhar 1). This comes out to an annual savings of R 4014/year. A household bio - digester could possibly pay for itself within 5 years.

3.1.2 Composting

In the 2012 waste management workshop 52% of participants favored a Panchayat level composting system over other options, and 25% opted for ward level composting. Anecdotal evidence from

interviews with residents showed a resistance to the idea of composting on site, and as most Agonda's don't participate in agriculture at their homes, it makes sense to implement a larger scale system.

3.2 Public Facilities

A second component to a comprehensive solid waste management program is public facilities placed at strategic sites to ensure that residents, tourists, or passers through always have a way to get their waste to the appropriate place. Only one public trash can was observed in Agonda at the intersection of MPR-1 and MPR-2, but many more are needed. Placement of bins along the beach road at regular intervals as well as inland in corridors that experience significant foot traffic could reduce litter along roads. See Planning for Sustainable pg 38 for indicators on foot traffic connections to MDR 51. Another strategy would be to look at where dumping occurs regularly and place bins in those locations. See Planning for Sustainable Agonda pg 48 for map of observed dumping locations in Agonda.

Public bins should have options for users to separate waste types. Plastics, food/organic (wet) waste, paper, and general garbage should all have individual containers. This program may need to be pilot tested before town wide implementation in order to gauge use and frequency of pickup needs. Modular bin units may be advisable here as bins may need to be moved depending on season.

To encourage use of public waste facilities, a community outreach campaign could be undertaken to explain what the facilities are and how they are used. Signage, literature, and town meetings are all possible methods of communicating this information and should be discussed by the working citizens group.

3.3 Waste Collection and Transfer

Door to door pick up of waste was cited in the 2013 waste management workshop as most desirable form of pick up. Door to door pick up may be the best way to ensure that residents participate in the Panchayat waste management plan, however it is also the most labor intensive form of waste collection as it requires workers to visit every house and business on at least a weekly basis.

Table 7: Wet Waste Storage Bin Size and Type	
Source: CoE on Solid Waste & Waste Water Management 22	
*LDPE = Low Density Polyethylene Plastic	
*HDPE= High Density Polyethylene Plastic	
	Size and Type of Wet Waste Container
Households	10 - 15 litres capacity bin with lid
Hotels & Restaurants	60 litres capacity - LDPE/HDPE bins
Shops & Offices	Suitable container not exceeding 60 litres
Market Stalls	40-60 litres bin - LDPE/HDPE
Marriage / Town Halls	Dumper Skip
Hospitals	60 litres bin for food & bio-degradable waste

The size and type of container recommended table 7 are based on the waste stream of an urban population in Kerala. The results of a waste survey in Agonda will better inform needed sizes and types of containers.

Door to door collection may not be feasible in some parts of Agonda because of road conditions, depending on what vehicle is used for collection. For example, auto rickshaws fitted to perform collection may not be able to access some of the rough and steep terrain in Agonda. Similarly large heavy waste collection vehicles may not be able to fit on narrow roads while allowing traffic to pass.

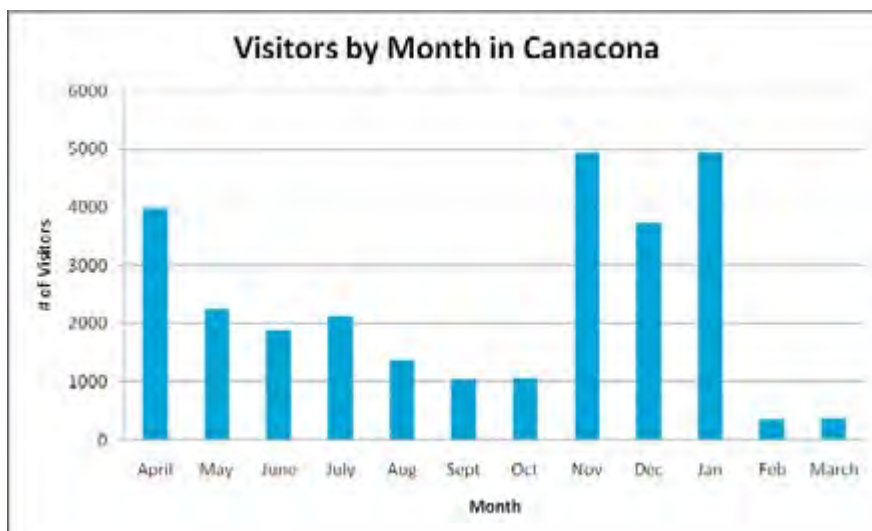
For these scenarios alternative methods of collection may need to be implemented. Where door-to-door collection is not possible, neighborhood collection facilities fed by residents or Panchayat employees moving ahead of trucks to retrieve waste may be alternatives.

Evaluation of road types and collection vehicle selection should be taken into account when developing the waste management plan to account for these types of scenarios.

4. Tourist Season Waste Management Plan

4.1 Tourist Industry Waste Survey

Agonda is increasing in popularity as a tourist destination. The tourists that visit Agonda during the high season of November – January add to the waste stream in Agonda, and this additional waste should be planned for in Agonda’s SWM. However, without knowing how much waste the tourist industry produces it is difficult to plan how to deal with it. The Agonda Waste Survey should be used to identify the quantities of waste associated with these types of facilities.



4.2 Tourist Industry Collection System

Because the tourist industry is almost exclusively concentrated along the beach road (MPR-1) collection of waste could be executed for many or all the tourist operations in one sweep with the correct vehicle.

The amount of organic waste generated each night by hotels and restaurants in Agonda is enough that not disposing of it on a daily basis could lead to unsanitary conditions. It could also provide significant inflows for bio-fuel producing anaerobic digesters or composting stations. Organic waste collection

from hotels and restaurants could be handled by a larger collection vehicle and could take place in the evening after the businesses have shut down or early in the morning so as to not block traffic along the narrow road.

4.3 Tourist Industry Waste Management Financing

Additional resources that will need to be dedicated to managing excess waste created by tourists in Agonda will incur additional costs on the program and Panchayat. An option to finance the waste operations during tourist season would be to implement a tax on tourist businesses.

For hotels the tax could be on the number of rooms available and for restaurants the tax could be based on the square footage of the establishment. In this way these businesses would pay their fair share of waste management costs.

91% of Agondan's that participated in the 2013 community workshop cited that they either strongly agreed or agreed with implementing a tax on tourist based industries to pay for waste management.

Other financing models could be discussed and developed by the citizen's advisory working group in conjunction with the community.

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Survey ID Number: _____

Surveyor Initials: _____

Date _____

Address: _____

Respondents Name: _____

Panchayat of Agonda Waste Survey

Respondents Ward: _____

Wards of Agonda

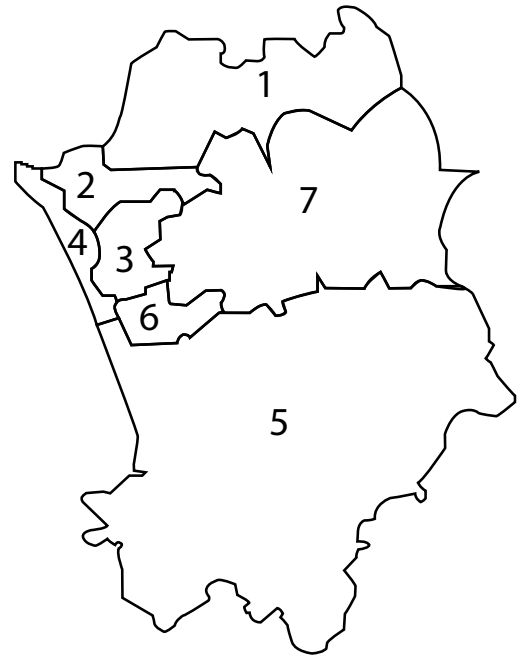
Respondent Type:

Household

Hotel

Restaurant

Retail



If Household, Number of People Living in Household: _____

If Hotel, Number of Rooms: _____

If Restaurant or Retail, Sq / M: _____

Waste Weights:

	Organic (Wet)	Glass	Metals	Textiles	Paper	Plastic	Other	Total
Kg's								

Wet Waste Management Preference:	Not Interested	Somewhat Interested	Interested	Very Interested
Would be interested in installing a household bio-digester:				
Would be interested in contributing to a Panchayat scale bio-digester:				
I would be interested in installing household composting:				
I would be interested in contributing to a Panchayat scale composting system:				

