

## The Implementation of Domestic Solid Waste Classification of at Resources in Phan Dinh Phung Ward, Thai Nguyen City, Vietnam

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**ABSTRACT:** Domestic waste is gradually becoming one of the sources of severe environmental pollution. Phan Dinh Phung ward is one of the central wards of Thai Nguyen city, with a dense population, so the amount of domestic waste in the ward is large. This study was conducted to assess the current status of domestic waste classification at the source to have a basis for proposing practical solutions to improve the efficiency of domestic waste management in Phan Dinh Phung ward. The methods used in this study include document analysis and synthesis, sociological investigation, and data processing. Research results show that: Phan Dinh Phung ward (Thai Nguyen city) has been classifying domestic waste at sources since 2018. Currently, 100% of households and business households in the ward do this. Segregation of domestic waste at sources; 98.7% of households put garbage in the right place; 89% of households know how to sort garbage; 57% of households carry out the classification of household waste. The proportion of households doing the correct classification is 45%. However, the number of households using garbage sorting tools distributed for the proper purposes and dumping the garbage on time is still low. For the waste separation at the source in Phan Dinh Phung ward to be more effective and to attract the participation of the people, it is necessary to perform synchronously from waste classification at the source to the collection. Transportation and treatment in the following directions: Sorting at the right source, collecting correctly, treating effectively, and conducting propaganda more often to the people.

**KEYWORDS:** Domestic waste, Classification of domestic waste at the source, Environmental Protection, Phan Dinh Phung Ward, Thai Nguyen City

### 1. INTRODUCTION

The population boom is increasing, and people's living standards are improving, leading to a rapid increase in consumption and waste discharge demand, making household waste a source of severe environmental pollution. The amount of domestic waste generated is increasing, putting much pressure on solid waste management and environmental quality. According to the National State of the Environment Report for the 2016-2020 period of the Ministry of Natural Resources and Environment, the total amount of domestic solid waste (DSW) in Vietnam's urban areas in 2019 is about more than 13 million tons/year, accounting for about 55% of the total DSW generated around the country [1]. The backlog of waste at gathering points, which has not been collected and treated effectively, reduces the beauty, pollutes the environment, and affects people's lives. In particular, not only in Vietnam, many countries worldwide are facing the situation of non-biodegradable waste components such as single-use plastics, which tend to increase rapidly, causing difficulties for solid waste treatment activities [2, 3]. The issue of domestic waste management at sources is increasingly concerned by countries around the world, including Vietnam.

As a first-grade urban city, Thai Nguyen city has the third largest population in North Vietnam, after Hanoi and Hai Phong. Like many other cities, the rapid urbanization of Thai Nguyen and the improvement of people's living standards have increased domestic waste. The classification of domestic waste at sources in Thai Nguyen city, in general, and Phan Dinh Phung ward, in particular, has many shortcomings due to inadequate infrastructure. People have not formed the habit of segregation waste.

Phan Dinh Phung ward is one of the central wards of Thai Nguyen city, geographically located: the East borders Tuc Duyen ward, the Northeast borders Trung Vuong ward, the North borders Hoang Van Thu ward, the Southwest borders Dong Quang ward, the South borders Gia Sang ward. The ward has a natural area of 2.72 km<sup>2</sup>. The ward's population as of 2022 is 7,467 households (26,444 people) distributed in 26 residential groups [4]. Due to the dense population, the amount of domestic waste in the ward is large. Phan Dinh Phung ward is one of four wards in the center of Thai Nguyen city that has piloted the classification of domestic waste at sources since 2018, according to the Project on the classification of domestic waste at sources in Thai Nguyen city in 2017 – 2020. However, there is currently no research

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or assessment on implementing the classification of domestic waste at sources in the ward.

This study was conducted to evaluate the current status of domestic waste classification at the source to have a basis for proposing practical solutions to improve the efficiency of domestic waste management in Phan Dinh Phung ward.

### 2. RESEARCH METHODS

#### *Methods of analyzing and synthesizing documents*

To carry out this study, the authors collected secondary documents from the Thai Nguyen City People's Committee, the National State of the Environment Report 2016-2020, and scientific documents on waste and waste classification and treatment. The documents focus on

- Some social and population characteristics of Phan Dinh Phung ward, Thai Nguyen city;
- the amount of domestic waste and the impact of domestic waste;
- the classification of domestic waste at sources.

These documents are analyzed and synthesized as the basis for building a research overview and also for the most accurate results.

#### *Methods of sociological investigation*

The sociological survey method is mainly interview, applied to 5,318 households, 450 business households in Phan Dinh Phung ward. The authors used an open-ended questionnaire focusing on the problem of waste separation at sources, with the following contents:

- + People know how to separate household waste.
- + People know the colors of the corresponding garbage containers.
- + People know the date and time of collection.
- + People know the level of punishment for households that leave garbage in the wrong place.
- + People use garbage containers provided.
- + People classify domestic waste at sources and correctly classify household waste.

In addition, the authors also surveyed people's difficulties and recommendations in classifying domestic waste at sources in Phan Dinh Phung ward.

#### *Data processing methods*

Microsoft Excel analyzed data to assess the current status of implementation and the community's awareness of the problem of sorting domestic waste at sources.

### 3. RESEARCH RESULTS

#### *3.1. Current status of classification of domestic waste at sources in Phan Dinh Phung ward, Thai Nguyen city*

The project of classifying domestic waste at sources in Thai Nguyen city for the period 2017 - 2020 of the People's Committee of Thai Nguyen city is implemented with the following specific objectives:

- + By 2018, 100% of households, agencies, and units located in the area of 4 wards will pilot (Hoang Van Thu, Quang Trung, Phan Dinh Phung, and Dong Quang) to complete the classification of biological waste at sources;

- + By 2020: 70% of households and agencies and units located in Thai Nguyen city will complete the classification of domestic waste at sources; the rate of collection and transportation of domestic waste in the city is over 90%; urban waste collection reaches 100%.

According to the project, domestic waste is classified into three types, stored in packages or equipment with the following colors:

- + The biodegradable organic waste (burnable waste): Leftover food, vegetables, leaves, and paper boxes stored in green packaging or equipment, collected daily.

- + Recyclable and recyclable waste: metal, paper, plastic, cans, bottles, rubber, nylon, and glass bottles stored in white packaging or equipment, collected on Tuesday and Saturday every week.

- + The non-burnable garbage: Sand, stone, gravel, crockery, and composite stored in red packaging or equipment, collected every Tuesday and Saturday. [5]

Households were provided with 3-compartment trash cans (white, blue, red) by Thai Nguyen city and plastic bags containing garbage of corresponding colors. Garbage containers can be reused in plastic bags or bins in conventional colors. In addition, the City People's Committee installed 3-compartment trash cans in public places, the city center, on main roads and streets according to the prescribed colors. The project also clearly stipulates the penalties for violations against individuals who put garbage in the wrong place and other contents, the responsibilities of the city's urban management department, the People's Committees of the wards, and residential groups for waste disposal with project implementation and waste separation at sources.

According to the project on the classification of domestic waste at sources in Thai Nguyen city in 2017 - 2020, Phan Dinh Phung ward has piloted the classification of domestic waste at sources from 2018. Domestic solid waste classification at sources in the ward is strictly organized according to the policy of the People's Committee of Thai Nguyen city.

To assess the situation of classifying domestic waste at sources in Phan Dinh Phung ward, the authors consider the following criteria: The number of households that know how to classify domestic waste and; the number of households knowing color corresponding garbage containers; the number of households that know the date and time of collection and the level of fines for households that leave their garbage at the wrong place; the number of households who use the allocated garbage containers, perform the type of domestic waste at sources and number of households correctly classified.

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The survey results on the implementation of waste separation at sources in Phan Dinh Phung ward are as follows:

- 89% of households got training on classifying domestic waste at sources according to the project's content. Moreover, 87% of households knew the color of the bags corresponding to each type of waste (burnable, non-burnable, recyclable).

- 410 of 450 business households know how to classify domestic waste at sources according to the content of the scheme, reaching the rate of 91%. Of which, 396/450 households know the color of the bags corresponding to each type of waste (burnable, non-burnable, recyclable), accounting for 88%.

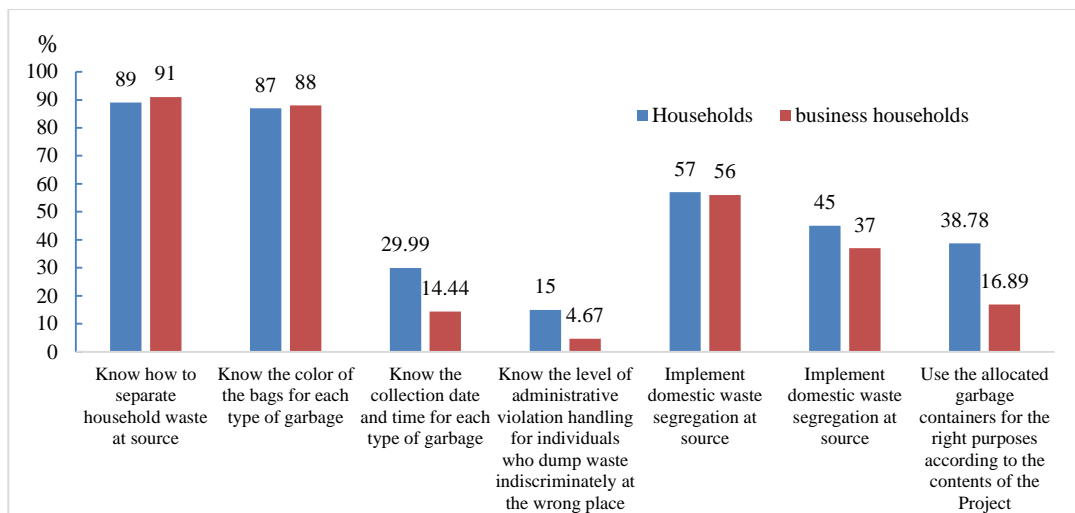
- 3,084 households could classify domestic waste at sources, reaching the rate of 57%. 2,393 households of 5,318 respondents can classify correctly, accounting for 45%.

- 56% of business households classified domestic waste from sources. However, only 37% of them can classify correctly.

- 38.8% of households using garbage containers (trash cans, stainless steel racks, plastic bags) were allocated for the proper purposes according to the scheme's contents. In comparison, only 17% of business households use garbage containers.

- According to the scheme's content, 30% of households and 14% of business households know the collection date and time for each type of domestic waste.

- 15% of households and 4.7% of business households know the level of administrative violation handling for individuals who dump waste indiscriminately at the wrong place.



**Figure 1. Summary of the implementation of waste separation at sources in Phan Dinh Phung ward**

Comment:

- The percentage of households who know how to classify garbage and know the color of the corresponding garbage containers is very high due to the close and continuous propaganda of the ward and city to each household. However, some households still incorrectly classify some household waste components. The reason is that there are many components of domestic waste, so people do not know how to classify it.

- In fact, most households in Phan Dinh Phung ward have classified domestic waste at sources. However, the percentage of households implementing correct waste classification is below average, corresponding to 37% of business households and 45% of households.

- The number of households using garbage sorting tools are distributed for the proper purposes, and know the time to dispose of the waste is low, especially for business households. Due to a large amount of garbage, it is impossible to put it all in the provided tools, so people equip themselves with other garbage storage devices and do not use

the provided tools.

In addition, the authors obtained many other reasons leading to the fact that the classification of waste at sources in the locality has not been thoroughly implemented, such as:

- + The family's house is small, and placing a 3-compartment trash can takes up space;
- + The amount of garbage bags can be burned quickly; households use the remaining two types of garbage bags;
- + Some non-burnable garbage can cause odors (seashells, snail shells), so people always dump the same types of combustible garbage every day;
- + The time of garbage collection is not suitable for some households, especially those with particular working time (shift work, trading);
- + Few respondent households have not got the behavior of accumulating garbage in the house, often putting garbage on the roadside or the area next to the house before the time of collection, so there is still the situation of dumping the garbage on time.

### 3.2. Assessment of the classification of domestic waste at sources in Phan Dinh Phung ward, Thai Nguyen city

Phan Dinh Phung ward has done quite well classifying domestic waste at sources. Preparing for the domestic waste classification concerns the City People's Committee, the People's Committee of the ward, and the residential groups. In conjunction with the City People's Committee, the research team of the University of Science (Thai Nguyen University) has disseminated propaganda to each household. In addition to us, self-management groups in residential groups in the ward regularly mobilize and organize inspections and reminders for the implementation of garbage classification and timely disposal of households, business households, and individual agencies' tastes. The city distributes propaganda materials and garbage containers (trash cans, plastic bags, stainless steel racks) to 100% of households and small business households. Some business households with a large amount of waste generated actively bought more giant trash cans. However, the correct use of bag color has yet to be thoroughly implemented for the above reasons.

100% of households and business households in the ward support classifying domestic waste at sources. Households are aware of the Project's role in improving the efficiency of domestic solid waste management, improving the living environment, and ensuring people's health. The survey results also show that 98.7% of households have put their garbage in the right place.

Most households know how to classify household waste and know the colors of the corresponding garbage containers. Households in the ward have segregated domestic waste at sources. The percentage of households using properly allocated garbage containers is still low.

In the area of Phan Dinh Phung ward, many types of waste have not been listed in the Manual of classification of domestic waste at the source of the Project on the classification of domestic waste source of Thai Nguyen city: Types: Used batteries, mattresses pads, seats, electric car batteries, hair, needles. In the process of classifying household waste, people need some help, such as: Not remembering all the classification methods for garbage; some households have not been given tools (bins, plastic bags) and have not been propagated before because they have just moved in; staff does not clean up some types (such as bulky items: beds, cabinets, tables, broken chairs, cushions); not enough bags, people do not know where to buy self-destructing bags; Because the house is cramped, it is difficult to classify, so if the garbage cannot be burned for a long time, it will smell.

The people of Phan Dinh Phung ward are very interested in categorizing domestic waste at sources. They have many suggestions to improve the efficiency of the classification of domestic waste at sources, such as:

- Proposing to distribute more plastic bags or introduce

addresses to sell bags, distribute large bags to business households; distribute more paper boxes, Distribute bins and plastic bags for garbage (newly moved households).

- Having a dedicated garbage truck, not storing different types of garbage together when collecting.

- Propaganda needs to be done more and more continuously.

- Each street should have a large garbage bin at the top; garbage collectors plan to collect types that are not currently collected (bulky items: beds, cabinets, tables, broken chairs, cushions).

- Increase the frequency of collection of non-burnable and recyclable waste.

- Bringing into general education in the city to propagate synchronously, widely, and appropriately for children and students.

### 3.3. Proposing some orientations to improve the efficiency of domestic waste classification at sources in Phan Dinh Phung ward, Thai Nguyen city

In order for the waste separation at sources in Phan Dinh Phung ward to be more effective and attract the participation of the people, the authors propose several orientations as follows:

- Conduct synchronously in the implementation organization, from classification to the collection, transportation, and treatment. Strengthen propaganda to households, production, and business establishments in the area.

- The collection and transportation of domestic waste should be carried out according to the scheme: Collecting each type of garbage separately with separate compartments or specialized vehicles. Increase the frequency of collection of some types of non-burnable waste (shells, mussels, animal bones) to avoid the risk of affecting people's health due to odors, rats, flies, and mosquitoes. Garbage in public places should be collected thoroughly. It is necessary to have the plan to collect waste such as broken wooden furniture, beds, wardrobes, cushions, bricks, etc. In the process of transportation, to limit spillage, and at the same time to effectively treat waste according to the proposed scheme.

- Conduct propaganda to students in the area to build awareness and habits for students from an early age. These are also an activity in line with the policy of the Ministry of Education and Training and the Ministry of Natural Resources and Environment on bringing environmental protection education content into the system of educational institutions.

## 4. CONCLUSION

Separation of domestic waste at sources has been carried out in Phan Dinh Phung ward, Thai Nguyen city, since 2018, according to the Project on the classification of domestic waste at sources in Thai Nguyen city period 2017 – 2020.

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