

# Mapping Informal Waste Sector in Da Nang

UNDP Accelerator Lab Research

Understanding the informal waste sector, its workers & dynamic during COVID - Da Nang Case Study

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# EXECUTIVE SUMMARY

The informal waste sector dominates the tradeable waste collection system in Vietnam. While this ecosystem is not well understood, it is accepted to be one of the most crucial systems diverting various waste streams from landfills and environments across the country. As Vietnam continues to grow economically, there is more pressure brought to essential sectors including solid waste management. The government is tackling this issue with several inclusive and non-inclusive models to overcome this growth.

The UNDP Accelerator Lab performed a series of experiments in 2019 in Da Nang and found that the **informal waste workers (IWW)**, also known as **informal waste pickers (IWP)**, are an integral, essential part of the waste management system. However, they have not been recognized by the government, nor included in any current and future waste management plans of the City. Therefore, the UNDP team set out to do an in-depth analysis of the importance of the IWPs to understand how their work impacts the current waste management system.

To highlight the importance of this informal sector, this study aimed to collect data from various unique angles. Firstly, an in-depth IWP survey was conducted to gather socioeconomic, demographic and waste-related behavioural data. Secondly, in order to capture the waste collection coverage, the study used GPS tracking to map the routes of IWPs. Lastly, key stakeholder interviews were conducted to further understand the entire informal waste sector ecosystem, its players and infrastructure involved. This short study was conducted for two months during May - June 2020 in the area of two districts: Ngu Hanh Son and Hoa Vang (Da Nang city). In total 40 IWP surveys were conducted, 9 routes GPS tracked and 39 coverage maps drawn. Based on the raw data, desk research and stakeholder interviews we have drawn the following key findings:

**Profile of a IWW:** The typical IWW is a middle-aged woman on a bicycle going through pre-selected neighbourhoods to pick up waste either from her established contacts or randomly from households/businesses, earning between 100,000-200,000 VND/day. She has been working as a waste picker for more than 10 years, and has chosen to do this job mainly because it allows her the time and freedom to attend to other domestic duties at home. It troubles her that some people usually look down on her job and some are less environmentally conscious. At her age, although she wants to quit working or change to a better job, she does not think she would have other options.

**Network within the informal waste collection system:** An established network is the main work resource for any IWWs. As waste picking is not exactly a highly desirable job for most people, IWWs only enter the business with the advising of a trusted contact. While looking for random waste on the street is a common method practised by most IWWs, households, restaurants, cafes, hotels, bike shops, construction workers, or even MUS workers contacts, etc are the result of years of experience working in the sector that helps lighten the work of IWWs. On the other hand, in rural areas where there is too little

waste source, IWWs and local CLCs directly compete against each other to buy waste from the local households and businesses.

**Value of metal waste:** Metals are the most sought-after type of waste, with iron at the selling price of approximately 5,000 VND/kg, aluminium at 18,000 VND/kg and copper at 90,000 VND/kg. Plastic and paper are also collected but profit from them usually is just an add-on.

**Secrecy in the value chain:** As the recycling industry is still in its infancy without much recognition from the authorities in Viet Nam, attempts to investigate the contact chain further behind the collection and consolidation centers did not bring many results. All aggregators in Ngu Hanh Son do not know or do not want to reveal who is buying from them, mostly to preserve business contacts and relationships but also in some cases the interviewee did not know their buyer. In Hoa Vang, some upstream contacts were collected thanks to aggregators' openness and the close proximity of the aggregator sites with the recycler's locations situated in and around the city's industrial zone.

**IWW thoroughly cover waste collection in the city:** GPS tracking data was collected demonstrating 3 different collecting methods of IWWs:

- Scavenging random waste on the streets.
- Driving straight to the big construction dump site and picking waste at one stop only.
- Driving the motorbike to designated contacts to ask for waste.

Furthermore, when visualizing the route coverage and GPS tracking maps, it is apparent that the IWWs are covering all streets, alleys, and businesses in a given location. The routes also overlap, even business contacts can overlap, and this further proves the full saturation of waste collection coverage by the informal sector in Da Nang.

**Picking through COVID-19:** IWWs have been deeply affected by the disruption of the industries that generate waste such as tourism, F&B and construction. While there were general health concerns related to their work, medical waste such as single-use masks were not an issue as IWWs observed that they were usually disposed of in the household organic waste bins which they did not go through. Many IWWs have expressed that they feel left out and unsupported by social welfare policies during the time of COVID-19.

**Municipal waste mismanagement:** Of the 16 official MUS (Municipal Dump Sites) of Da Nang URENCO located in Ngu Hanh Son district, 13 were identified. In Hoa Vang district, although there was a list of the general waste pick-up route and the number of waste bins allocated along the routes, no official documentation on the exact location of each MUS was made. Therefore it was impossible for the research team to identify individual MUSs. However, in both districts MUSs have one thing in common: most of them are accompanied by an illegal dumpsite with high environmental leakage with evidence of burning. Construction waste at or nearby the construction sites are also leaving an unsightly aesthetic around the area even with existing regulations against it. While the beachside of the survey area is very well kept, the many spots of the lesser-visited riverside is a complete dumpsite where children have been seen to be playing around.

**Rural vs. Urban waste management:** Comparing Ngu Hanh Son and Hoa Vang districts, in general, the rural areas practice better solid waste management than the urban neighborhoods, with lesser dumpsites



and more municipal collection sites. Separation at source is occurring within rural communities, which is mainly dictated by the agricultural lifestyle in the villages without any need for interventions from the other stakeholders.

Taken together, it is clear the importance of the informal sector in solid waste management in Da Nang. Not only are the IWWs collecting waste from all areas in any given location, if they were not recovering the waste it would likely end in the City's landfill or the environment (including oceans). For these reasons, governments, including Da Nang City, need to re-evaluate how to integrate an inclusive model that successfully manages waste to reach targets while being innovative when collaborating with the informal sector. While there are several points of intervention that need to be considered including collection fees, waste collection, source separation, infrastructure, social system integration and law enforcement. In this study, we recommend an inclusive system that integrates the informal waste pickers directly into the municipal collection; as this work also demonstrated that these relationships between municipal workers and IWWs already exist. Specifically, municipal dumpsites could be managed by one or a selected few IWWs according to defined standards that can include general oversight, cleaning, segregation, watering of planter boxes, handling hazardous waste, electronic waste, calling for landfill collection and potentially educating the users towards source separation.

If sufficient trust is established between the municipal waste operator - Da Nang Urban Environment Company (DURENCO) - and the IWW(s) managing the collection point, the service provided by the IWW can be extended to the local household collection of waste and/or the municipal waste management fee, which is currently handled by DURENCO staff. Cost-saving potential for DURENCO and other mutual benefits of this approach have to be piloted to be fully understood. Social protection (health, accident insurance), protective devices, equipment and training, shall be provided to the selected IWWs by DURENCO. While this model would only be feasible for larger municipal collection points, the IWW could be provided with a bicycle to also service smaller surrounding collection points. Utilizing such a model would overcome many barriers facing the municipal waste system while utilizing available capacity, expertise and coverage of the local informal waste sector.

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# 1. Study Objectives

Da Nang is a class-1 municipality and the fifth largest city in Vietnam in terms of population (with over 1.1 million people). Located on the coast of Vietnam and the mouth of the Han River, it is one of Vietnam's most important port cities. Da Nang is one of the five direct-controlled municipalities and is under the direct administration of the central government. Da Nang has a higher urbanization ratio than any of Vietnam's other provinces or centrally governed cities. It is also one of the most beautiful coastal cities of Vietnam and has abundant tourism potential. Da Nang is implementing the Resolution 204/NQ-HDND dated 19/12/2018 by the City People's Council on domestic solid waste management and Decision 1577/QD-UBND dated 11/4/2019 by the City People's Committee on promulgating the Plan on domestic solid waste segregation in Da Nang to 2025.

UNDP Accelerator Labs (AccLab) were created globally to re-imagine development for the 21st century – and do so at an unprecedented scale by tapping into the relationships, resources, and the expertise of UNDP and its partners. UNDP AccLab in Vietnam has partnered with Da Nang City, and more specifically, Da Nang's Department of Natural Resource (DONRE) to tackle Da Nang's environmental pollution. Based on this partnership, in 2019 the team carried out ethnographic research on different waste management stakeholders in Da Nang and found that the informal waste workers (IWW) have been a big and integral part of the waste management system. However, they have not been recognized by the government, nor included in any current and future waste management plans of the City.

Realizing the important role of these IWWs in the waste management system, AccLab wants to create an experiment to understand and visualize the contribution of IWWs in Da Nang, ie, how their work impacts the current waste management system, as well as to gather necessary data for policy advocacy with the City's government. This project aimed to achieve:

- Research and collect data of IWWs including socioeconomic, demographic and waste-related data.
- Track the routes of IWWs to understand their waste collection coverage throughout a particular area
- Process and present the data in a visual map and report
- Propose recommendations on how to best facilitate the work of IWWs and integrate them in the waste management system of Da Nang.

## 2. Informal waste collection in Vietnam

Vietnam has been listed as one of the top five contributors to plastic waste entering the ocean. Today, a third of the waste in Vietnam comes from urban areas and a significant amount of plastic waste is generated by extensive use of PET bottles and single-use plastic. The country produces over 30 million tons of solid waste per year and an estimated 3,500 tons of plastic waste per day is discharged<sup>1</sup>. The informal sector is responsible for recovering and thus diverting tradeable waste streams from landfills or, if mismanaged, the environment.

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<sup>1</sup> World Bank, 2018

The current waste streams, collection and disposal mechanisms in Vietnam involve various stakeholders from both the formal and informal sectors. Domestic, household waste is not typically source-separated meaning tradeable, recyclable waste is mixed with organic waste and other contaminants. Typically this waste is curbside in front of the business or household directly for collection or placed at a designated dumpsite (which can either be municipally managed or not). The first level where tradeable, including various types of high-value plastics, paper (mainly cardboard) and metal, gets recovered is through informal waste workers (IWWs) or level 0. The IWWs sort through household/ business waste to scavenge any tradeable item and are identifying very specific items based on distinguishing features such as color, size, weight, etc. However, their scavenging behavior is greatly driven by the selling price of a particular stream on any given day.

Next, the IWW brings their yield to an aggregator, typically referred to as a collection center or junk shops. These collection centers are referred to as L1 aggregators and typically interact directly with L0 however some buy directly from businesses or are pickers themselves. These centers are the first point of tradeable consolidation in the waste value chain. In Vietnam, collection centers can vary greatly in size, infrastructure and setup depending on an expansive range of factors. Generally speaking L1 aggregators have simple infrastructure in place, trade with IWWs and are family-owned businesses.

Moving along the value chain, L1 aggregators consolidate tradeable waste streams and once a particular volume is reached (usually restricted by transport or storage capacity) they trade with L2 aggregators or consolidation centers. These centers are much larger in size, trading bigger volumes of waste and are operating larger, more established businesses. The main distinguishing feature between the two levels is the size. While some L1 aggregators trade directly with buyers, often L2 consolidators are in between as they collect more volume and own trucks for transportation before selling to other traders, end buyers or L3 (e.g. factories).



**Figure 1. Informal Waste Sector in Vietnam**

Besides the informal waste collection system in Vietnam, municipal waste operators are responsible for the collection and transport of waste to landfill. They typically have designated collection points throughout the city where households and businesses can drop waste. Additionally, households and

businesses leave waste in front of their homes for municipal workers to collect. This is a paid service and done typically with a pushcart attached to a motorbike for ease of navigating small alleys where large municipal trucks cannot fit. Therefore, after collecting waste per house the municipal worker will bring full carts to the designated municipal collection point which gets serviced by municipal trucks and brought to landfill. Generally, the waste has already been scavenged by L0 pickers before municipal workers reach the waste and if there are any remaining tradeables the municipal workers sort and trade as well.

The current waste value chain in Vietnam has three main endpoints for trash: landfill, environment or recycling. There is still no official, consistent and scientifically-based data regarding the recycling rate of any kind of waste at a national level in Vietnam. A National Environment Report published in 2011 estimated the recycling rate of municipal solid waste is approximately 8-12% and mainly taking place by the informal sector in craft villages<sup>2</sup>. According to the VPPA and VPA, the amount of plastic scrap recycled in 2018 was between 700-1000 tons. Recycling activities within craft villages are manual, outdated and causing serious environmental and health issues. There are an estimated 302 recycling establishments within Ho Chi Minh City, mainly District 11 and of these 67 are recycling plastic<sup>3</sup>.

### 3. Methodology

The informal waste sector on its own is a small ecosystem consisting of a variety of different stakeholders, sites, products and working initiatives. For the purposes / goals of this research, a two-stage approach was applied:

- Desk research: compilation of the previous research and papers and general understanding of local context. Result: the study framework that provides categories and criteria for categorization of main factors in the informal waste value chain.
- Field visits and survey: after completion of final survey questionnaire, the in-field study interviews and surveys took place in Ngu Hanh Son and Hoa Vang districts in Da Nang, Vietnam and detailed approaches for each type of data collection is mentioned below. Result: raw, unique data consolidated from various approaches to build a picture of the informal waste sector in Ngu Hanh Son and Hoa Vang districts in Da Nang city.

The study framework was designed together with the UNDP AcCLab team using the collective intelligence methodology. This framework can be seen in summary Table 1.

**Table 1. The study framework of the IWW research and mapping**

No.	General category	Level	Type	Description
1	Aggregation	L0	Informal waste worker	Consist of waste pickers who collect waste material from trash bins, dumpsites or landfills and have no input cost. Sometimes L0 aggregators have a method of transportation like a bicycle or motorbike, which they use to cover a larger area and collect more waste. At times, L0 aggregators collect directly from the households as well. They have no shop/ storage space of their own.

<sup>2</sup> MONRE, 2011

<sup>3</sup> Ho Chi Minh City DONRE, 2006

2		L1	Collection center (segregation)	These small scrap aggregators who own a shop where they collect, store and minimally process waste material collected from L0 aggregators, households, apartments and small businesses. They typically like to set up shop where they can be guaranteed a constant supply of post-consumer waste – either in residential areas, near industries, or near a landfill. They are material agnostic, and typically buy all material that they deem sellable downstream. They generally sell all the material they collect to an L2 or a larger L1 aggregator in weekly or biweekly cycles.
3		L2	Consolidation center (processing & trading)	Level 2 aggregators: they primarily buy material from L1 aggregators and bulk generators of recyclable waste. To be viable, they have to be able to store much larger volumes of recyclables, and so favour setting up shop on the periphery of the city. Greater specialisation with regards to the material is typically found at the L2 aggregator level, in terms of segregation and/or processing.
4		L3	Processor/Recycler	Level 3 aggregators are driven by specific materials, more professionally established and their waste streams are composed of many L2 aggregators. These are typically located within larger cities, such as HCMC where rPET and other recycled goods are processed into other products/materials.
5		D0	Community collection site	Within streets or communities sometimes organized curbside disposal of waste is taking place in dedicated areas. While some households are typically placing trash in front of their houses in buckets, styrofoam boxes, etc., there are sometimes clear collection points. This has clear intentions by multiple households to be a collection point for the city.
6	Disposal-Dumpsite	D1	Municipal collection site	Municipal collection sites are dedicated locations for waste disposal chosen and managed by the municipal waste operator. These areas have green dumpsters and bind for proper waste disposal from households and small businesses. The municipal waste operator will collect waste with trucks or tricycles (motorbikes with dumpsters attached) on a daily basis. Sometimes these sights also have "walls" enclosing them from the general public to improve city aesthetics and smell.
7		D2	Illegal dump site	Illegal dumpsites are areas that are not permitted by the city officially as waste disposal locations. These sights are often filthy, dirty, smelly and waste burning occurs here. As there is no municipal waste management, these sites often overflow with household and small business waste.

8		D3	Temporary dump site	These consist of illegal dumpsites that appear temporary in nature. They are typically found in empty land lots and consist of various waste streams including household, construction and small business trash.
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### Location selection:

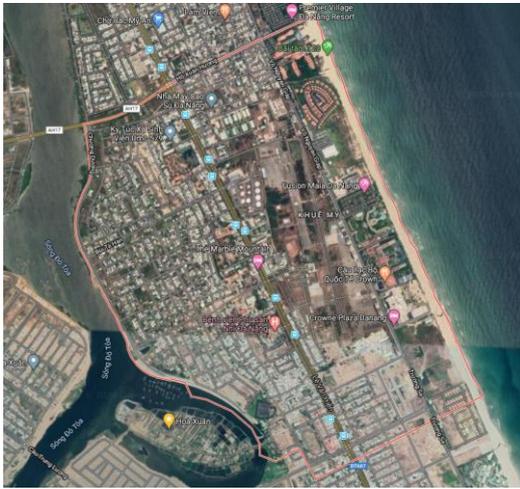
Together with the AccLab team, Ngu Hanh Son district was selected due to an overlapping study with UNDP GEF program and its diverse spread of areas (Figure 2) such as:

- My An ward: A tourist area pre-Covid-19, but has been a mix of local, F&B businesses and more long-term expats along the beach. This is the most populated ward of the district, hence was predicted to yield the largest amount of household waste and the most residential IWWs.
- Khue My ward: A newer, more local area with most of the population living along the riverbank, and most of the waste collecting activity and businesses gathered behind the large establishments (The University Dormitory, The SOS Village, the Da Nang Maternity Hospital).
- Hoa Hai Ward (Marble Mountains): This area is a typical old residential Vietnamese village and even though it is a famous attraction thanks to the mountains and the traditional marble carving art, most tourists only spend no more than a few hours visiting the site and do not stay overnight. At the time of the survey, tourism activities had completely vanished in the otherwise busy marble shops and the Water mountain due to Covid-19. Therefore, waste streams are mainly from local people and a significantly smaller number of local visitors to the Water Mountain compared to pre-COVID. The waste collection sector is also less damaged by the withdrawal of tourism.
- Hoa Quy ward: Recently developed area with a scarce population. Only the main roads are finished, while many places are still empty land lots waiting for development.

After the survey was finished in Ngu Hanh Son district, the research was extended to obtain a deeper understanding of the rural and suburban areas in Hoa Vang in order to paint a bigger picture and to collaborate with the UNDP GEF - Women' Union of Da Nang's project on waste management. Due to the short duration of the extension project and the large size and diversity of Hoa Vang district, the research areas were narrowed down to :

- Hoa Lien Commune: a large and diverse commune consisting of the downstream Cu De river plain, resettlement residential areas, a brand new middle-class area but still in the middle of construction and development, a part of Da Nang's Industrial Zone and the relatively vast but empty Da Nang High-tech Park as well as some agricultural farmland in between. The waste sources, therefore, come from household and small businesses activities, construction and manufacturing work.
- Hoa Bac Commune: the commune lies along with the upstream of Cu Đê River. The majority of the population lives along the two river banks and work in the agriculture/timbering sector. While there are some hospitality establishments, the waste volume generated from tourism is neglectable and mostly comes from households and local businesses.

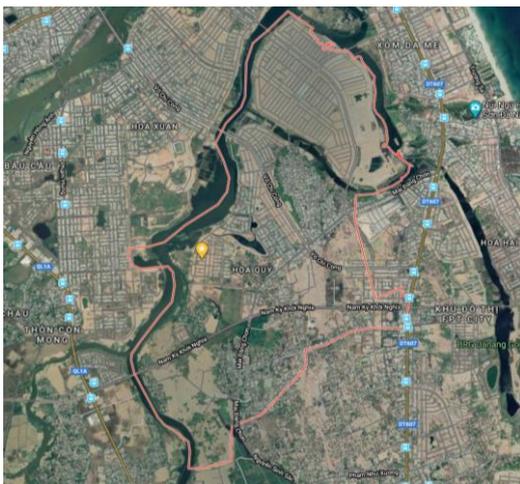
Figure 2. Defined study areas



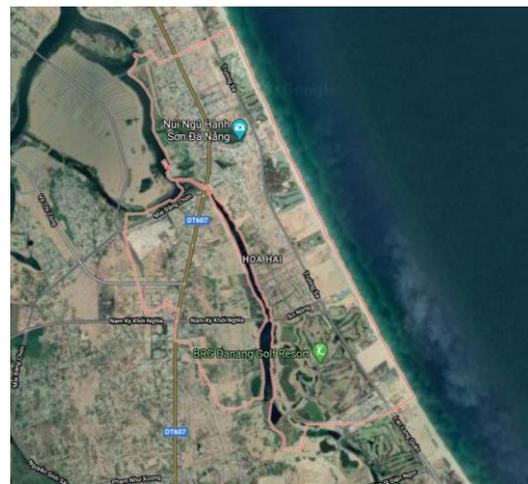
My An ward



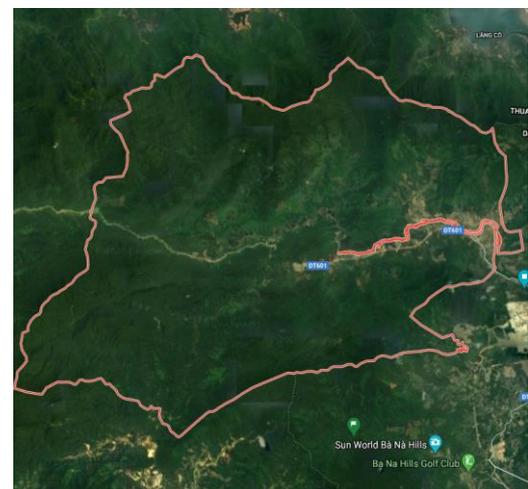
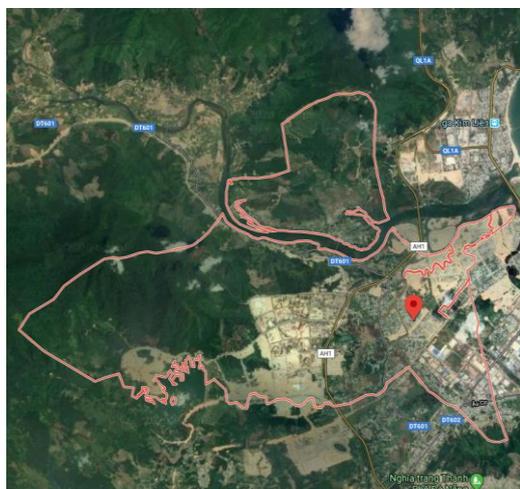
Khue My ward



Hoa Quy ward



Hoa Hai ward



Within the predefined areas, this study deployed the following activities:

- Location survey: Considering the close relation between waste pickers and where they source their waste from, a map of dumpsites and aggregation centers was established. The location survey questions can be found in Appendix 1.
- Informal Waste Worker survey: an extensive questionnaire was presented to the informal waste worker to understand their demographic, socioeconomic, work behaviors and location coverage. The IWW survey questions can be found in Appendix 2.
- Route tracking: To fully study the picking area each individual picker covers everyday, route tracking on consenting pickers was also conducted (only performed in Ngu Hanh Son district).
- Aggregator in-depth survey: to understand this stakeholder group in more detail, an additional survey was composed to interview operators of both collection and consolidation centers. The aggregator survey questions can be found in Appendix 3.

## Methods of data collection

### Location mapping

In this exercise, a Google Form has been created with a set of standard questions to categorize the discovered sites to the right group: disposal / dumping sites or aggregation sites. When a site is initially discovered, a pinpoint would be dropped so that the research team member can have the most precise coordinates of the location. This location's coordinates are then used to input in the aforementioned Google Form with a code name of the site for easy data archives. These sites are then categorized and coded accordingly into:

Dumping sites:

- Temporary dump site (TID)
- Illegal dump site (IDS)
- Community collection site (COM)
- Municipal collection site (MUS)

Aggregation sites:

- Collection center (segregation) (CLC)
- Consolidation center (processing & trading) (CSC)

### Informal Waste Picker survey:

Another Google Form was also created for an in-depth understanding of the IWWs. Each survey was conducted by one interview team member asking an IWW and filling in the online form. Besides data collected from the form, other stories told by IWW and observations were documented and included in the discussion section below.

The questionnaire content was regularly adjusted based on the feedback of the interviewing team and discussion with UNDP AccLabs to ensure the most useful and relevant information would be given priority and attention. The questionnaire can be reviewed in the Appendix 2.

The general approach to conducting the surveys was having interview team members driving around in Ngu Hanh Son and Hoa Vang district in search of random IWWs at work. After introducing our work and the purpose of the survey, each IWW was offered to answer the survey and in exchange for their time, a small stipend would be given. However, it must be noted that this is not the main motivation persuading the IWWs to participate in this interview.

A second approach was having interview team members going directly to the collections centers (CLCs) that trade with IWWs from 3:30 PM to late afternoon. This is the time when most of the IWWs almost finish their working day, come back to their regular CLC to weigh the amount of waste they have collected during the day and get paid by the CLC owner. At the CLC with the most IWWs working with, there were even chairs, a table, a jug of drinking water and a jug of tap water for handwashing prepared for the IWWs to sit and chat with one another. This created a relaxed atmosphere where the IWWs are no longer so pressured to make a living and agree to do the survey when surrounded by familiar people. This approach appeared particularly successful with one of the bigger CLC in My An ward, where the owner(s) seems to have a long-term good relationship with her pickers and relatively open to the research team by agreeing to let the team sit at her center for the whole afternoon. This is not often the case in other centers. Though not confirmed by further supporting data, there is a theory about how the pickers attitude would often be affected greatly by individuals that they have the most interaction with. On a more general note, this reflects the traits of IWW's social network.

### **Route tracking:**

To obtain proof of the coverage of the IWWs in their working area, beside one question in the survey asking IWWs to draw the main routes and areas where they work, route tracking was conducted. A GPS tracking app called Geo Tracker installed on a mobile phone was employed for this task. Given the permission by the IWWs, the research team implemented two methods of route tracking:

- The phone was given to the IWWs at the beginning of their shift, and carried by the IWWs during the entire working time, then given back to the interviewers after work. Some IWWs started their shift at 2 AM, hence the phone was given to them at 5 PM the day before. After receiving the phone back, personal and unrelated data was omitted before exporting the tracking files to other parties for further study. With this type of data
- Interviewing team members followed the IWW with the app on the mobile phone turned on for a shorter period of time, typically around one hour.

The length of the track collected by having interviewers follow the IWWs at work is much shorter than that of the self-tracking because it depended on the IWWs' behaviour. For example, the interviewer followed an IWW to a construction dump site where then she stayed the whole morning; thus not much information would be collected if the tracking were to be continued. Though time-consuming, this method created opportunities for longer discussion to happen between the IWWs and the interviewers, that are mentioned below.

Route tracking was not part of the research in Hoa Vang due to the logistical barriers as well as the fact that route tracking data collected from Ngu Hanh Son has proven that the IWWs indeed covered the entire area of their selected neighbourhood.

### **Aggregator in-depth interviews:**

In Ngu Hanh Son, after completing the Aggregation Location survey and the Informal Waste Picker survey, interview team members went to the identified aggregation centers with a short Google Form for the owners. The questionnaire was to confirm the trading price and volume of the typical waste, the effect of COVID-19 on the business and the relationship between aggregators and IWWs.

In Ngu Hanh Son district, in the same area where multiple IWWs surveys had happened and aggregators had been told about the work of the interview team, CLC owners were particularly more patient and open to answer the questions than CLC owners in neighborhoods where we were not yet the familiar faces. Also, as they are businessmen and women, some questions could be seen as sensitive information not to be disclosed to non-business partners, hence in many of the 10 surveys collected, some answers are left blank.

In Hoa Vang district, the Aggregator and Dumpsite Mapping, the Informal Waste Picker Survey and the Aggregator in-depth interviews were all conducted simultaneously. It is worth noting that CLC owners in both Hoa Bac and Hoa Lien are very open for discussion. All but 3 CLC owners that had been approached did agree to do the survey and provided more detailed information about trading works and upchain contacts than the CLCs in NHS.

### **Methods of analysis**

After this study was completed, the raw data was analyzed using Graphpad Prism 8 statistical and graphing software. As the sample size was limited due to the constraints and scope of work of this study no rigorous statistical analysis was performed.

The mapping component of this work was done utilizing an online version of ArcGIS. This mapping tool provides an interactive, data visualization component that can be easily shared, accessed and embedded.

When any data was used to extrapolate to draw conclusions, the detailed logic was outlined for reference.

### **Assumptions and limitations**

Although the research team has tried to conduct the survey and recorded the most “raw” data, there have been some differences in local culture and perception that might affect the collected responses, especially in quantitative questions requiring the responder’s ability to comprehend a numeric answer. For example, when asked about the average amount of waste collected per month, very few could make a concrete answer as there are high fluctuations between “good” days and “bad” days, resulting in their inability to conclude the monthly volume. The question was then broken down into the amount of daily volume and the average working days in one month. This approach improves the answer’s quality, however it must be noted that the questions still involve the summary of working days, which constantly changes for the IWW sector.

When the surveys were conducted at a collection center, the IWWs were more likely to answer that they only trade with this particular center to maintain their relationship with the owner, while they can have more than one regular trading place.

## 4. Study Activities and Results

### Location Surveys: Dumpsites, Aggregators & Municipal waste collection

We identified and surveyed a total of 221 locations including 165 dumpsites and 56 aggregators. The two main areas that were surveyed were the whole My An ward and the northern half of Khue My ward, i.e from Nguyen Van Thoai street to Bui Ta Han street, and the Marble mountain area surrounded by Le Van Hien - Huyen Tran Cong Chua - Truong Sa - Nguyen Thuc Duong and the Co Co river in Hoa Hai ward in Ngu Hanh Son district. Moving on to Hoa Vang, we also focus the mapping on Hoa Lien and Hoa Bac communes, whose main waste collecting and trading activities stay in the residential Hoa Lien 3,4 and 5 clusters. Of these sites the subcategories of each type of location identified is summarized in Table 2 and example photos of the different categories and subcategories identified in this study can be found in Figure 3.

Table 2. Summary of locations identified by subcategory and location

Category	Subcategory	No. Identified Ngu Hanh Son	No. Identified Hoa Vang	Total No. Identified	Criteria
Dump site	Temporary dump site (TID)	32	15	47	<ol style="list-style-type: none"> <li>1. Temporary site</li> <li>2. Dumping site on empty site lots</li> <li>3. Household, business and construction waste</li> <li>4. Not managed by municipal waste operator</li> </ol>
	Illegal dump site (IDS)	37	8	45	<ol style="list-style-type: none"> <li>1. Not managed by municipal waste operator</li> <li>2. Dump site for many households, small businesses in one area</li> <li>3. Appears more permanent due to volume of waste present and appearance of site</li> </ol>
	Community collection site (COM)	13	4	17	<ol style="list-style-type: none"> <li>1. Consists of mostly household waste</li> <li>2. No formal municipal bins are present</li> <li>3. Often waste is directly placed on the street</li> <li>4. Burning of waste is common</li> </ol>

					in these areas 5. Still with the intention to be collected by city
	Municipal collection site (MUS)	23 <sup>4</sup>	33	56	<ol style="list-style-type: none"> <li>1. Dedicated area where municipal waste operators collect waste</li> <li>2. Usually present are green dumpster or waste bins</li> <li>3. Burning of waste can still occur at such locations</li> <li>4. Sometimes hidden by temporary/moveable walls</li> <li>5. More permanent in appearance</li> <li>6. May see municipal workers emptying bins, cleaning areas, etc.</li> </ol>
Aggregator	Collection center (segregation) (CLC)	32	17	49	<ol style="list-style-type: none"> <li>1. Typically include households, small businesses that collect from L0 aggregators</li> <li>2. Location is typically near a constant supply of post-consumer waste (residential, industry, landfill)</li> <li>3. Material agnostic: buy all material with market value including paper, metal, plastics.</li> <li>4. They are mining separating waste directly from F0 sources and no processing is happening here.</li> <li>5. L1 may utilize small trucks or motorbikes to transport consolidated tradeable materials to L2 sites.</li> </ol>
	Consolidation center (processing & trading) (CSC)	4	3	7	<ol style="list-style-type: none"> <li>1. Typically larger operations that are purchasing primarily from L1 aggregators.</li> <li>2. Not necessarily focused on one particular waste stream</li> <li>3. Often own transport vehicles to collect larger volumes of waste from L1 aggregators</li> <li>4. Not directly working with L0</li> </ol>

<sup>4</sup> Note number identified did not match DURENCO data and 3 locations could not be identified or found, note for these discrepancies in the discussion section of this report

					aggregators
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Figure 3. Example photos of different categories & subcategories



Illegal dumpsite



Temporary dumpsite



Community collection site



Municipal collection site



Collection center (segregation)



Consolidation center (processing & trading)

Furthermore, the location data was inputted into a final map with each layer consisting of a different subcategory of location data (Figure 4) using ArcGIS online mapping tool. Besides collecting the location surveys on the ground, we worked side-by-side with the municipal waste operator Da Nang Urban Environment Company (DURENCO). They provided us with the official municipal waste collection sites in our study areas (Table 3) which we cross-compared with our location surveys and analyzed.

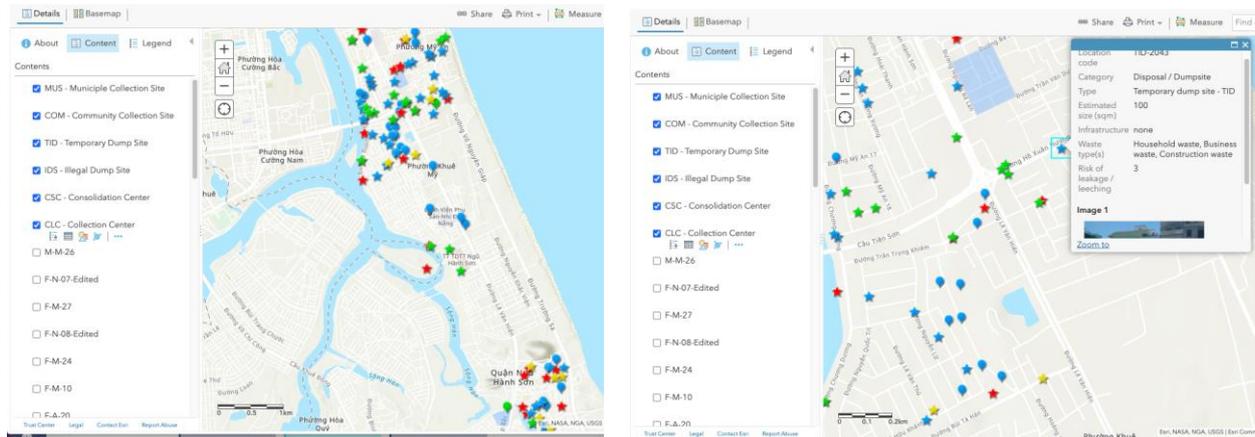


Figure 4. Mapping of location survey points including descriptive pop-out boxes

Table 3. Municipal waste sites provided by DURENCO

Ward name	Street name	Number of sites	Remark
<b>Ngu Hanh Son district</b>			
Khuê Mỹ	Vũ Mộng Nguyên	1	identified
	Trần Trọng Khiêm	1	identified
	Chương Dương (near Tuyen Son bridge)	01 at the beginning of the road	unable to identify
		01 at the end of the road	identified
	Trần Văn Đán	2	identified
Mỹ An	Intersection of An Thuong 34 and new road	1	identified
	An Dương Vương	2	identified
Hòa Quý	Mai Đăng Chơn	1	identified
	Intersection of Vo Chi Cong & new 10.5meter road (unnamed)	1	unable to identify
	New 7.5meter road (unnamed) (near Da Nang Writers Building)	1	identified
Hòa Hải	Nguyễn Văn Nguyên	1	
	Hỏa Sơn 2	1	identified
	Nguyễn Thúc Đường	1	identified
	Tân Trà 9 (end of the street)	1	unable to identify
<b>Total:</b>	<b>11 streets / roads</b>	<b>16</b>	
<b>Hoa Vang district</b>			

Hòa Liên & Hòa Bắc	ĐT 601 road: all the pick-up points on the road		Unable to identify the number of stops for pick-up along the route
	Hòa Liên market		
	Mộ Bà Già		

### Informal waste picker in-depth interviews

Between May 4 through 19th, 57 IWWs were approached in Ngu Hanh Son district and asked for their participation in the research. Of the total approached, 52% agreed to partake in the survey and 30 in-depth interviews were successfully conducted. The data analysis was broken down into two components: demographic/socio-economic & behavioural/waste.

Subsequently, the research was carried on in Hoa Bac and Hoa Lien communes of Hoa Vang district, with 15 IWWs identified and 10 interviews completed between June 18th to June 26th. Similarly, the data collected are also analyzed below.

### Demographic & Socio Economic Data Analysis

Of the 30 IWWs interviewed in Ngu Hanh Son district, 97% (29 respondents) were women while 3% (1 respondent) were male (Figure 5). The age of the respondents was diverse and spread across older age groups, where 14 respondents 47% were in the age group of 50-59 years old and the oldest interviewee was 77 years old (Figure 5).

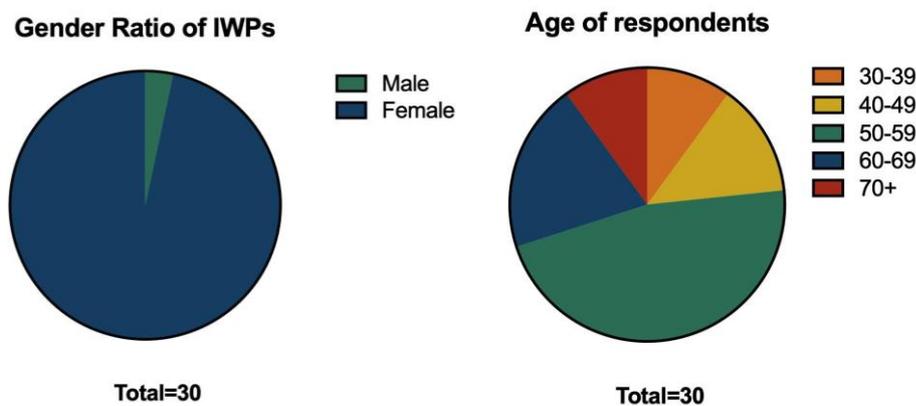


Figure 5. Gender ratio of IWW interviewees and age groups in Ngu Hanh Son District

Interestingly, when analyzing Hoa Vang surveys, 100% of interviewees were female, with one exception of a wife/husband pair. Additionally, 60% were between 50-69 years old, making up for the majority of interviewees in Hoa Vang.

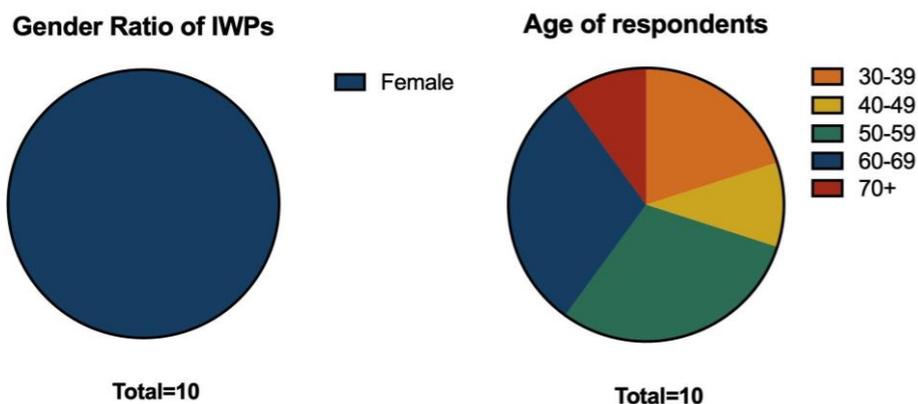


Figure 6. Gender ratio of IWW interviewees and age groups in Hoa Vang District

Among the IWWs interviewed in Ngu Hanh Son district, while many pickers are local residents of Da Nang, many of them also come from nearby Quang Nam Province or even northern Vietnam. Taken together 73% respondents either came from Da Nang or Quang Nam provinces while 13% were originally from the northern province of Thanh Hoa. Interestingly, one picker said she used to work in Ho Chi Minh city but now has relocated to Da Nang since she is from northern Vietnam and the bus ride home is significantly shorter from Da Nang. On the contrary, 100% of interviewees from Hoa Vang study were from Da Nang. This gap represents the labor transfer trend during urbanization. In an emerging economy like Vietnam, workers tend to move from the agricultural sector and rural areas to industry sectors and urban areas to seek for better chances of employment. However, due to Covid-19, the ratio between pickers from Quang Nam and northern Vietnam may not be well represented as pickers commented that many of their fellow pickers who are from northern Vietnam have not yet returned to Da Nang.

Table 4. Hometowns of respondents in study districts

Ngu Hanh Son		Hoa Vang
Province / City	# of pickers	# of pickers
Da Nang	11	10
Quang Nam	11	0
Thanh Hoa	4	0
Ha Noi	1	0
Nam Dinh	1	0
Nghe An	1	0
Thai Binh	1	0

The respondents in this survey were also diverse in terms of the number of years they had worked as a waste picker, ranging from 2 years to 30 years (Figure 7). Taken together, one-half of the respondents in Ngu Hanh Son district have worked in the informal sector for 15-24 years (Figure 7). When analyzing the socio-economic data, one-third of the respondents have 4 family members while the remaining responses ranged from 0 to 16 total family members (Figure 7). In terms of education level, 50% of the respondents

attended secondary school and one-third attended primary school (Figure 7). From this data, 2 IWWs did not go to school while one attended high school and another had a university degree.

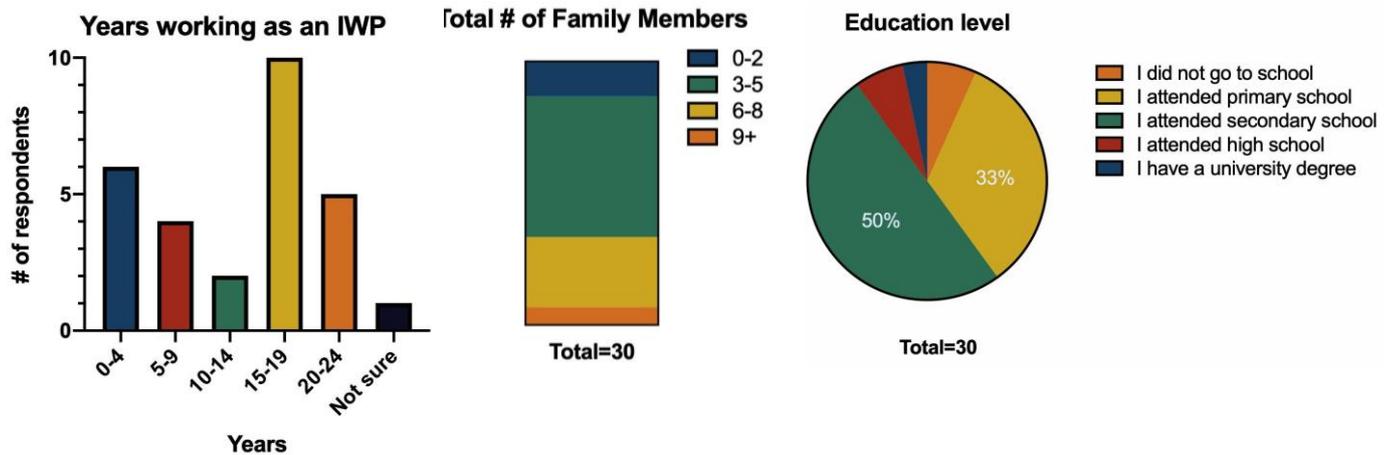


Figure 7. Socio-economic data collected from IWW surveys: Years as IWW, family members and education level in Ngu Hanh Son district

In comparison, Hoa Vang IWWs worked in waste between 1 month and 10 years equally. While the sample size is much smaller in comparison to the Ngu Hanh Son sample set, waste picking in rural areas is much more adopted when in need of additional income. Furthermore, when analyzing the total number of family members in rural Hoa Vang (Figure 8), we observed a 50-50 split between 3-5 and 6-8 family members per household. Lastly, education level varied in comparison to more urban areas. Of the participants, 70% were educated either attending primary school (40%) or secondary school (30%), while another 30% did not attend school. In comparison to urban Ngu Hanh Son, this data suggests the education level of IWWs in the rural area are lower than that in the urban area.

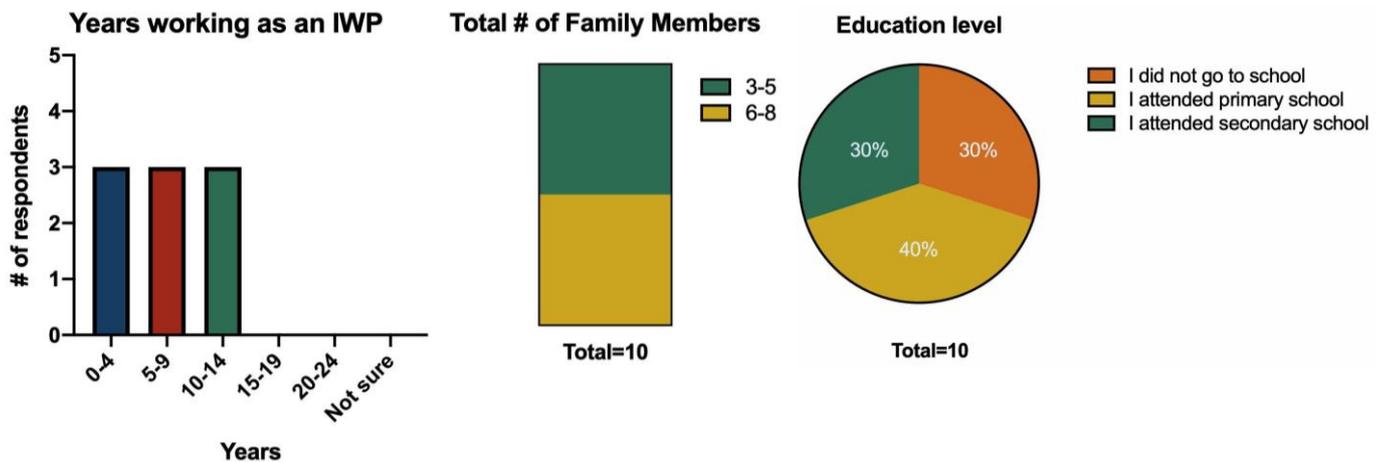


Figure 8. Socio-economic data collected from IWW surveys: Years as IWW, family members and education level in Hoa Vang district

Next, we surveyed regarding their employment status and other potential work. Of the 30 respondents in Ngu Hanh Son, 21 or 70% do not have any other employment obligations, while 30% have other part-time work (Figure 9). From the follow-up questions, we found that those who have a part-time job have various types of employment, including farming, house helper or babysitter. However, those commitments were only occupying between 2-20 hours per week, depending on the respondent. Furthermore, when asked how much time off they take per month the results varied however 45% of interviewees responded

they do not take any time off, while the remaining answered with diverse responses due to the flexibility of the job and some responses included:

- 1 day per week when I am sick
- 4-5 hours every day
- 5-8 days per month
- When I feel sick or have to support my family

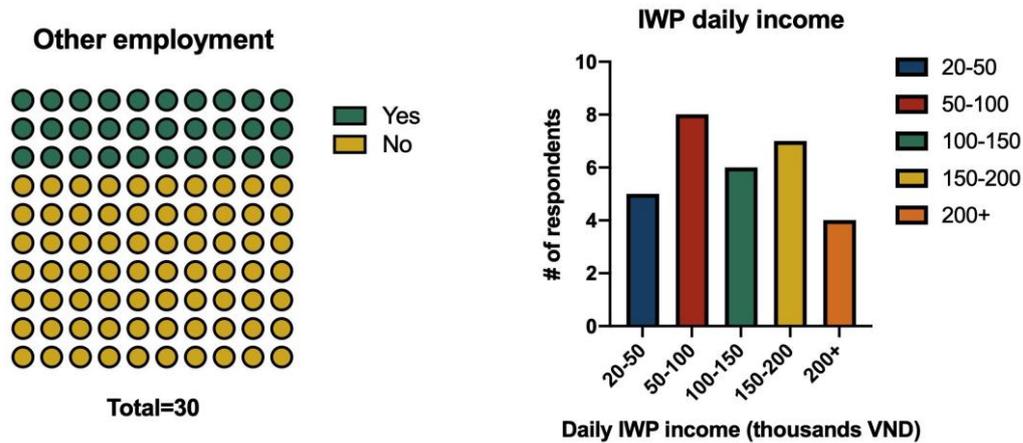


Figure 9. Employment status and daily income of IWWs in Ngu Hanh Son

In contrast, 60% of Hoa Vang respondents mentioned they have another job while 40% cited this is their main income stream (Figure 10). Of additional jobs mentioned, the main response includes farming and simple trading activities such as selling banh bao. This is not surprising as the reduced waste streams and rural life lead to taking on multiple jobs to make ends meet versus in urban areas where waste is more plentiful and can singularly become the main source of income for most.

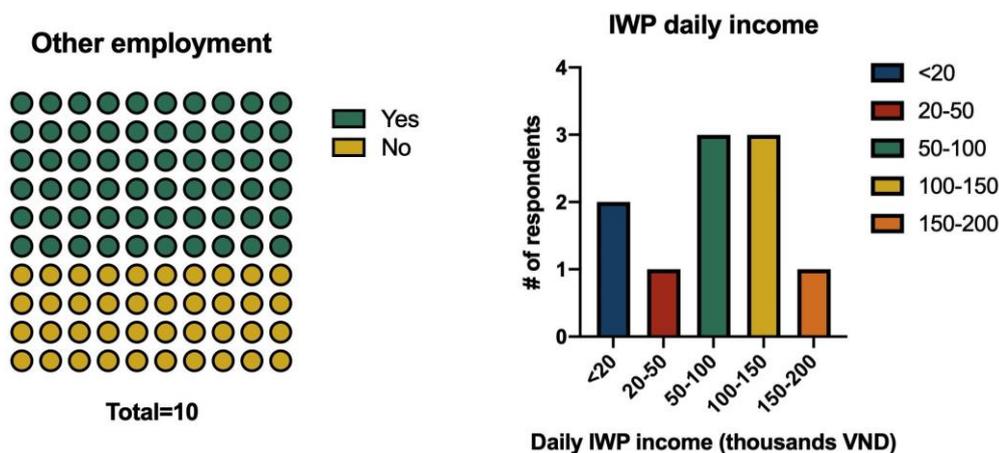


Figure 10. Employment status and daily income of IWWs in Hoa Vang

Furthermore, when asked about their daily income, the respondents reported a range starting from 20,000 VND (\$0.86) per day through up to 300,000 VND (\$12.88) per day in Ngu Hanh Son. A majority of interviewees (27%) reported that they are earning between 50,000-100,000 VND (\$2.15-\$4.30) per day, while (23%) of IWWs indicated their income falls between 150,000-200,000 VND (\$6.45-\$8.60) per day

(Figure 9). However, in comparison, IWWs in Hoa Vang on average are earning less with 60% of respondents earning between 50,000 VND (\$2.15) to 150,000 VND (\$6.45) per day. Furthermore, 20% of IWWs in rural Hoa Vang are earning 15,000 VND (\$0.65) or less, which is in stark contrast to the earnings in urban areas (Figure 10).

Taken together, if IWWs are taking a few days off due to illness or unforeseen circumstances (calculated based on one day per week) and have other forms of employment, they can earn on average income waste picking of anywhere between 1,300,000 to 5,200,000 VND (\$55-\$223) per month. Notably, rural areas are earning much less and need to have side income to make a living and support their families. Note some IWWs indicated a decrease in their income due to the COVID-19 situation and this is discussed in more detail in the “Discussion” section of this report.

### Behavioral & Waste Collection Data Analysis

As part of this study, we investigated the behaviour habits of IWWs as well as waste-specific activities. Waste pickers have various ways to find tradeable waste and different places where they collect waste from Ngu Hanh Son and Hoa Vang district. When they have a full load of tradeable, the waste is traded at a collection center, usually a well-established relationship. When asked how often they trade with their collection centers, the responses were 68% traded with only one collection center and frequency varied greatly (Figure 12). Interestingly, waste trading between stakeholders varies greatly in urban versus rural areas. Most IWWs in Hoa Vang also have one regular CLC, but 30% of them do not sell waste everyday to the CLC. Instead waste trading only happens once every two weeks or even a full month. In 2 of these 3 cases, 2 IWWs in Hoa Bac could not sell waste to the local CLC but instead, save it at home until CLC in Hoa Lien came up and bought it at a better price. This and the data on IWW’s income explained above confirmed the lower volume of waste available to be collected by IWWs in Hoa Vang compared to Ngu Hanh Son.

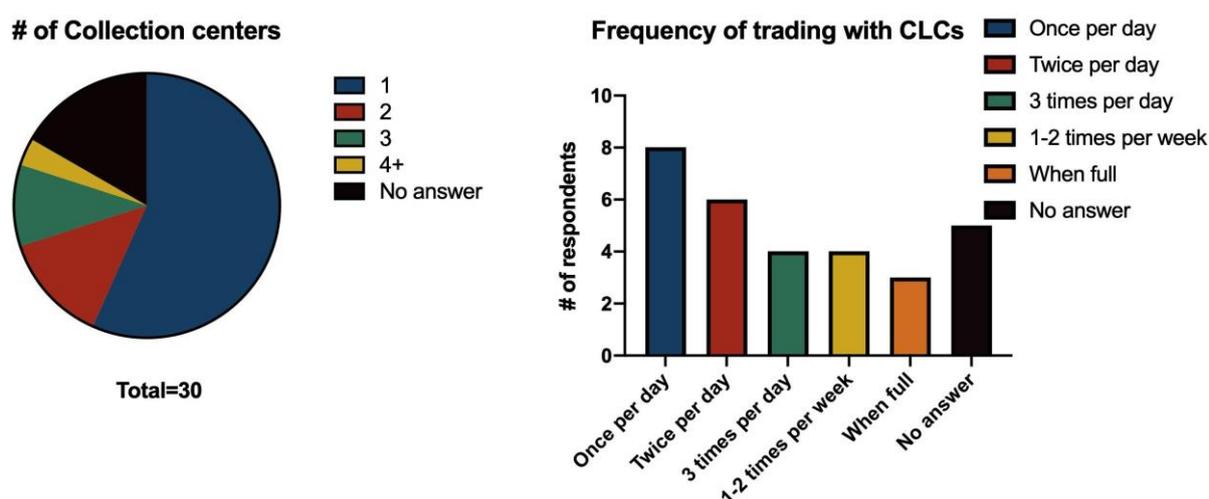


Figure 12. Collection center interactions: Quantity and Frequency in Ngu Hanh Son

To understand the informal waste landscape and sources of collection, we asked the IWWs where they collect waste from and which types of waste is collected. The majority of respondents (60%) mentioned that they collect waste by going around the neighborhood and looking in the bins. This is the most employed method as it does not require any cost from IWWs yet yields the most profit out of 1 kg of

traded waste. One IWW specifically said that her waste is either picked or given to her by households and construction workers and she never buys anything. Additionally, while already riding around using this approach, 12 IWWs (40%) also go to each household to ask. After establishing a network of contacts which is crucial and further discussed below, 14 IWWs (46.7%) come and pick up the waste when their contacts call. These contacts vary from hotels, restaurants, cafes, to corner stores, bike fixing shops and individual households. On the other hand, one IWW said they only pick at large construction sites due to their poor health condition, and another says she mostly picks waste at a MUS where the municipal workers give her permission.

Additionally, the main waste streams currently being traded in Vietnam also correlated with this IWW survey with 100% of respondents ,in both districts, collecting metal, plastic and paper, with one expectation of the IWW that works directly with municipal workers who typically have picked all metal before so she is left with only the cheaper tradeables. These are the most commonly traded streams so this response was expected. However, to understand the waste streams in more detail, we investigated the different types of plastic waste being traded by IWWs (Table 5).

Surprisingly, IWWs are trading other types of plastic waste besides PET (clear water bottles). In fact, they are also trading other plastic material types including HDPE, LDPE (90%) (high-value plastics) but also bags (20%) and even utensils (56%) in Ngu Hanh Son (Figure 13). Some IWWs noted that they were not trading these items but keeping them for their own use. Additionally, IWWs in Hoa Vang are collecting PET, HDPE and plastic containers (100%) and plastic cutlery (50%) is also being collected. As there is no market for the remaining “low-value” plastics, the IWWs will dump the remaining plastics or burn them.

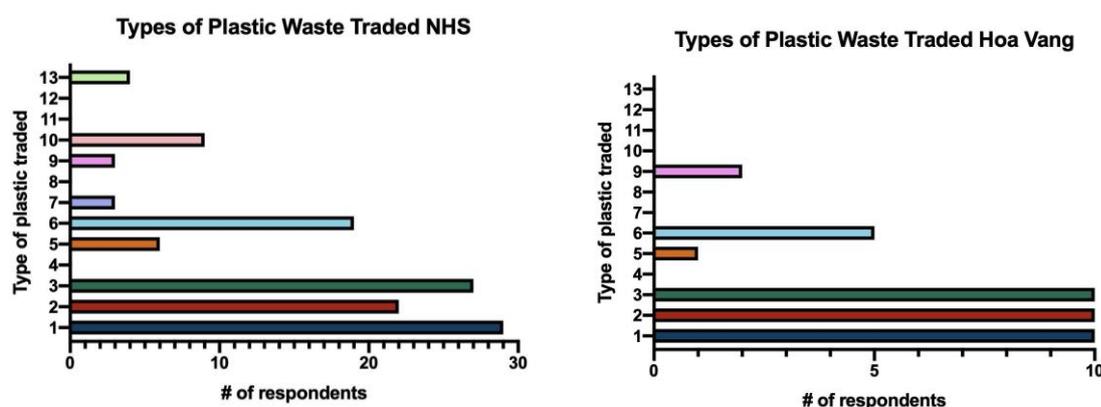


Figure 13. Breakdown of various plastic items traded by IWWs

Table 5. Types of plastic waste to be collected among IWWs

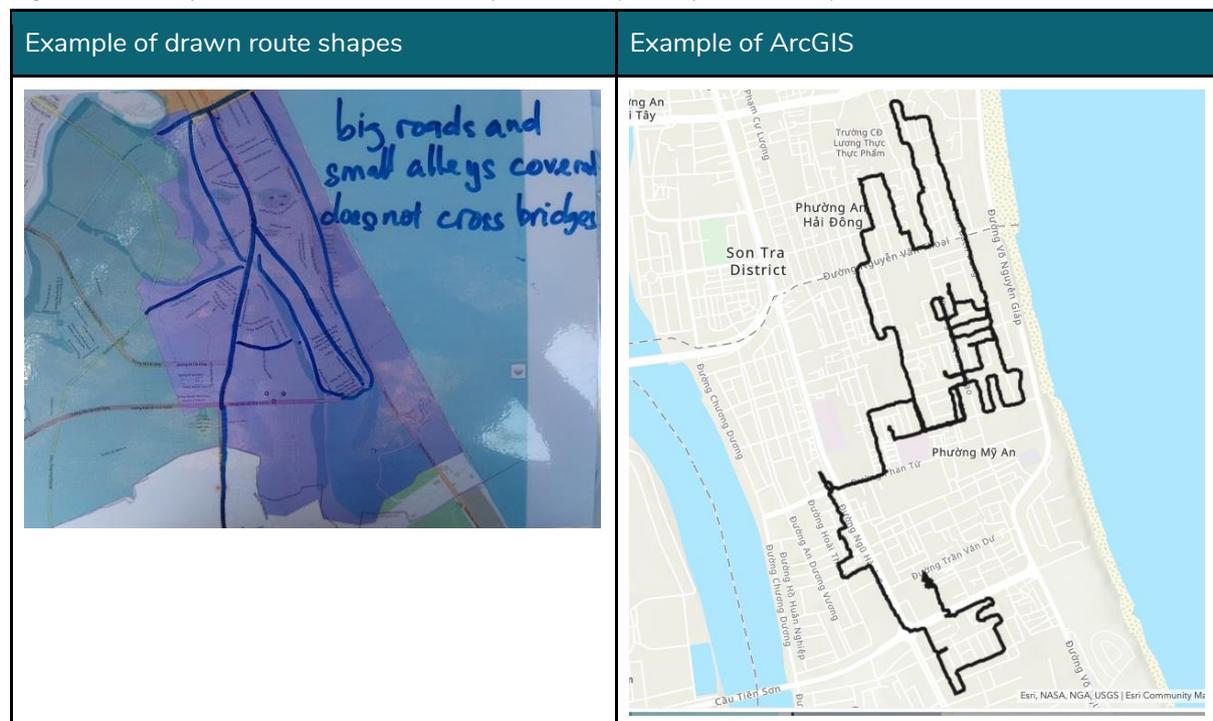
No.	Typical items
1	Plastic bottles
2	Plastic (food, drink) containers
3	Shampoo / Detergent bottles
4	Wrappers

5	Drink cartons
6	Plastic cutlery / straws & Plastic implements
7	Styrofoam packaging
8	Styrofoam (food) boxes
9	Plastic films
10	Plastic bags
11	Plastic bags (black, thick)
12	Fruit cover
13	Feedbag

### Route tracking

The route tracking activity of this study was performed using three main approaches. The first approach was during the IWW survey the interviewer asked for their typical routes they go on to collect their daily yields. This information was captured and drawn on a laminated map and then photo documented. For this type of route tracking, 28 maps were drawn (example in Figure 14.) This data was then drawn in google MyMaps before exported as a raw data file and consolidated into the final ArcGIS interaction waste map (see section 5).

Figure 14. Example screenshot of route shapes drawn (on map in the field) and in ArcGIS from GPS data



The second approach to collect route tracking and coverage data was to equip cooperative IWWs with a phone that had a GPS tracking app enabled. The app used for tracking was called GeoTracker and the phone was placed in a bag for easier transport. Besides location data, this app also collected temporal data, allowing for in-depth analysis on how long IWWs spend per pickup point, etc. While this method proved to be the most challenging due to the short time frame and the resulting lack of trust, for this study we tracked nine pickers for ten routes via this approach and were also able to capture eight successful routes from seven pickers during different times of the day. We collected five routes in the morning, two in the afternoon and two in the night.

**Table 6. Tracking time of IWWs**

Track code	Method of tracking	Tracking time
F-N-07	Self-tracking with phone	3 hours 45 minutes
F-A-08	Self-tracking with phone	3 hours
F-N-08	Self-tracking with phone	5 hours
F-M-10	Self-tracking with phone	6 hours
F-A-20	Self-tracking with phone	2 hours 20 minutes
F-M-24	Followed by interviewer	35 minutes
M-M-26	Followed by interviewer	52 minutes
F-M-27	Followed by interviewer	1 hour

Data on Table 6 hence confirmed what the IWWs had said about their main working hours, with night shift and morning shift being the most important times, while afternoon shift is significantly shorter due to the unfavorable weather as well as the fact that that most waste has already been picked in the morning.

### Aggregator in-depth interviews

In addition to the IWW surveys, a brief aggregator survey was conducted to better understand how collection and consolidation centers are operating in general. During this survey, 10 aggregators were interviewed in Ngu Hanh Son district, of those 08 were collection centers and 02 were consolidation centers.

9 interviews were conducted in Hoa Bac and Hoa Lien in Hoa Vang district, of which 1 was actually a community waste collector, 7 were collection centers and 1 was a CSC focusing on iron. It is important to note that there could be a vast difference between the scale of the aggregators in Hoa Bac and Hoa Lien. Some smaller CLC owners are technically doing the work of an IWW, going out and trading directly with local waste sources of households and businesses, while other CSCs buy directly from factories much larger sums of waste compared to data collected from CSCs in Ngu Hanh Son.

Ngu Hanh Son: Aggregation centers were found to collect metal, plastic, paper and glass. Of the 10 interviewed, 100% traded metal, 100% plastic, 90% paper, and 20% glass. Only 1 of the 10 centers traded all materials, and the most common combination was the trading of metal, plastic and paper (8 responses) with only 2 centers trading glass. Centers were also asked whether they process any waste themselves. 50% indicated that they separate waste types, 20% stated that they remove labels and caps

from PET bottles, while 40% shared that they do no waste processing. 1 center stated that they remove the plastic coating on electricity cables, but that they don't perform any other processing (like remove labels, caps etc.) because it is too time consuming.

Likewise, one CSC owner in Hoa Lien commune (Hoa Vang district) also removed plastic coating of the cable core and said that he used to have a plastic pressing machine, however it did not make a big difference in his profit and he always has to ship the waste out as soon as he can to make room for the newly coming waste.

In Ngu Hanh Son district, of the 4 centers that answered, the volume of metal (mainly iron) waste traded monthly ranged from 100 kg to 10,000 kg with an average of 3,280 kg/month, a median of 1,500 kg/month, and the general consensus for buy and sell prices was found to be 4,900 VND/kg and 5,400 VND respectively. In terms of plastic waste, of the 7 centers that answered, the volume traded monthly ranged from 100 kg to 15,000 kg with an average of 1567 kg/month, and a median of 2,000 kg/month. The buy and sell prices reported were more variable than those for metal. Few respondents specified a buying price, but those provided ranged between 2,000 and 4,500 VND/kg. Selling prices ranged between 4,000 and 7,000 VND/kg for PET, HDPE and PVC; HDPE prices were often cited slightly lower than PET, and PVC pricing equal to or slightly lower than HDPE. Finally, aggregators were trading between 100 kg and 8,000 kg of paper waste each month, with an average of 3166 kg/month and a median of 1,000 kg/month from 3 responses. Buying prices ranged from 1,500 to 2,000 VND/kg and selling prices, from 2,200 to 2,500 VND/kg. This information is summarised in Table 7 below. Because of the huge variability in the amount of traded waste, it is potentially more useful to use the median values to make any comparisons.

The same questions were more eagerly discussed by aggregators in Hoa Vang. Nine aggregators answered our survey and from which data on volumes and prices was collected from 6 to 7 owners, depending on which type of waste. Iron as a representative of metal groups are typically bought from the IWW at 5,000 VND/kg and sold upchain from 5,600 - 6,100 VND/kg. CLCs usually accumulate an iron volume from 1.2 to 5 ton per month, with an average number of 2960 kg/month, and median of 2,350 kg/month. Plastic buying price is 2,000 - 4,000 VND/kg, selling price at 4,000-20,000 VND/kg, trading volume varies from 350 - 2,000 kg/month between each CLCs, averagely 1,086 kg/month per CLC, with an median number of 1,000 kg/month/CLC. Last but not least, CLCs in Hoa Vang trade somewhere between 550 to 3,500 kg of paper per month, on average 2,025 kg/month and medianly 2,1000 kg/month, at the price of 1,500 - 2,200 VND/kg when bought from IWWs and 2,000 - 3,100 VND/kg selling to factories/CSCs.

**Table 7. Summary data related to waste traded by Aggregators:**

District	Material	Amount Traded (kg/month)	Average (kg/month)	Median (kg/month)	Purchase Price (VND/kg)	Sale Price (VND/kg)
Ngu Hanh Son	Metal	100 - 10,000	3,280	1,500	4,900 (Fe)	5,400 (Fe)
	Plastic	100 - 15,000	5,370	2,000	2,000 - 4,500	4,000 - 7,000

	Paper	100 - 8,000	2,870	1,000	1,500 - 2,000	2,200 - 2,500
Hoa Vang	Metal	1,200 - 5,000	2,960	2,350	5,000 (Fe)	5,600 - 6,100 (Fe)
	Plastic	350 - 2,000	1,086	1,000	2,000 - 4,000	4,000 - 20,000*
	Paper	550 - 3,500	2,025	2,100	1,500 - 2,200	2,000 - 3,100

\*the highest quality of plastic waste coming straight from factory, at the time when oil price was high, unclear plastic type

It is worth noting that metal is the main stream of waste that drives the collecting behavior of the IWWs, even though it is not represented in Table 7 of Ngu Hanh Son section. Due to the very small sample scale and the reluctance to disclose what is considered as “business information” of aggregators, more data on plastic price and amount was recorded than on other types of waste. For example, most CLCs interviewed noted that their trading amount varies between a few tons per month for each type of waste, while one CSC only gave the number on plastic of 15 tons/month without mentioning the amount of metal and paper, thus potentially perplexing the data. Contrastingly in Hoa Vang, data was collected on an CSC whose main trading waste is iron, reaching 150 tons per month. However the volume on plastic and paper of his is not that much higher than of a medium size CLC, at 3 ton and 5 ton per month subsequently. Therefore data from this CSC was not included in the Table 7 as an attempt to keep the number neutral.

Aggregators were also asked about the number of pickers that currently trade with their center. Of the 8 that answered this question, only 3 indicated they work directly with IWWs; this ranged from 3 to 7 pickers pre-COVID. Another expressed that they bought waste from construction workers and other people that dropped by their shop, and not from IWWs. Three centers answered that they either mostly purchase waste from smaller collection centers, work exclusively with businesses, or work with large wholesale clients, including big resorts like Furama. The remaining interviewee simply stated they do not work with individual workers. Aggregators were asked whether or not they were operating at full capacity i.e. whether they were trading as much as possible, or whether they could buy more if it were available. Of the 8 aggregators that responded, 6 indicated that they could trade more, but “couldn’t find more sources”, while 2 answered that they were already purchasing as much as they could.

Of the aggregators in Hoa Vang that answered that question on the number of pickers they work with before and after COVID-19, all said that it is the same amount. This is due to the fact that pickers in Hoa Lien and Hoa Bac are all local residents of the area who could instantly start working again after the social distancing period was over, while many pickers in Ngu Hanh Son are from other provinces and might choose to return to their hometown during COVID-19 and have not come back. On whether the aggregator could source more waste or sell to new buyers, the answer is that buyers must be able to pay more than their current contacts, which is interestingly also the same condition for them to be able to win the bids to buy from factories against the current factories’s waste contact..

Beyond waste trading, aggregators in Ngu Hanh Son were asked about their background, and what they liked best about their job. Most were pickers themselves before opening/working in the aggregation centers, while others shared that they had small businesses not related to waste, including selling sugarcane juice and seamstressing. When asked what they liked most about their jobs, responses

included high income and the fact that the work was “easier than working in restaurants”. Several mentioned that they used to be pickers and that they had “worked [their] way up”, while one shared that “it’s just a job that earns enough to get by” and that they didn’t like anything about it. Interestingly, it should also be noted that when asked if and how they felt that pollution in Da Nang was a problem, of the 4 aggregators that answered, 3 did not have any opinion or were unsure, and 1 answered that they felt the area where they lived was clean.

In Hoa Vang, two other CLC owners were also farmers which land clearance brought them to the new neighborhood and career. Another said that she also worked as an IWW for a couple years and opened the shop once she had accumulated enough business contacts. Not only IWWs have multiple jobs but smaller CLCs also have to do the same to sustain themselves. One CLC helps her husband with their ice making facility at home, another spends some of her time on the family’s paddy field, and one is still a worker at an paper factory to which he sell his paper waste, doing 12-hour shift and taking advantage of the 24 hour rest to run the waste trading business, earning him an extra 4-7 million VND/month. Two CLCs observed that the waste they collect are quite clean as well as the areas where they live are well-kept, while one commented that she usually has a sore throat due to having to inhale the paint and chemicals from the waste. Five CLCs and CSC agreed that this job provides a good income and three enjoyed the flexibility, however most commented that they do not think there is a future in it. The job is getting harder and harder to sustain as “people used to give away waste for free but now we have to buy”, or “there is too much competition now”. One said she had contact in a factory of the industrial zone and was in process of finishing the contract to buy from it but gave up because of too much complicated paperwork, she is in her 50s and plans to retire in a few years. Finally, aggregators were asked how their business had been affected by COVID-19. 100% answered that the amount of waste they are currently trading has noticeably decreased, 60% answered that the price of waste had also decreased, and 40% that there are less IWWs currently working.

Four CLCs in Hoa Vang said that there are fewer IWWs working during COVID-19, while the trading price has fluctuated. 100% of aggregator noticed that the waste volume also has gone down, in some cases for so long that they had just started trading again since early or mid-June. One CSC owner especially comments that some of his aggregator friends have closed their business because they could not afford rent and salary for their workers during COVID-19.

## 5. Informal waste sector mapping

Taken together, the data collected above was either analyzed, mapped or both depending on the type of data and information that needed to be visualized. For this study, the raw data was collected and inputted into a consolidated map to give:

- An overall impression of the informal waste sector in the selected locations
- A view of the potential waste hotspots where dumpsites are high and waste collection coverage is low
- An interactive data visualization tool to understand the informal waste sector’s involvement in waste collection and management
- An indication on the IWW collection coverage within selected areas

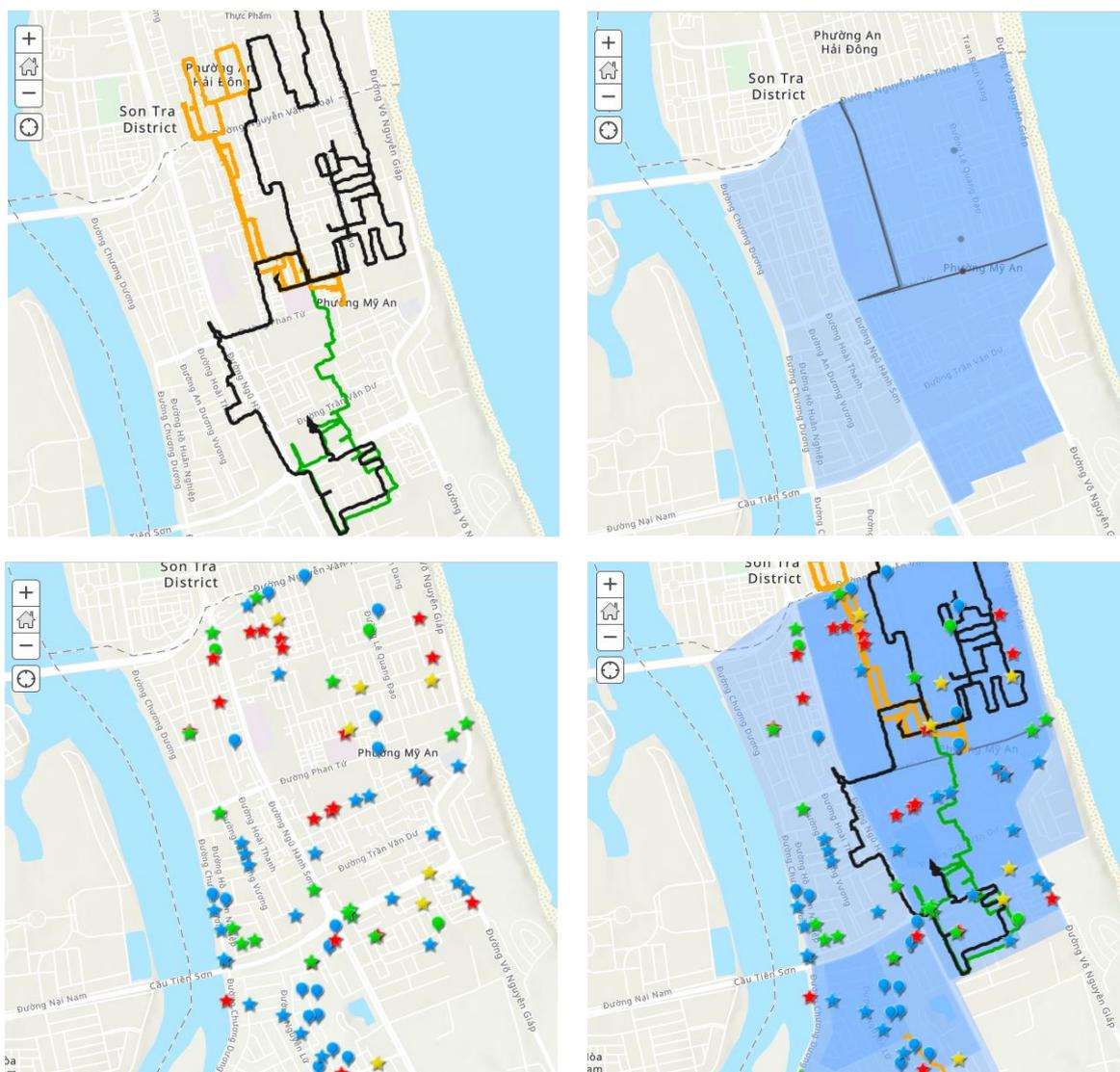
The map was color coded for ease of use and below is a descriptive legend:

- Dumpsites: Star icon with colors based on subtype

- Aggregators: Pinpoint icon with colors based on subtype
- GPS tracked routes:
  - Black routes indicate this route was tracked at night
  - Orange routes indicate this route was tracked in the morning
  - Green routes indicate this route was tracked in the afternoon
- Coverage maps:
  - General color of opaque blue
  - Within each coverage map there are two layers, one indicating the coverage shape (blue) and the other are distinct pin points (gray) where the picker drops off waste (e.b. CLCs or CSCs). Therefore when location points are layered above the exact aggregator they are working with can be distinguished.

The map for this study can be accessed [here](#) and below are selected screenshots taken of the map for illustrative purposes only.

**Figure 15. Screenshots of interactive map from ArcGIS**



Under this study the following assumptions were made by the UNDP team. After our data collection and mapping we can make the following conclusions:

**Assumption 1:** IWW routes cover most (>80%) of the geographical area in the study.

*Testing - Did the data collected in/validate the above assumption? (e.g: using routes data to show coverage)*

Through this research study, specifically the route tracking and mapping we validated that IWW routes cover >80% of the geographical area for this study for both Ngu Hanh Son and Hoa Vang district.

**Assumption 2:** There are areas with higher concentration of IWWs activities than others (hotspot).

*Testing - Did the data collected in/validate the above assumption? (e.g: using location and timestamp data to show if there are higher concentration of activity in certain areas or not)*

The research highlighted some key areas where pickers concentrate (mostly CLCs to drop off waste) but this is only for a short period of time. Typically, IWWs are dispersed during collection and have dedicated areas of focus based on relationships, behavior and methodology. It is worth noting that there are certain areas/streets where the aggregation businesses gather closely together specifically An Thuong Area in My An, Alley 70 Bui Ta Han in Khue My, Nguyen Duy Trinh and Tran Dai Nghia in Hoa Hai. These locations are where more IWWs are found, especially in the late afternoon during trading times.

**Assumption 3:** The collection/aggregation centers are central nodes of waste trading activities

*Testing - Did the data collected in/validate the above assumption? (e.g: using location and timestamp data to show if IWWs converge more in areas with more collection center or not)*

All waste trading activity is occurring via aggregation points, mainly collection centers. As they are the main buyers of waste, IWWs collect their daily yield and trade with CLCs directly.

**Assumption 4:** The IWWs and informal sector contribute significantly to Da Nang waste recycling effort.

*Testing - Did the data collected in/validate the above assumption? (e.g: using coverage area data, volume data to compare with formal collection and recycling to come up with an rough estimate of the contribution)*

Based on the data collected, we are generally able to extrapolate collection volumes from different angles (IWWs, CLCs, CSCs), providing a reasonable confidence in the estimated collection volume of the informal sector, despite a very limited sample size.

To derive the estimated collection volume of the informal sector in Danang, the following datasets were used:

- **From IWWs**
  - Number of IWWs in a clearly defined area (compare page 37)
  - Extrapolation of number of waste pickers to Danang (low, medium, high)
  - Average collection volume per IWW (below)

<b>Independent Waste Pickers</b>			
<b>Daily amounts (in kg)</b>	<b>Metal</b>	<b>Paper</b>	<b>Plastic</b>
NHS	12	32	9
HV	12	10	15
NHS & HV Average	<b>12</b>	<b>21</b>	<b>12</b>
Total average IWP collection / day	<b>45</b>		
	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b># IWPs in Danang</b>	1,000	1,400	1,800
Total Waste Collected / day	45,000	63,000	81,000
Total Waste Collected / month	1,350,000	1,890,000	2,430,000
in Tons	1,350	1,890	2,430
<b>IWP collection / waste to landfill</b>	4.50%	6.30%	8.10%
<b>IWP collection / total waste Danang</b>	4.31%	5.93%	7.49%

**Interpretation:**

- IWWs play a significant role in the overall recovery of recyclable waste, with a total collection between 6% and 7.5% compared to the volume brought to landfill (approximately 1000 tons per day).
  - As the study was conducted during COVID19, which as described in this report had a significant impact on the total waste volume, the normalized total volume can be assumed to be higher than the calculated values (possibly 10%).
- **From CLCs**
    - Number of CLCs in Danang from independent waste sector report by IUCN presented at PRO Vietnam Anniversary 2020 (estimated at 336; with sensitivity analysis low and high)
    - Average collection volume per CLC (below)
    - Considering that CLCs also buy direct from the source as well as from the municipal waste workers, it can be assumed that the total volume of all CLCs is slightly above that of all IWWs

<b>Collection Centers</b>			
<b>Daily amounts</b>	<b>Metal</b>	<b>Paper</b>	<b>Plastic</b>
NHS	110	130	52
HV	99	67	36
NHS & HV Average	104.5	98.5	44
Total average CLC collection / day	<b>247</b>		
	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b># CLCs</b>	300	336	400
Total Waste Collected / day	74,100	82,992	98,800
Total Waste Collected / month	2,223,000	2,489,760	2,964,000
in Tons	2,223	2,490	2,964
<b>CLC collection / waste to landfill</b>	7.41%	8.30%	9.88%
<b>CLC collection / total waste Danang</b>	6.90%	7.66%	8.99%

**Interpretation:**

- As assumed, the total volume lies slightly above the IWW percentage, as the collection is not limited to IWWs but also aggregates collection from municipal workers and other sources.
  - Similar to the above, the values may be influenced by COVID19 and may be slightly higher during regular operations. There currently is no reliable data on the changes on total collection volume by the municipality.
  - This extrapolation and calculation derived a total recovery ratio of around 9% of the total waste volume (compared to the pre COVID19 disposal amount of 1,000 tons / day).
- **From CSCs**
    - Collection volumes of consolidation centers collected during the study
    - Assuming that the total number of aggregators includes CLCs and CSCs
    - Assuming that for each 25 CLCs, one CSC consolidates the volume and collects additional waste (directly from businesses, factories and other sources)

<b>All Aggregators</b>			
		<b>Ratio</b>	
<b>CLCs</b>	247	25	6175
<b>CSCs</b>	5000	1	5000
		26	430
	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b># aggregators</b>	300	336	400
<b>Total Waste Collected / day</b>	128,942	144,415	171,923
<b>Total Waste Collected / month</b>	3,868,269	4,332,462	5,157,692
<b>in Tons</b>	3,868	4,332	5,158
<b>CSC collection / waste to landfill</b>	12.89%	14.44%	17.19%
<b>CSC collection / total waste Danang</b>	11.42%	12.62%	14.67%

**Interpretation:**

- As CSCs typically have advanced transport and logistics capabilities, additional waste streams can be utilized by CSCs, such as direct business collection, collection from factories, etc., which yield higher overall collection volumes of 12-15% of the total waste.
- While this value is highly dependent on the above-mentioned assumptions, it is generally in line with our expectations, that CSCs would have a higher total recovery than CLCs and CLCs would have a higher total recovery than IWWs as it follows the informal value chain conclusively.

**Assumption 5:** There are many illegal dumping sites in NHS and Hoa Vang and they keep reappearing in similar spots.

Testing - Did the data collected in/validate the above assumption? (e.g: using location data, and ideally come back to check if the site has been cleared or if new site appears)

While this is out of the scope of this study, generally the sites identified are typically illegal dump sites composed of construction waste in a neighbouring empty lot. These sites continuously appear as other

construction sites dump waste at the same or other empty land lots. Other types of illegal sites were also observed but are not as common.

## 6. Discussion

The informal waste sector in Vietnam is responsible for the collection, trading and even recycling of entire waste streams in the country. This study set out to prove the importance of this sector and in particular of the individuals involved in this value chain. As municipalities begin to restructure their waste management operations to accommodate growing economies, populations and therefore increased volumes of waste there is a high risk that this sector will be left behind. For these reasons, this short experiment together with the UNDP AcCLab aims to shed light on the informal waste sector in Da Nang, specifically the informal waste pickers and aggregators. By doing this we can make inclusive recommendations to the government that engages, supports and collaborates with the informal waste sector for a mutually beneficial system that adequately addresses the urban waste challenges..

### 6.1 Formal and informal waste infrastructure

By understanding the waste sector infrastructure, a framework begins to assemble for both the formal and informal waste ecosystem. Through the location surveys both dump sites and aggregators were identified. In the map, visually one can see the widespread reach of the aggregators throughout the selected area. This coverage of collection sites allows for more convenient drop-off for pickers and more small business owners in one particular area. It is worth noting that there are certain areas/streets where the aggregation businesses gather closely together specifically An Thuong Area in My An, Alley 70 Bui Ta Han in Khue My, Nguyen Duy Trinh and Tran Dai Nghia in Hoa Hai.

#### 6.1.1 Dump site mismanagement

In this study what became apparent was the overwhelming identification of dump sites. The disposal of waste in Da Nang is highly mismanaged as many dispose of their waste wherever they choose and burning of waste is still a common practice. The related health risks seem to be poorly understood by the local community. In particular, in many areas around My An and Khue My wards, infrastructure and private construction development are happening fast, which results in many construction sites. Aesthetically speaking, it looks messy and moreover it is dirty with high risk of environmental leakage. While IWWs go there often to collect scrap metal for trading, after construction is finished the waste is dumped usually at the nearest empty lot for another individual to manage.

Notably, there are clear regulations against the act. In particular, Circular 08/2017/TT-BXD mentions that solid construction waste management lies with the construction project investors or household owners and the responsibilities include:

1. They must submit a Solid Construction Waste Management Plan or an Announcement of Solid Construction Waste Management to the authority before construction happens, stating the estimated amount of waste, waste recycling plan and information of the third party waste collectors and recyclers.
2. They are responsible for the waste management at the site.

Therefore, the issue surrounding disposal of construction waste seems to lie in the lack of enforcement of regulations that are already in place.

In comparison, the Marble mountain area is an older residential area compared to the new area in An Thuong or the river area. Therefore, in and around the Marble mountain area not many empty land lots are turned into dump sites. Even the dump sites seem to have significantly less trash than My An area, possibly because there is less construction going on and thanks to the local government paying attention in cleaning them up more regularly.

It is worth noting that while the beach side of Ngu Hanh Son is very well kept and regularly cleaned up, the riverbank is the opposite. With lesser people visiting this area -mostly local residents, less attention is paid and most of the riverbank is classified as TID or IDS with a very high chance of leaking directly into waterways. This observation would allude to the fact that if the government prioritizes keeping areas clean it is possible and works well, however if there is no clear directive given the area becomes a dumping ground. During the course of this study, a 1km stretch of the riverbank has been turned from natural habitat into illegal dumpsite in a matter of days. The total volume can be assumed to sum up to 10-15 truck loads of construction and mixed waste. Given the extent of this event, one has to question if this is just a result of lack of municipal enforcement or a result of a more intentional illegal disposal approach.

In Hoa Bac and Hoa Lien of Hoa Vang district, the amount of TID and IDS are also substantially fewer than that of the urban My An area, due to:

- The largest residential area of Hoa Lien is actually a new resettlement zone for people whose land clearance and the subsequent compensation moved them to this area. Therefore while there are also a high amount of large and small, both public and private construction going on, the construction site is on an previously empty land lot that require no dismantling work which generates the low-value uncollected construction debris. In My An a lot of construction work includes renovation and reconstruction of a house after which the local household do not know where to discard their waste.
- It is also possible that with larger scale work of building highways and infrastructure as well as putting up brand new middle-class residential areas, the implementation of the waste management plan is better followed. It was observed in Hoa Lien that construction materials and tradable waste are left in a more organized manner at the sites compared to in Ngu Hanh Son. A CLC owner has commented that he has trading contracts to buy metal waste from construction companies via bidding processes.
- In Hoa Bac, due to the nature of farm work, agriculture waste is usually left by the sidewalk, but this type of organic waste has always been utilized for other purposes and does not create a negative impact on the local people's life although occasionally, dead plant waste is gathered and burned instead of being left back in the farmland, causing smoke and burning sight on the roads.

The waterways including river and channel in both Hoa Bac and Hoa Lien are also observed to be free of plastic waste. This could be explained as these are the upstream river and small channel ways which have accumulated little to no plastic waste along the course, and local people do not have the habit of treating the river and channels as dumpsites.

### ***6.1.2 Dump sites and municipal management***

The managed dump site situation became clearer once we worked with the municipal waste operator DURENCO to get a list of official collection points. As the organization in charge of waste management and disposal of the entire Da Nang city, DURENCO has a schedule to pick up waste from households and

businesses on a daily basis in Ngu Hanh Son district. Due to the features of small streets and roads in Vietnam, Da Nang included, DURENCO has to use different means of transportation to be able to access different areas. For big roads accessible for cars, a waste truck equipped with a compressor will stop in front of each dumpster to collect the waste. However, for smaller streets and even alleys in the urban areas of Ngu Hanh Son, DURENCO workers will have to ride a bike, which is more compact and easy-to-manuever in narrow spaces, to collect waste from households and possibly small businesses. The waste collected on a bike will be then brought to a collection point located on the regular routes of DURENCO waste trucks. Those collection points are called “lifting” points (“điểm nâng” in Vietnamese). Within the framework of this study, the research team has contacted DURENCO and received a list of those “lifting points”, which are referred to as MUS’s (see Table 3. Municipal waste sites provided by DURENCO). One interesting finding is that in the surveyed area of Ngu Hanh Son the research team identified 23 MUSs, meanwhile the number of “official” MUSs is 16. The reason for this discrepancy lies in the fact that on the roads / boulevards that are relatively long, in addition to the fixed “lifting points”, DURENCO still has to arrange small dumpsters along the way to mitigate the littering. Often, these public MUS sites are only arranged additionally on the streets/roads that are relatively empty, without many households or businesses (thus the shortage of waste bins).

In Hoa Vang district, due to its special geographic traits and scattered population, the waste management mechanism is completely different from the rest of Da Nang. DURENCO is only responsible for waste pick-up at the MUSs located on their route and the treatment of such waste. In each village / community, a person appointed by the local authority will work as a public waste worker, collecting waste from households and businesses and bringing to their nearest MUSs. During the process, these appointed “public” workers might freely collect the tradables from the waste, making some extra money alongside their main income from being a “public waste worker” for the community. This could be the most suitable mechanism for the region, however its internal operation process reveals a shortcoming: as the person in charge of community’s waste collection is not fully trained and paid by DURENCO, the working quality of this personnel is uncontrollable, resulting in bigger issues in waste mismanagement than in urban areas like Ngu Hanh Son. In both Hoa Bac and Hoa Lien, the waste mismanagement of the local responsible person leaving each MUS a messy dump site has been reported as one of the more bothersome environmental issues to the local communities. For more information on this please see our “Solution cards” which can be found [here](#). Complaints have been collected from the people living around and suffering from this type of mismanagement are:

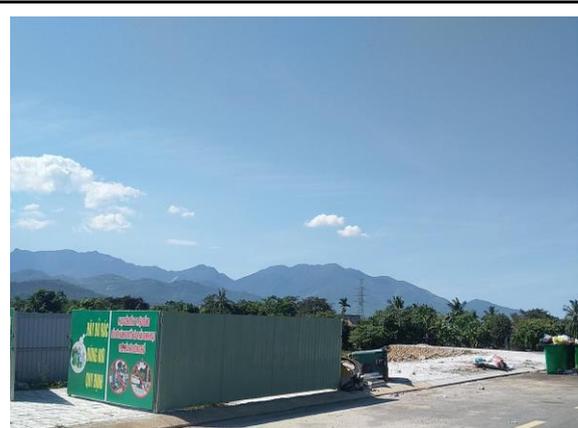
- Households in certain newer resettlement residential areas do not have their waste picked up from their house even though they have to pay the same amount of collection fee as areas that do.
- MUSs in the more rural areas are often disturbed by cows and then smaller animals such as chickens, dogs, rats will pick at the bags.
- Waste bins at temporary MUS sites once full of trash are also supposed to be regularly towed away to the official MUS sites and replaced with empty bins but in many cases are not and only cleaned up when the trucks come to collect waste as scheduled.
- Some temporary MUS bin placement also cause concerns to the people living nearby, for example a temporary MUS is put at the village’s commonplace, which usually serves as children’s playground in the afternoon, or the rice drying platform in season and occasionally the wedding venue. However local people reported that the site is always unsightly and smelly, especially in the raining season, when water will leak from the bin and run into her house. At another site in the

same village, 2 municipal bins are put on the mainroad in the most busy area of the village. The grocery store owner across the site said she has complained to the Secretary of Hoa Lien PPC and the head of the village living next by is also aware, but nothing has changed and her family and business have to suffer the smell of dead rats and other decomposing waste all year around. Once a week, the truck will come to collect waste but besides that, the full bins are never towed to the official MUS in the field nor the site is cleaned up.

- MUS does not have enough bins and the waste pick up frequency is not sufficient enough, causing waste to be left outside of the bin and get picked at by cows and chickens.



MUS in the rural area are often crashed down by cows or and then chickens, dogs, rats will pick at the bags. Trashful bins at temporary MUS sites are also supposed to be towed away and replaced with empty bins but are not. (MUS-2158, Hoa Lien)



MUS with metal walls but the workers prefer to leave the bins outside. (MUS-2161, Hoa Lien)



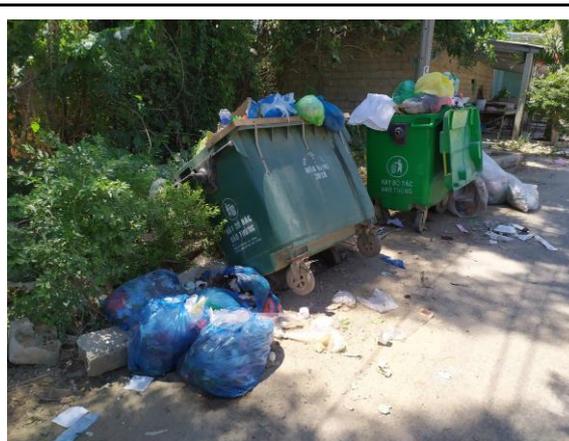
MUS does not have enough bins and are not collected regularly enough, get picked at by cows and chickens (MUS-1053, Hoa Lien)



MUS whose bins do not have lids to prevent waste spillage. (MUS-2141, Hoa Lien)



Temporary MUS is put at the village's commonplace, which usually serves as a children's playground in the afternoon, or the rice drying platform in season and occasionally, a wedding venue. However local people report that the site is always unsightly and smelly, especially in the rainy season, water will leak from the bin and run into her house. (MUS-3003, Hoa Lien)



Two municipal bins are put on the mainroad in the most busy area of the village. The business owner across the site said she has complained to the Secretary of Hoa Lien PPC and the head of the village living next by are also aware, but nothing has changed and her family and business have to suffer the smell all year round. Once a week, the truck will come to collect waste but besides that, the full bins are never towed to the official MUS in the field nor the site is cleaned up. (MUS-2142, Hoa Lien)

It also seems that the waste management authority is well aware of the issues above and efforts to correct the problems have been made and observed at some MUS points, such as MUS bins with lids on to prevent spoilage, or official MUS that is covered with metal wall and concrete floor, not only to prevent spoilage and leaking and animals from access the waste but also to require people to get off their bike and put waste properly instead of throwing the waste at the bins while driving by. However at one beautiful well kept walled MUS, burning still takes place out of the wall and at another, the MUS workers decide to leave all the bins outside of the walled space for convenience.



MUS protected by metal walls not only prevents animals from accessing the waste but also requires people to get off their bike and put



MUS with concrete floor prevents leaking into the soil. (MUS-2156, Hoa Lien)

waste properly instead of throwing the waste at the bins while driving by. (MUS-2156, Hoa Lien)



MUS with more bins and better collecting frequency as well as more motivated workers. (MUS-1029, Ngu Hanh Son)



Municipal bins in a temporary location (in front of a school) are equipped with lids to prevent spillage. (MUS-2240, Hoa Lien)

Overall, these efforts show that it is entirely possible to perfect the waste management system with enough awareness, enforcement and collaboration between the local communities, the formal waste workers and higher policy planners. There are already models of such collaboration happening at a smaller scale that can be adjusted and applied to the city-wide scale.

### Spotlight Story: PPC - DURENCO - Semi-formal Picker Triangle

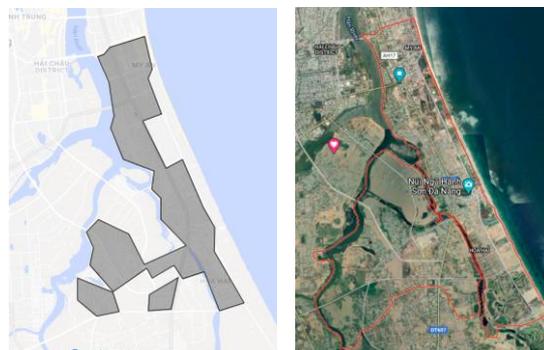
An interview was conducted on who we thought at first as an CLC owner explained that she is the neighborhood's waste collector. She was appointed to this job by her local PPC, however she does not receive any salary or social welfare from the PPC itself. Her income from the job comes from the fact that beside being responsible for collecting waste for a neighborhood of 400 households and bringing them to the 2 official MUS for the DURENCO truck to collect 3 times/week, she also collects the waste management fee (20,000-25,000 VND/household/month). She gets to keep the sum of all the households that agree to pay her, plus extras from selling the tradable waste (120,000 VND/week), after paying DURENCO 1,700,000 VND/month.

#### 6.1.3 Aggregator density and distribution

Besides dump sites, aggregation points identified were more concentrated in urban areas such as My An in comparison to rural areas. This is logical as there are more opportunities for waste trading in highly concentration waste disposal areas. Additionally, there were 3 CSCs identified in urban areas compared to the 1 found in rural areas. We observed similar findings when comparing CLCs and identified 8 in rural areas and 22 in urban areas. As these are businesses, it is logical that there are higher concentrations of such sites where there are higher volumes of waste.

In Hoa Vang, as the most populated areas are the clusters of Hoa Lien 3, Hoa Lien 4 and Hoa Lien 5, it is no surprise that 4 CLCs and 1 CSC businesses gather around this area. Another busy neighborhood, the Hoa Lien Market is home to another 3 CLCs. Other CLCs and CSCs in the commune scattered across the more empty zone. Interestingly the one CSC surveyed in the research located in the rural northern part of Hoa Lien where it is his own land, but he also has another shop in the more convenient sub-urban area.

To derive an estimate for the total number of IWWs, we can extrapolate the collected data and derive a rough estimate for Ngu Han Son district. We applied the following logic and calculation:



IWWs Interviewed	17	
IWWs Rejected	19	
Estimated Unmapped	5	
<b>Total # IWWs during experiment</b>	<b>41</b>	
Corona adjustment based on aggregator feedback	70%	
<b>Total # IWWs in regular conditions</b>	<b>59</b>	
Covered core area of experiment in km2	4	
<b>IWWs per km2 (residential area)</b>	<b>15</b>	
Ngu Hanh Son total area in km2	37	
Non-Residential Area	17	Selected area (left picture) based on satellite analysis (right picture).
Residential Area	15	Total residential and mixed area around 15km2.
<b>Total IWWs in Ngu Hanh Son</b>	<b>225</b>	To be used as indication only, as IWW density may vary throughout different residential areas.

## Waste sector infrastructure summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

Rural areas manage dump sites better than urban areas in terms of leakage, cleanliness and smell.

Mismanagement of dump sites, mainly municipal locations, leads to complaints and encourages illegal dumping activities.

The main factors that cause mismanagement of dump sites includes incorrect bin placement, low frequency of pickup and lack of care by local citizens.

Not all dump sites are mismanaged and there were several showcase examples identified in this study.

There are significantly less TID and IDS in rural areas in comparison to urban areas.

We identified aggregators in both rural and urban areas, however we observed not only lower density in rural areas but also the replacement of IWPs by CLCs in some areas. In these situations CLCs buy directly from households/businesses and are in direct

### 6.2 Profile of an informal waste picker

The informal waste sector in Vietnam is often portrayed as dirty, poor and bottom of the social status scale. However, this sector and in particular the informal waste pickers are the workhorse of the waste collection system in Vietnam and if they didn't exist the country would be facing insurmountable waste management problems. Since this sector is informal in nature, it relies heavily on networks, relationships and is dynamic. For these reasons, clear data is not easily found on this subgroup. Through this study, we engaged with 42 IWWs and met nearly 75 in the defined study area. Through these interactions we began to paint a clearer image and profile of IWWs and understand their essential role in waste management in Da Nang.

#### 6.2.1 Demographics and Socioeconomics of IWWs

As outlined in the analysis above in Ngu Hanh Son, IWWs were found mostly to be middle-aged to older women; of the 30 IWWs interviewed, 29 (93%) of them were women, and 23 (77%) were over the age of 50. Half of these IWWs had been working in the informal waste sector for 15 to 24 years, and 70% do not have any other employment beyond waste picking meaning they rely solely on this income. 45% answered that they do not take any time off (unless they are sick), but many cited that they only work 4 to 5 hours each day, leaving time for other obligations. At least 5 respondents (17%) stated that age played a role in their decision to work as an IWW; "I'm old and there's not much I can do", "there is no other option" and similar were often cited in these cases. 3 more respondents (10%) stated that they felt they had "no other option" or that they did "not know other jobs", but they did not link this explicitly to their age. Interesting, only 1 IWW stated that they liked the fact that their job "helps clean the city", and only 1 responded that they didn't like anything about it.

Regarding their income, it was found that IWWs can earn, on average, anything between 1,300,000 VND (US\$55) to 5,200,000 VND (US\$223) per month; however, they did indicate a decreased income recently as a result of COVID-19. While some IWWs have other jobs which cannot be distinguished in the total income reported, a general understanding of their income range can be drawn from this study.

Additionally, respondents were also asked about the expenses they felt they could afford with their income from waste picking. Of the 18 IWWs that answered this question, 15 (83%) answered that they could afford food, while 7 (39%) answered they could afford housing (e.g. rent) and 6 (33%) that they could afford education for their children. Less popular responses, with 1 or 2 people citing them, included medical expenses, savings, and fuel (for bikes). Interestingly, one IWW expressed that they didn't feel their salary "was enough for anything" and that they had to borrow money frequently from the owner of their collection center, while another shared that it was "not enough for food" and that they owed people money. Contrastingly, another IWW stated that their "children take care of [them]" and that they do this job for "pocket money" for themselves and their husband.

In Hoa Vang, we found and approached 15 IWWs, 10 of which agreed to let us conduct the interview. Two interviews were more in-depth answers of the Anthropological questionnaire provided by the UNDP-Accelerator Labs. Similar to findings in Ngu Hanh Son, IWWs in Hoa Vang are mostly middle aged women from late 40s to early 70s, 7 (70 %) of which are above 50 years old. Four IWWs (40%) have also worked in the sector for more than 10 years. On average the income of IWWs in Hoa Vang is at around 3,000,000 VND or 129 USD per month, with ranging between 300,000 VND (13 USD/month) to 4,000,000 VND (171 USD)/month, which is significantly lesser than that of Ngu Hanh Son. With this income alone, 5 IWWs stated that it is enough to cover food, 1 of which can also afford education for their children and another said it covered medical expenses. 4 IWWs answers that with this job alone, it is not enough for anything, that they either have other jobs, or have the support of their spouse, their CLC owner or the government to live by and send the children to school. On the other hand, one IWW said that she sometimes pays double to buy waste from poor old ladies out of pity and even organizes a charity kitchen with the help of other sponsors in the neighborhood once a month or a couple months depending on how much she makes.

Interestingly, 6 (60%) of the IWWs said they have other job(s) beside waste picking, which are closely related to the agriculture-dominating economy of Hoa Vang, such as farm work in the family, wood picking, produce trading (banana and sugarcanes). This is also due to the lower volume of household and small business waste in the Hoa Bac and Hoa Lien where the population is smaller than that of Ngu Hanh Son and waste from factories only goes directly to the bigger CLCs and CSCs, which makes it impossible for IWWs to invest all their time into waste picking and get a sustainable income from it. All IWWs answered that they do not take any day off unless they have social events to attend, or when they are busy with farm work or do not feel well enough to work. Some mentioned that they sometimes or always work 4-5 hours per day when the rest of the time is dedicated to other duties. 5 of 10 IWWs said that they used to have higher earning jobs such as construction worker, factory worker, trader or farmer, wood and snail pickers, before old age, urbanization and even COVID-19 drove them to take on the waste picking job.

### ***6.2.2 IWW Empathy Interviews***

During the research in Hoa Vang, three in-depth interviews were also conducted on one CLC owner and two IWWs to gain deeper insight into the lives and work of each individual. Full interviews can be read at Appendix 5.

### Ms. CLC owner

“I’m also a farmer. We have 2 “sào” of paddy fields, with 2 crops of winter-spring and summer- autumn per year. I just finished rearranging the young plant. This is the time when all farmers are busy with their planting so the IWPs are also working less as many of them are farmers.”

“I do not like it when on the media, whenever IWPs are mentioned, they are always portrayed as people in destitute situations when in reality they are just normal people doing their job. I’d want people to leave them alone. People have even made me self-conscious of the act of waste picking. If I see a can/bottle on the street, I would have to look left and right, only if there are no people around that I would pick it up, otherwise I don’t want people to ask me why I do it.”

### Worker turned IWP during Covid-19

“I used to be a worker at a factory in the industrial zone for 8 years. When corona hit, there was no more work and I decided to quit that job... Then I asked my friend who has been an IWP for more than 10 years if I could go work as an IWP and she said yes.”

“The CLC owner in this village does not want me to go buying waste in her neighborhood as she has been here long before while I’m a new worker... IWPs in Hoa Bac do not sell waste to the local CLC here as they buy very cheaply. We all wait for the CLC in Hoa Lien to come up and buy from us.”

“I used to earn a lot more from being a factory worker than from this job. I don’t have much money for socializing now so I don’t hang out with my friends or see them as

### Senior IWP in Hoa Bac

“We have to drive motorbike as the terrain of Hoa Bac has many slopes... During the rain season, there are also strong winds that’s so scary when you’re out working, it feels like the winds can push you and your load off the road.”

“I won’t accept it when other CLCs/IWPs buy from my business contacts as this is such a small community with not that much waste to buy. My friend and I never go picking together because that would leave us both with nothing.”

“There have only been public trash bins around 4 years ago. Before that, there used to be dumpsites around the village and there was no truck to collect waste. Households did whatever they want with their waste. Now I think 80% of the waste in Hoa Bac has been

## Informal waste picker summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

IWPs are associated with low status in society.

Generally speaking, rural IWPs are more open to sharing in comparison to urban IWPs who are more prone to secrecy.

IWP job is mostly dominated by women.

In rural areas, due to lower volumes of waste, IWPs often have other jobs to make a living while in urban areas waste picking can earn a decent living.

Rural IWPs have lower income on average compared to urban IWPs.

### **6.3 Gender in the informal waste sector**

Gender often plays a major role in informal sectors and this was also shown in this study, in particular with the IWWs and aggregation centers. Of the 30 IWWs surveyed, 29 (97%) were female while only 1 (3%) respondent was male. It cannot be said that this is the gender ratio of waste pickers in Ngu Hanh Son district since nearly 60 IWWs were approached in total and half agreed to take part in the study. Nevertheless, there can be a large gender gap in this particular sector.

Similarly, in Hoa Vang 100% of the survey respondents were female, and only 2 of the total 15 IWWs we found were male workers.

The main driving factor for this gap is due to the gender roles in Vietnam and clear advantage of this job: flexibility. The job of an IWW is more suitable for female roles in the household. They have to take care of their children and the family-related affairs which for many women are their first priority, while waste picking is only done as a part-time job after they have finished their household duty. That's why they select "flexibility" over "money" when asked why they took this job in the first place.

#### ***6.3.1 Gender differences in monitored routes***

After collecting the 8 route tracks from 6 female and 1 male IWWs, behavioral differences of the IWWs were also collected. Five females, one of which contributed 2 tracks, performed typical working routes of IWW in residential areas, going around every street of the neighborhood collecting waste from households, restaurants and cafes. The other female worker said she also collected waste in residential areas, but during the tracking time, she went beeline from her breakfast place to the construction dumpsite and dedicated her entire morning shift there. At the construction site, a couple of IWWs - mother and daughter - were also interviewed. Both of them were seriously ill hence could not go riding around the neighborhood. Instead, the 52-year-old daughter rode the 75-year-old mother on the bicycle to a construction dumpsite where both stayed and did their picking together. The singular man who was interviewed and tracked used a motorbike that allows him to cover a much larger area, not just in all 4 wards of Ngu Hanh Son but also in other districts of Da Nang and in smaller cities in his hometown Quang Nam. As observed in his tracking data, his route mainly sticks to the trans-province highway, with aimful turns to a few selected streets in residential neighborhoods, not to all roads there are, to stop at the known bike fixing shops where he sources the most high-value waste only - metal.

#### ***6.3.2 Gender ratio in aggregation centers***

Of the ten aggregation centers surveyed, the majority are family businesses. Seven centers operate with 1 female and 1 male - the wife and husband of the family, while 2 centers have 2 male workers and 1 center is run by one female only. Some CLCs we have observed, though not included in the survey, state they have another male worker besides the owner couple. Seven of the ten answering the survey are female. Interestingly, at three centers, the first person to talk to the interviewer was the husband, but along the way, the men told their wife to answer the questions instead. Another CLC approached but no survey said that the husband works at a public Science Institution of Da Nang, when his wife is in charge of the family business and their son is the truck driver. During the IWW interviewing that happen at a CLC, it was observed again and again that the female owner of the CLC is the person writing notes on the amount of the trading waste and paying the IWWs, while the male workers help the IWW carrying the heavier

material and loading waste on or off the trucks. This observation matches the Vietnamese tradition of having the women participating and taking control of the financial matter in the family business.

Not surprisingly, 5 of the 9 CLC surveys conducted in Hoa Lien and Hoa Bac also showed that it is the shared work between the wife and husband. Two of the couples have 1 or 2 male worker(s) to help with the business. Interestingly, the other 4 CLC only has one owner/worker, 2 of which being the husband when 2 being the wife when their spouse has other work because “he’s too busy to help me” or “there’s not that much work, I can do it by myself and even have to work several jobs to make ends meet as this is how the village life is”.

An interesting note, in Hoa Lien and especially in Hoa Bac, the CLC owners work much more directly with the smaller waste sources of household and local businesses. In Hoa Bac, both 2 CLCs that we found exclusively go out to see and buy from their contacts as the relationship between them and IWWs are more as competitors due to the small amount of waste volume available to buy in the rural area.

## Gender in the informal waste sector summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

IWPs in both rural and urban areas are mostly comprised of women.

Further up the value chain there is more gender diversity and typically for both rural and urban areas couples (husband and wife) are operating a CLC or CSC together.

Routes tracked between a male waste picker versus a female waste picker was vastly different in terms of technique and methodology. The male used only contacts to collect his waste via motorbike, while female pickers are on bicycles and often go from household to household.

### 6.4 Behavior of an informal waste picker: routes, techniques and methodology

Besides collecting key demographic data and data points of IWW routes, this study investigated the behavior of the informal sector in-depth including their waste collection techniques, relationships and networks. This allows us to paint a clearer picture of the informal waste ecosystem and the working within, which facilitates better interventions and recommendations in this sector to the government and other relevant stakeholders.

#### 6.4.1 Routes, schedules and waste stream prioritization

The source of waste is diverse and we observed this amongst our IWWs survey respondents. Some collect from individual households, while others have strong relationships with businesses and collect when needed from those sources. In particular, for IWWs that work in the My An residential areas whose waste comes from households and restaurants, there are usually 3 shifts: night shift from 2 to 7 AM, morning shift from 6AM to 12 PM and afternoon shift from 2 PM to 6 PM. Some IWWs also go on a shorter tour around the local market after 7PM when the market has closed. IWWs choose which shifts to work depending on how comfortable they are with the working hours, the temperature of the days, the

responsibilities they have as a caretaker at home, and other part-time jobs during the day. In general the 2-7 AM shift is the most lucrative working time for IWWs who choose to take on the shift to clean up waste right after all restaurants and bars in the area has closed.

Furthermore, the construction waste stream plays a vital role in waste collection and therefore IWW behavior. As the highest tradeable is metal, construction sites are hotspots for such material and this drives IWW routes and daily waste collection. If there is a construction site that has waste to scavenge pickers find this out through their networks and contacts and prioritize this site over all other collection points (e.g. households, small businesses) as they can recover rebar, scrap metal and even leftover cement bags, which are potentially being traded directly with other construction sites however this is not confirmed.

Due to the small carrying capacity of their bicycle and the physical demand on the IWWs to carry the load, IWWs usually drop their waste when it reaches their maximum weight limit at a collection center, which could be whichever center closest to where they are at the moment, or a singular collection center where they are a regular. If the IWWs choose to always work with one center only, multiple rounds of waste unloading can happen during the day depending on how much waste they have collected. However, only in the afternoon from 3:30 PM to 6 PM do IWWs go back to the center to do waste separation and weighing and getting paid by the collection center owner. Some IWWs also leave their waste at a designated drop-off point, which is a space on the sidewalk of the hotel's backstreet. Their regular collection center owner comes and helps them carry the waste back to the center with a motorbike and hanger at 6PM everyday. Leaving waste unattended at the drop-off point can also lead to “often having my waste stolen by others” as one IWW commented.

Continuing down the value chain, collection centers usually have trucks coming to pick up the waste at 9AM-11AM every morning. Other busier centers have been seen to be loading waste on to a truck at any given time of the day. Many trucks bear a Da Nang municipal plate while one truck has been noted as having a Hanoi plate. After conducting a more in-depth interview with aggregators, we found that many CLCs and CSCs equip themselves with their own trucks for transportation. “Without a truck, you cannot sell waste to the factories. There’s a chance that factories will keep your truck inside for days before they can clear the waste. We could not afford the rent of a truck for several days in that case.”, one CSC explained. Some smaller CLCs' waste is brought to their consolidators by the consolidator's trucks. Some CLCs had no idea or refused to disclose the trucks that have been bought from them to go to where or belong to whom. One CSC said the trucks are from the recycling factories, another said all the waste is transported to Ho Chi Minh city. No exact name or location of any recycling facilities was recorded.

In Hoa Vang, IWWs mostly follow the morning and afternoon schedule similarly to Ngu Hanh Son. However, it is not recorded that IWW also does the midnight tour, unless their contacts (construction workers) call them to come to pick up at that time. Some IWWs are also only part-time workers, spending the rest of their time on other agriculture-related jobs. Waste is also dropped at the regular CLC at noon while on their way home for lunch, and at 5-6 PM for the afternoon shift.

In Hoa Lien commune specifically, large amounts of waste are generated from the factories in the industrial zones and large infrastructure projects that are being carried on. These types of waste, however, are usually not accessible to the individual IWWs but only to the bigger CLCs and CSCs via bidding contracts. For example, one CLC stated that on average, he buys 150 tons of iron per month from the construction

companies, compared to other smaller CLC that only buy 1 to 6 tons/month. Some IWWs, however, can also go scavenging low-value waste such as plastic that factories illegally dump around their sites.

Another type of high-value waste from the manufacturing activities are uncontaminated transparent plastic film that was previously used to wrap imported materials for production. This type of plastic is priced at up to 23,000 VND/kg, depending on the fluctuation of oil price as other plastic waste types.

#### 6.4.2 Upstream routes of waste

Thanks to the CLCs' openness, some routes of waste streams have been recorded. Depending on the CLCs' network, their waste can go to CSCs to be shipped to other provinces if no recycling infrastructure is available within Da Nang, or eventually to the factories in the city, for example:

Waste type	Sub-type	Upstream options	Note
Plastic	High-value plastic	CSC in Hoa Cam  CSC in Hoa Khuong	It is said that there is not yet a factory in Da Nang, all is compressed and shipped to Ho Chi Minh city.
	Low-value plastic	CSC in Son Tra  Trucks that comes from Binh Dinh province	While there are a few buyers, the price of low value plastic is too cheap to even out the transportation cost from the CLC to the CSC, which many times lead the CLCs to dump the collected waste back to the dumpsites or even burn it.
Metal	Iron - Grade A	Factories within the Thai Nguyen Steel Corporation, Thai Nguyen province	
	Iron - Grade B	Da Nang Steel factory  Small factories in Kim Lien, Nam O, Da Nang	
	Aluminum	Local CSC in Da Nang	Aluminum is pressed then shipped to Ho Chi Minh City as no factory is available in Da Nang.
Paper	Cardboard paper	Tan Long Paper and Packaging factory, Da Nang	Cardboard paper is recycled and made into new cardboard.

Table 8. Buyers of waste for further processing and recycling

#### 6.4.3 Waste trading prices throughout the value chain

As mentioned, the three main waste streams collected by the informal sector included metal, paper and plastics. Due to metal waste having the highest price compared to plastic or paper, construction sites or

dumpsites are where many IWWs choose to frequently visit. We found that some IWW would ride their bicycle straight to a large construction dump site at 3 in the afternoon, waiting for trucks to unload the construction waste and spend their entire afternoon picking waste there, then come back and repeat the next morning.

For these reasons, the waste recovery ratio is highly driven by price. When discussing price with the IWWs and aggregators some were confident with the trading rates while others gave more vague responses. In comparison, we took the average of the trading prices per waste stream from each stakeholder group and summarized below in Table 9. It is worth noting that many IWWs and aggregators alike mentioned that pricing has changed over the COVID-19 period. Additionally, pricing, especially for plastics, is highly driven by the end buyer (plastic factories, traders) and therefore if there is demand from a buyer the price changes accordingly. One CSC owner in Ngu Hanh Son that also buys directly from IWW said that he made a profit of 400-500 VND/kg of waste between buying and selling, not deducting shrinkage. Interestingly, though prices on Iron were not collected from an CSC in Hoa Vang, the owner did reveal that he makes a profit of 300,000 VND out of trading 1 ton of iron. Note the study conducted interviews in Ngu Hanh Son in May and Hoa Vang in June meaning there was a month gap in data collection, and prices likely fluctuated during that time.

**Table 9. Average waste stream selling prices based on a stakeholder group**

Name of stakeholder	Paper (VND/kg)		Plastic PET/HDPE (VND/kg)		Metal (VND/kg)	
	Ngu Hanh Son	Hoa Vang	Ngu Hanh Son	Hoa Vang	Ngu Hanh Son	Hoa vang
Informal waste picker	1,500 - 2,000	1,500 - 2,000	3,500 - 4,000	3,000 - 4,000	(Fe) 4,730 (Cu) 80,000	Fe 4,700 - 5,000 (Al) 15,000 - 19,5000 (Cu) 60,000 - 90,0000
Collection center	1,800 - 2,400	2,000 - 3,100	4,000 - 5,000	4,000 - 7,000	(Fe) 4,700 - 5,200	(Fe) 5,600 - 6,100 (Al) 19,000 -23,000
Consolidation center	-	3,000	6,500 - 7,000	5,000	-	-

#### **6.4.4 Waste volumes throughout the value chain**

Similarly to the trading prices of waste, the total volume recovered either by IWWs or aggregators is diverse and varies greatly depending on the waste picker and center interviewed. Again, this information was difficult for IWWs to recall as they are not keeping track of such numbers, while aggregators were more confident with these numbers.

It is also imperative to understand that the data presented on the table below are very rough numbers and might not represent the reality of the waste business in neither Ngu Hanh Son nor Hoa Vang, as each number is just calculated from a sample of 4 to 9 surveys. In the case of Hoa Vang, the number of Collection centers are more reliable to draft a bigger picture as we were able to interview 9 aggregators of a network of approximately 20 aggregators, and only 10 IWWs of a community of 30-40 IWWs in Hoa Lien and

Hoa Vang. The assumption was made prior to conducting the research was that due to Hoa Vang being a lesser populated area, the amount of waste collected and traded in Hoa Vang would be significantly lower than that of Ngu Hanh Son. Statistics show that this is true for plastic and paper, however, numbers of metal are quite similar between the two districts. This could be because while there are fewer small private constructions going on in Hoa Lien, CLCs and even some particular IWWs there can make up the number by buying waste from larger projects, whether with a contract or from the construction workers sneaking them out.

**Table 10. Average waste stream trading volume based on stakeholder groups**

Name of stakeholder	Paper (kg/day)		Plastic (kg/day)		Metal (kg/day)	
	Ngu Hanh Son	Hoa Vang	Ngu Hanh Son	Hoa Vang	Ngu Hanh Son	Hoa vang
Informal waste picker	31.82	15.4	8.83	9.97	11.5	11.8
Collection center	127.78	67.5	52.29	36.2	109.2	98.6
Consolidation center	-	166.7	~500	100	~500	5133.3

## Informal waste collection behavior summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

IWW working shifts vary based on several external factors such as weather, sources of waste, personal preference and network.

Construction waste plays a key role in informal waste collection mechanisms as metal has the highest trading volume, therefore this waste stream is prioritized over all other streams. This means behaviors, schedules, networks and methodology are surrounded around construction waste locations and players. While this is more observed in urban areas where a lot of construction is taking place, we also observed the high demand for metal waste trading in rural areas as well.

Trading activities between IWPs and aggregators vary and depends on individual pickers' capacity, route and relationships. Generally, trading takes place in the late afternoon after a full day of collection has occurred.

In urban areas, there is deep secrecy rooted in the informal sector where information such as upstream actors is impossible to uncover. However, in rural areas the openness of people is apparent in upstream value chain information was successfully collected.

Trading prices, while disclosed, are not necessarily accurate due to vagueness of responses, moreover with fluctuating pricing these rates change often based on buyers, oil prices, waste imports, etc.

When comparing the waste trading volumes of CLCs in Hoa Vang vs. Ngu Hanh Son, the volumes of metal are similar with little discrepancies. However, paper is notably lower in Hoa Vang and interestingly plastic waste volume is nearly 5 times lower as well.

The low plastic waste volumes in rural areas can be caused by the decreased high value plastic consumption in poorer areas with little disposable income. Conversely, lower-value plastics such as sachets are often used but not collected in the tradable waste streams.

### 6.5 Informal waste sector networks

With most informal sectors, relationships and networks play a significant role in the ecosystem. Although it has been assumed, the inner workings of the informal waste sector networks is not well proven or understood. During this short study, we incorporated a few questions to get some key insights into this system of intricate relationships between IWWs and also between IWWs / aggregators and IWWs / municipality.

During the survey, IWWs were asked whether they had any friends or relatives that also worked as IWWs, and what they usually did when they came across a hotel with lots of valuable waste items that they could not collect in one go. Expectedly, 16 of 30 respondents (53%) indicated that they did know other people working in the waste sector, while 12 (40%) indicated that they didn't, and 2 (7%) were unsure. Interestingly, only 17% of respondents stated that they would inform good friends to come and split the waste with them, while 57% stated that they would call the collection center to pick up the waste for them, and 23% answered that they would collect all the waste themselves over multiple trips. Several IWWs clarified that they would get their family members including children to help them, as opposed to

good friends, and one respondent suggested that they never found this to be a problem as there was never enough waste.

The same answers were collected in Hoa Bac and Hoa Lien, with 6 of 10 IWWs having acquaintance in the job, 3 does not and 1 with no recorded answers. Half of the IWW will go multiple rounds themselves to collect and save from paying the CLC for transport cost, 4 will call the CLC to come and help them pick their waste, and one IWW also said she never encounters that problem of having too much waste.

### ***6.5.1 The relationship and networks between waste stakeholder groups***

The relationships within the informal waste sector network are key to the overall success of IWWs and aggregators alike. Of these relationships, some of the most crucial are the connections between IPWs and waste sources such as businesses or households. It was observed in this study that IWWs seem to maintain a strong relationship with their waste contacts. When driving around asking household and local businesses if there is waste to buy, even when the answer is no, IWWs still stopped and chatted with their contact, some for less than 5 minutes but others chatted for more than 15, depending on the IWWs' personality and their relationships. IWWs in both Ngu Hanh Son and Hoa Vang will accept drinks and even stay for lunch with their contacts if invited.

Besides strong relationships between source and IWW, the relationships between IWW and CLCs are vital for success. One good example of this is through the mother and daughter IWW couple mentioned above used to be farmers. When they lost their land and job during land clearance, their neighbor - an IWW who owns a CLC herself introduced them into this job. Since then it has been 18 years and they still go picking together at the construction dump sites. An ex-factory worker switched her job after COVID-19 and started working as an IWW after asking her experienced IWW friend about the pros and cons. A CSC owner said that she and her husband used to work all kinds of jobs until a cousin of them who works for DURENCO advised them to enter the waste trading business one year ago. This example highlights the importance of having a trusted contact that gave them an entry into a new opportunity when it was desperately needed. As mentioned above, the IWW relationships to CLCs can be minimal or of great depth, in some cases borrowing or even giving money is even done in these trusted relationships.

While some IWWs switch CLC when they find a better trading deal, one IWW forms a sense of loyalty to their CLC. At first she was mistaken as a CLC owner as in front of her house there was a "Waste buying" Sign. However during unofficial chatting without doing a survey, she shared that she is just an IWW and sometimes she buys small amounts of waste from random construction workers. The initial capital she had to do business is a small loan from an CLC owner she has been working with for ten years, therefore she cannot sell her waste to anyone else.

As mentioned above that one IWW can have several regular CLCs, however an IWW we interviewed in Hoa Lien ward pointed out that some CLCs do not buy "dead" plastic and some other do, she cannot sell only low value "dead" plastic to one CLC and then sell high-value waste to another that gives better price for the waste, which is unfair and she is often stuck in that difficult situation which leads her to choose to get rid of or not to collect the low-value plastic altogether.

Interestingly, as we continue further down the value chain and investigate CLCs and CSCs relationships and connections to buyers the relationships become far more secretive. These connections are protected and typically not shared. If anything during the survey, very vague responses were recorded about these

L3 players including “truck buys from me” or “factory is purchasing”. When asked if the CLCs would sell to other or different buyers some CLCs stated that they already have long-time business partners and would not sell to anyone else, also because they do not have that much waste due to COVID-19. Another CLC, however, said that she cannot control the selling price of her waste, hence chooses to sell to the highest payers at that moment. When approaching CSCs with the same question, all answers are the same that they are willing to work with new customers.

### ***6.5.2 Relationships between the informal and municipal sectors***

Besides the internal, informal waste sector relationships, in this study, we identified relationships amongst the formal and informal sectors. Some IWWs have already been working with the DURENCO workers. In fact, this mutually beneficial relationship allows for a cleaned municipal dump site by the IWW in exchange for leftover tradeables. These relationships between the formal and informal sector may hold the key towards integrating these sectors together in the future (also highlighted in the spotlight story above).

## **Spotlight Story: Relationships with DURENCO**

One of the IWP we found at a MUS shared that she used to be a construction worker. However at her age she was no longer able to do such a physically demanding job three years ago. That was when she started working as a part-time

## Networks in the informal sector summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

On average in both rural and urban areas, nearly 60% of IWPs have acquaintances within the informal sector.

This network is leveraged to create win-win scenarios (collection at large dump site) and also needed to be successful in the sector (not well connected workers are often bullied).

Besides internal relationships, IWPs rely heavily on the relationships with individual households and businesses where they collect waste, often spending time to maintain and continuously grow those connections.

Similarly, some IWPs have strong connections to CLCs, while other are agnostic in terms of their end buyers.

Relationships are also existing between the informal and municipal sector in both rural and urban areas. Several relationships were identified in this study that illustrate both sectors working closely together to manage waste.

### 6.6 Informal waste picker health and safety

Health and occupational safety are important for any sector especially for those working in the informal waste sector. As IWWs are the first waste “filter”, scavenging through unsorted, raw waste there are many hazards that come along with this job. For these reasons and the unprecedented times of the COVID-19 pandemic, this research also investigated some key health concerns that may be facing this sector.

IWWs were asked about the extent to which they felt their health is impacted by their work as a waste picker. 17 of 30 respondents (57%) answered a rating of either 4 (6 responses) or 5 (11 responses) out of 5, indicating that they felt their health was very impacted by waste picking. 7 respondents (23%) answered with a 3 out of 5 ratings, while 6 (20%) answered with either 1 (5 responses) or 2 (1 response) out of 5, indicating they didn't feel they had any/many health issues related to waste picking. This indicates quite a large skew towards the higher responses, suggesting that IWWs do not feel that their profession is particularly healthy or good for them. It was also observed that a large majority of IWWs wear protective equipment, especially masks (100%), hats (97%) and gloves (90%). Items like enclosed shoes (37%) and thongs (10%) were less common. However, it was observed that personal protective equipment (PPE) is not necessarily utilised effectively. Often, IWWs preferred to pull their masks down under their chins because of the heat, which was particularly problematic when sorting through construction cement and concrete as it stirs up large amounts of construction debris and dirt which are then inhaled.

In Hoa Vang, IWWs and even some CLC owner, in general, feel concerned about the job's effect on their and their family's health, as “There are paint and chemicals in the waste, I usually have a sore throat after inhaling it, I don't let my children come here” or “my husband (who go out picking waste with her) get very sick after being in the heat for the whole day”. Similar patterns of using protection equipment are also observed on the IWWs in Hoa Vang with 80% of IWW going out with gloves, hats, masks and more. One

frail IWW reported she has not been able to work for the last couple weeks as one day on the road she was chased by a dog leading to her falling off the bicycle and had to get 8 stitches on her arm.

### ***6.6.1 Mode of transport in the informal sector***

In terms of mobility, IWWs mode of transport is most commonly the bicycle (80%) while another 20% use motorbikes. Generally, this is the chosen mode of transport since it allows them to move at a slow pace to observe waste that has been left on the side of the street. No fuel cost and less maintenance requirement also are great advantages. However, it also discourages some IWWs in Beachside My An ward to cross Le Van Hien - a busy street that is often employed by big trucks and cars - to go to the riverside of My An. The roads in the riverside of My An is also steeper into the river which requires more strength from the IWW to go back and forth on. Considering that the job description requires IWWs to drive around all day, a motorbike is a substantial investment due to the gas and maintenance cost, it is not a suitable mode of transportation for IWWs who drive around every street corner to pick random waste. Of the IWWs that use motorbikes, two of them are senior workers who have established for themselves a network of contacts in the neighbourhood. They no longer choose to ride around collecting random waste but only go directly to their contacts who have saved the waste and called them in advance to come to pick up.

60% of pickers from Hoa Vang use bicycles as the mode of transportation when the rest choose the motorbike. The difference here compared to Ngu Hanh Son is due to the fact that Hoa Bac and Hoa Lien are both vast areas with lower population density compared to Ngu Hanh Son. This means the IWWs often have to travel far and longer to get the same amount of waste as their peers in Ngu Hanh Son resulting in their choice of motorbike. Especially with the unfavourable landscape of Hoa Bac Valley, a motorbike is simply a must.

## **Spotlight Story: On a bike to the bike shops**

The interviewed IWP on motorbike does not even live in Danang. He still lives in Dai Loc -Quang Nam with his family, and everyday he drives out of town to either Hoi An, Tam Ky or Danang. While conducting route tracking on him, he only drove to the predestined bike fixing shops which he had known before to ask for metal waste. Even though in the survey, he answered that he also picked paper and plastic, the investment cost that

### **6.6.2 COVID-19 findings**

As COVID-19 has brought the world to a halt, the waste sector has continued to operate but with noticeable changes in number of IWWs and total volume of waste. IWWs were asked about the impact that COVID-19 has had on their work. 26 of 30 respondents (87%) indicated that there has been a noticeable decrease in the amount of waste, and 0 respondents answered that there had been an increase in the amount of waste. 6 respondents (20%) shared that many of their peer IWWs had gone back to their hometowns as a result of the pandemic; many, especially those from Northern Vietnam, have since not returned. Only 3 respondents (10%) suggested that they felt their health was more at risk; this could be a result of the fact that IWWs were working less during the height of COVID-19, and were, therefore, less exposed than they would normally be. Even a large CSC we have located whose owners are from Quang Nam and are in contact with large hotels in the area had stayed close during the first three weeks that the research was carried out due to the disruption of those hotel operations. Furthermore, a notable result from COVID-19 was the decrease in income amongst waste pickers caused by the decrease in waste available.

When asked if they were worried about the possibly contaminated masks and other medical waste they might encounter, IWWs said that they did not go out to work during the social distancing period, and afterward did not think it was an issue as they did not usually see masks littered on the street, or “masks are put in the household trash bin where I don’t pick at”, and “ I practised social distancing and covered myself better during COVID”. Interestingly, one IWW commented that she has noticed an increase in people’ overall environmental and health consciousness that “households wrap and cover their trash more properly after COVID”.

When the financial support package for affected workers was mentioned as a conversation starter, many IWWs shared the confusion that they did not know how to claim for help from the relevant authority. Some IWWs said that they had been contacted by the local authority confirming their eligibility for the support package and filled in the paperwork but no actual support was yet delivered, other workers reported to have not heard anything from the authority. Dissatisfaction was expressed by a 69-year-old IWW, when the local public workers came to her house and announced that her children were eligible for the support package while she was not because she was over the official working age. Unsupported by her children and still having to work for a living everyday, this worker is an example of this vulnerable demographic group that was not included in this large scale program.

## Health and safety in the informal sector summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

Most IWWs in both rural and urban areas wear personal protective equipment (masks, gloves, shoes, etc).

Some IWWs mentioned the direct negative impact their job has on their health especially when dealing with paint and chemical containers.

80% of IWWs use bicycles to collect waste while 20% use motorbikes. The mode of transport influences the methodology of collection. For instance bicycles are often used as you can drive slower to observe waste coming up on the street and easily navigate small narrow alleyways, while motorbikes are needed to overcome challenging hilly landscape in rural areas like Hoa Vang.

COVID-19 has had a direct impact on the amount of available waste to collect therefore leading to the decrease in income for many IWWs in Da Nang.

Most IWWs were not concerned about encountering contaminated waste as they practiced social distancing measures during the lockdown and felt safe when they returned to work.

However, IWWs continuously expressed their concern about being unable to access the government support packages issues for COVID-19 relief. This was due to them being unqualified, unable to register or unsure how to get connected to such program.

### 6.7 Job satisfaction and entrepreneurship in the informal waste sector

These responses may be related to the reasons IWWs cited for their choice to work as waste pickers; only 7 of 30 respondents (23%) in Ngu Hanh Son cited high income while 17 (57%) cited flexibility as the best things about their job suggesting that while many may not perceive the income to be sufficient, they appreciate other elements of the work. 4 (13%) IWWs answered that they enjoyed the job, and 3 (10%) specified that they liked not having a boss and that they could, therefore, make their own schedules. This aligns with the fact that it is overwhelmingly women that work as IWWs; because it is the role of women to maintain their households, including taking care of their children and family members, it makes sense that women would work in jobs that allow them to keep their own schedules, and take time off work when needed.

Half of the pickers in Hoa Vang enjoyed the fact that waste picking is not as physically demanding as other typical jobs available in the district such as farmer or factory worker, especially those who are burdened by old age and poor health conditions. 50% also choose Flexibility as to the reason why they keep doing this job. Only 2 pickers think that the job gives good income, while another lamented that waste prices used to be much higher and people used to give away waste instead of selling them 6 or 7 years ago.

Some aggregation owners in both districts started their career as a waste picker. In Ngu Hanh Son, two waste pickers - one we failed to interview- stated that they have a collection center at home and do buyback from other IWWs but still go out every day picking themselves. In Hoa Bac, a small CLC owner

said that waste trading is only one of her sources of income, as living in a village with few waste streams requires her to be resourceful and take whatever seasonal jobs available at the moment.

## Job satisfaction and entrepreneurship in the waste sector summary

After surveying both rural and urban areas in Da Nang, we were able to draw out the following key findings:

Most IWPs choose this job due to its flexibility. As most IWPs are women this makes sense as they are allowed to pick when they have time between taking care of the household, children, etc.

IWPs strive to own their own CLC in the future in hopes to become more successful in waste and trade more volume.

### 6.8 Unexpected findings and solutions

Source separation of solid waste has been observed to happen in rural areas of Hoa Vang district. Although training on source separation has never been conducted in the villages, the local people have already practised it as a part of their traditional behavior. The picture below captures different types of waste left in front of a local household:



Left bucket: Food waste is collected in the bucket and left outside the house for the neighbor to collect and feed pigs.

Middle bag: Low-value plastic waste that the local IWW and CLC do not collect. Multiple bags of this same type of waste have been observed in the village's public bins.

Right bag: PET bottles and metal cans are sorted aside to be sold.

The informal waste pickers are not only retrieving waste from the typical sources of households, businesses, constructions or factories, but also dip their hand deep to get the waste already ended up in the landfill not having to stay there. A CSCs owner acknowledged a contact who is the head of an IWWs group that only goes picking at the Da Nang's Khanh Son landfill. This group of IWW sorts through and collects several truckloads of waste per day. The CSCs said he and his 2 employees also used to go picking at the landfill, and can earn up to 1 million per day. However, the hard work made him decide to stop doing so, and the unpleasant smell of waste deterred him from buying waste from this IWW group. **This proves the potential of waste collected via an adequate source separation system, even if a large part of the tradable has already been traded**

**before the rest of the waste arrives at the landfill.** A good waste management system resulting in cleaner waste would also be of tremendous help to the daily work of these workers.

Often, IWWs and even CLCs owners have described how hurtful it is for them when faced with untrue perceptions of outsiders about what it is like to be a waste worker. Interaction with 40 IWWs has shown that each worker is a unique individual with a different story who is making a great yet unacknowledged contribution to the city day and night. Some IWWs do not even stop at making a living out of this job but have already given back to the community well beyond the act of cleaning up waste.

## Spotlight Story: Picking waste and giving



*“I used to be a construction worker back when a day of labour was worth 21,000 VND, now it is 300,000 VND/day. But I couldn’t do that work anymore and became a waste picker 3 years ago. Everyone has their job, and there has to be someone doing this job.*

*In the summer I’m a full-time vegetarian, the rest of year I’m for 10 days each month. Sometimes when buying waste from the poor old ladies I would pay double for their waste, I believe there is karma in life... I organize charity kitchen in the neighborhood, with the help of other donors. If I have money I do it once a month, otherwise once a couple months or so. I still learn a lot everyday going out on the streets. “*

— Ms. Đào

## 7. Policy Recommendations

During the course of the study, we identified several points in which the municipal waste management and informal waste sector already intertwine, although currently only on an informal level. This includes but is not limited to municipal waste workers segregating tradable waste from their collection and selling it to aggregators, municipal waste workers informing IWWs about larger amounts of tradable waste if identified on their route and IWWs supporting municipal sites in keeping it clean.

These naturally formed collaborations showcase the value that more strategic integration of the informal waste sector can have on the overall waste management system. We have identified several potential intervention points, many of which would unfold their potential best within a comprehensive and combined approach.

As mentioned throughout this report, the stakeholder group mostly contributing to waste recycling, in general, are the IWWs as well as the aggregators and service providers within the informal value chain. If

authorities and municipal waste operators want to successfully reduce the amount discarded in landfills or leaching into the environment, a dual approach of infrastructure improvements and informal waste sector integrations is needed. Additionally, regulatory adjustments and especially the lack of enforcement needs to be addressed.

## IWW integration

When talking about integrated waste management models in Vietnam, we must consider and learn from areas, where the informal sector has already been integrated. The most prominent example is HCMC and the integration of Independent Waste Collectors (IWC). The HCMC model is far from perfect and shall not be replicated, but it provides essential learnings in terms of best and worst practices that are considered in our recommendations below.

### A brief outline of the integrated waste management approach of HCMC:

- HCMC has several levels of waste workers, namely the formalized municipal waste workers (appx. 2,000 workers) the semi-formal independent waste collectors (appx. 4200 workers) and the informal waste workers (also referred to as pickers or street workers).
- Municipal waste workers are hired by Citenco (municipal waste operator) collect waste in urban areas and transport waste from the transfer stations to the landfills. Equipment is provided by Citenco and the workers participate in the social system. The transfer fee from the transfer stations to the landfill is around 45 USD / ton or 1,000 VND / kg, which is not extended to the IWCs.
- IWCs collect from households and businesses, especially in the places harder to reach by truck and bring the collected waste to transfer stations. IWCs work in defied and licensed collection areas and collect the monthly waste management fees. In addition to the monthly fees, the IWCs trade recyclable waste within the informal system similar to IWWs. IWCs collect approximately 65% of HCMC municipal waste. The average income of an IWC with a licence for around 200 HH is appx. 10mn VND but it is always shared with other collectors. Overall the average income is around 5mn but all equipment and supplies (vehicle, gas, protective gear, etc.) has to be paid for from this amount. IWCs do not participate in the social security system (unless voluntary payments are made). 65% of the IWCs are migrants.
- The collection licence has been awarded historically and origins are now hard to follow. The licenses can be inherited and are informally transferred or consolidated.

While the above clearly outlines some social inequalities and leaves room for improvements, it also shows that there is potential for a balanced system between the formal and informal sector. The IWWs are already well established throughout Da Nang and shown in particular for Ngu Hanh Son district through this study. DURENCO can utilize these capacities if an adequate sharing and support system can be established.

To make adequate recommendations, it has to be noted that the municipal waste system in Da Nang works differently in the sense that DURENCO is fully self-funded and only obtains the household and business waste collection fee to cover all its expenses. In addition to this, DURENCO is paid a disposal / landfill fee of 42,000 VND / ton by the City.

DURENCO Announcement 658/MTĐT-KD on the fee on the Service of collecting and transporting daily waste in Da Nang city:

	Subject of application	Unit	Fee (VND)
<b>1</b>	<b>Family household</b>		
<b>1.1</b>	<b>Non-business household</b>		
1.1.1	Apartment	Household/month	15.000
1.1.2	House in small alley	Household/month	25.000
1.1.3	House with street facade	Household/month	30.000
<b>1.2</b>	<b>Business households with trash volume no more than 1m<sup>3</sup>/month</b>		
<b>1.2.1</b>	<b>House in small alley</b>		
1.2.1.1	<b>Group 1:</b> Construction materials; F&B; produce; electronics; vehicle fixing, motel businesses	Household/month	50.000
1.2.1.2	<b>Group 2:</b> Textiles; pet shops; jewellery; car/bike washing; grocery and other businesses...	Household/month	45.000
<b>1.2.2</b>	<b>House with street facade</b>		
1.2.2.1	<b>Group 1:</b> Construction materials; F&B; produce; electronics; vehicle fixing, motel businesses	Household/month	100.000
1.2.2.2	<b>Group 2:</b> Textiles; pet shops; jewelry; car/bike washing; grocery and other businesses...	Household/month	80.000
<b>2</b>	<b>Education facilities; public and work office; military facilities; residential complex with a management unit;...</b>		
2.1	Trash volume no more than 1m <sup>3</sup> /month	Facility/month	165.000
2.2	Trash volume from 1m <sup>3</sup> /month	m <sup>3</sup>	205.000
<b>3</b>	<b>Health facilities; manufacturing and business establishments; hotels, restaurants; railway stations, wharves, markets, ... (except for those specified in Section 1.2)</b>	m <sup>3</sup>	265.000

## Collection Fees

Currently, DURENCO employs fee collection workers to collect the household and business fees in person, often having to come back to the households several times until the owners can be reached. This system is not only inefficient, but is also subject to errors and intentional overcharging. The mere collection of waste fees therefore bears a cost for DURENCO and separates the collection monitoring from the fee collection, which does not allow for any simple incentive or penalty scheme for source separation.

To evaluate if the collection of waste fees could be partially carried out by formalized / integrated IWWs, the system has to be understood in more detail. There may be a significant cost saving potential for DURENCO, on the fee collection and waste collection side.

## Waste Collection

As proven in the HCMC model, formalized IWWs referred to as IWCs can offer significant benefits to municipal waste operators if a sustainable and mutually beneficial model can be established. As DURENCO in Da Nang only receives the waste collection fees, a fair split or alternative benefit structures would have to be defined.

The so-called 'last mile collection' is costly for municipalities, as the collection by cart, especially in smaller streets and alleys is slow and inefficient. As IWWs typically already cover these areas, a fee split may be manually beneficial, as IWWs would obtain more tradable waste and potentially an additional part of the waste fee (optional).

Such an initiative could be complemented by a source separation program that makes the collection more efficient and increases tradable recovery, which may be motivation enough for IWWs to cover selected 'last mile routes'.

## Source Separation

Although Decision 1577/QĐ-UBND already demands source separation of domestic solid waste to be practiced in all districts of Da Nang by the end of 2019, there is no implementation to date in Da Nang except for some smaller trials<sup>5</sup>.

While the potential benefits of source separation seem apparent, several factors have to be considered, including additional transport vehicles or adjusted frequency according to selected waste streams, the enforcement of required separation, education and training on separation and the infrastructure to lift the potential from segregated waste streams. Without adequate infrastructure in place, the public perception can turn towards an unwillingness to comply if it is known that all waste is still dumped in the same landfill (as many examples have shown in the past, including Da Nang's neighbour Hoi An).

DURENCO has considered source separation and favours the following separation split: Recyclables / Residual Waste. This split is inadequate to address the most significant waste volumes, as 70%+ of waste is of organic nature. A more adequate separation shall focus on the usability of the waste streams and the ability and likelihood to further separate categories after collection. Therefore, all recyclable/tradable materials can be combined for easy collection by the informal waste sector. Another important category is organic waste, as organic residuals render all remaining waste close to unusable. The third category can be residuals, which includes all non-organic and non-recyclable waste.

Besides the required processing infrastructure matched to the expected volumes, which is paramount for the success of a source separation program (addressed below), several interventions have to happen in parallel to justify any efforts, as all good intentions otherwise can be rendered irrelevant:

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<sup>5</sup><https://thuvienphapluat.vn/van-ban/tai-nguyen-moi-truong/Quyết-dinh-1577-QĐ-UBND-2019-Ke-hoach-trien-khai-phan-loai-chat-thai-ran-sinh-hoat-Da-Nang-412525.aspx>

- community training and education,
- incentives and penalties (incl. enforcement),
- logistics and frequency adjustments,
- separation bins (adequate waste bin on household and business level as common in most markets with adequate waste management will allow for unified waste separation and collection; while the pushcart collection allows for more flexible bin size and form as no hydraulic lift system is used, the typical waste container consists of styrofoam boxes or open containers which only add to the problem through waste leakage and inability to monitor separation).

## Waste Infrastructure

While many investors are actively or opportunistically evaluating the Vietnamese waste market, only a few investments are actually realized and even fewer ever become operational or sustainable. The reasons are diverse, but one common denominator is the intransparent, lengthy and unpredictable permit process. While laws and regulations are relatively clear and have adopted international best practices, there are still many challenges at the local implementation level.

This paralyzes the system and limits investments to the following three categories:

- Government-backed projects or PPPs (with a high failure rate due to a lack of alignment between the partners)
- Large corporates with sufficient capacity to 'fund' the permit process in terms of time and related expenses
- Illegal or non-permitted waste processing facilities (problematic because focus solely lies on profitability and not on environmental compliance or community concerns; this is a major concern for the waste industry in Vietnam, as these adverse practices provide a bad reputation to the entire industry and make investments in permitted facilities even more difficult; while some owners of non-permitted waste sites have indicated that they would prefer to invest in better machines, wastewater treatment systems, etc. the fact that they can be shut down any day hinders such investments)

As source separation is essential for deviation of waste from the landfill and source separation can only be effective with adequate infrastructure in place, it is absolutely essential to work towards a more supportive regulatory environment that can attract small and large waste solutions needed to address Da Nang's waste issues. Unfortunately, the latest developments seem to favour incineration projects, perceived as a 'silver bullet', while it, in fact, hinders all sustainable development.

One way to overcome the above-mentioned challenge is to create a conclusive master plan that identifies solutions and technologies that receive a 'pre-approval' status which investors can bid for a pre-defined project under certain conditions and are guaranteed the relevant licences once the parameters are fulfilled. This is not to be confused with the common practice of call for proposals or call for investments, which do not go far enough in the risk mitigation for investors and are typically still subject to long tender processes.

Local infrastructure, including recycling facilities, are also essential for an inclusive model with the informal sector. While Vietnam has a well functioning informal waste sector and a large number of small and medium-sized recycling facilities (many of which are non-permitted), recovery through the informal sector

only works if it creates economic benefit. As most recycling facilities are located around HCMC and Hanoi, the transportation cost eliminates potential profits and therefore excludes the majority of waste from the informal recovery system.

Recently formed producer initiatives (PRO Vietnam, PPC, etc. ) and a variety of development programs (UNDP, IUCN, IDH, Assist Asia, WWF, etc.) provide an ideal framework for collaborative investment and capacity building work.

## **Regulatory Adjustments**

### **Social System Integration**

Besides the aforementioned adjustments on infrastructure regulations and incentives, as well as the necessary training for the different authorities and departments, we would like to point out urgent issues that became most apparent during the COVID19 pandemic. Due to the informal nature of IWWs work, the workers do not have access to the same benefits as other waste workers hired by companies or the government, although their role in the waste system is as important as the formalized part.

The 62bn VND support and relief fund for COVID19 is supposed to support the most adversely affected workforce and businesses. The problem is that IWWs are not a business nor are they in a formally registered work relationship and for this reason do not have access to this fund, although IWWs are one of the most affected. This can be changed in offering a voluntary registration process for IWWs, enabling them to participate in the social system, get basic health and social protection and also increase the transparency of the informal sector.

### **Enforcement**

Another suggested point of intervention is to improve the law and regulation enforcement on waste offences. While an appropriate legal and regulatory framework is in place, the enforcement is virtually non-existent. Vietnam has shown that it can rapidly adjust community behaviour with enforcement campaigns, as last seen at the beginning of 2020 with the strict 0% alcohol enforcement when operating a vehicle.

Addressing the waste issues in a similar campaign can kickstart a shift towards more sustainable community behaviour, including the reduction of illegal dumping, avoidance of waste burning, source separation and more. While the initial effects of such campaigns are significant, they also tend to fade after some time. The continued enforcement could be handled via a targeted reporting system (hotline, mobile app, etc.), in which the local residents and IWWs can participate.

Such a system would include the reporting of misconduct, set mechanisms by the municipality to address the issues through fines and cleanup actions as well as through targeted awareness campaigns. IWWs can be contracted for the cleanup of illegal dump sites and paid from the fines issues to the responsible individual or company.

While addressing the enforcement mechanisms require strong political support, the lack thereof renders many important efforts in waste mitigation useless and often even incentivises misconduct from a financial perspective.

## IWW Integration into Municipal Collection Points

According to our in-field learnings and naturally developed symbiotic relationships identified during the IWW survey, we recommend an intervention that has the potential to build a foundation for a step-by-step formalization or integration of the IWWs into the municipal system.

DURENCO provided a list of 16 municipal collection points for an area of appx. 4 km<sup>2</sup> in Ngu Hanh Son district (Table 3) and 7 additional municipal sites were identified in surrounding areas. After evaluating the sites for size, waste types and general conditions, we found that the majority are mismanaged, several with significant risks of leaching and leakage. This may be due to negligent disposal of surrounding households or businesses and/or inadequate maintenance and care by municipal workers.

After learning about the aforementioned relationship between IWW and DURENCO, detailed in the “Spotlight Story: Relationship with DURENCO” on page 28, a strategic integration of IWWs into the maintenance of the municipal waste sites can create mutual benefit and expand beyond the two parties mentioned.

To make a targeted recommendation, we had to understand the structure of Municipal Collection Points better. The selected properties do not belong to DURENCO but are selected locations from each ward/district. Only few of the sites are permitted for the purpose and it is within the authorities decision to remove those collection points if complaints arise. While this should be a motivation to keep the collection points orderly and public disturbance low, the opposite is more common. Significant smells, leaching and tipped over bins, burn pits and loose waste is a common sight.

This may be due to a lack of time or care by the municipal workers but the Spotlight Story has shown that alternative mechanisms can solve this problem. Integrating the IWWs into the Municipal Collection Points to manage and recover recyclable material provides the following benefits:

- Less smell and public disturbance of the surrounding community
- Ability to avoid adverse practices through IWW oversight (incl. burning if trained)
- Higher recovery and recycling rates (with adequate equipment in place)
- Less waste required for transport to landfill
- On-call collection if beneficial
- More time for municipal workers (bins are ready for loading at arrival and can be placed back into spot and potentially cleaned by IWW)
- Opportunity for separation / recycling program (separation bins common recyclables)
- Integration of hazardous waste collection (currently practically non-existent)
- Easier / increased income for selected IWW through recyclable recovery

While it is generally not possible to build permanent structures on those sites, a temporary cover structure can be designed to make the appearance of such sites more pleasant, with planter boxes surrounding the bins and potentially a roof structure to maintain smells and avoid rain filling the bins.

The site would be managed by one or a selected few IWWs according to defined standards that can include general oversight, cleaning, segregation, watering of planter boxes, handling hazardous waste, electronic waste, calling for landfill collection and potentially educating the users towards source

separation. A small storage space can be included to reduce the need for daily sale to aggregators by the managing IWW and some hand tools and personal protective gear can be supplied.

If sufficient trust is established between DURENCO and the IWW(s) managing the collection point, the service provided by the IWW can be extended to the local household collection of waste and/or the municipal waste management fee, which is currently handled by DURENCO staff. Cost-saving potential for DURENCO and other mutual benefits of this approach have to be piloted to be fully understood. Social protection (health, accident insurance), protective devices, equipment and training shall be provided to the selected IWWs by DURENCO.

While this model would only be feasible for larger municipal collection points, the IWW could be provided with a bicycle to also service smaller surrounding collection points.

#### Initial design ideas:



### Transport / Transfer Station

On a larger recovery scale, a similar IWW integration can happen at the planned transfer stations in Da Nang. While these transfer stations are still in planning, this may be the best time to collaboratively work with DONRE, who is responsible for the planned sites, on an integrated approach.

Transfer stations offer a permanent location at a larger scale, allowing for the integration of beneficial infrastructure elements, such as a separation conveyor belt, baling machines, storage silos, etc. that could be used by IWWs to more efficiently extract recyclable waste from municipal waste streams.

The municipal waste operator can partner with IWWs for the last mile collection and can then focus on logistics and transport from transfer stations to the landfill. As IWWs have diverse backgrounds with varying preferences, the engagement of IWWs should be a blend of fixed and flexible integration. Some on-site roles require fixed schedules while other roles can be handled more flexible on a first come first work basis. All IWWs can be registered and step-by-step integrated into the social system.

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[Link to Appendices](#)