



RESEARCH MODEL OF COLLECTION AND CLASSIFICATION OF HOUSEHOLD SOLID WASTE IN LAO CAI CITY, LAO CAI PROVINCE

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Abstract

Along with Vietnam's economic and social development, the amount of household solid waste generated from households is increasing. Classifying household solid waste at source will significantly reduce the load on household solid waste treatment stages. Lao Cai City has implemented the classification of household solid waste since 2016 and achieved very high efficiency. The classification of household solid waste has now become a habit of the people here. This study evaluates experiences in collecting and classifying household solid waste in Lao Cai City, Lao Cai province.

Keywords: Domestic solid waste; Management of domestic solid waste; Classification of domestic solid waste; Urenco Lao Cai.

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1. Introduction

According to the “National Environmental Status Report 2016 - 2020” published by the Ministry of Natural Resources and Environment at the end of 2021, domestic solid waste continues to increase nationwide, averaging 64,658 tons per day. The estimated amount of domestic solid waste in urban areas increased by an average of 10 - 16 %/year; the total volume of solid waste generated was 35,624 tons/day, more than 13 million tons/year, accounting for 55 % of the total volume of domestic solid waste generated by the country. The rate of collection and treatment of municipal solid waste increases by an average of 2 % per year.

In which, most of the domestic solid waste has yet to be sorted at source.

Article 75 of the 2020 Law on Environmental Protection, which came into effect in 2022, stipulates domestic solid waste arising from households and individuals is classified into 3 categories: Solid waste capable of reuse and recycling, food waste, and other domestic solid waste.

The separation of solid waste at source will bring many economic and environmental benefits, helping to overcome the shortcomings of the current waste treatment process. If the separation of domestic solid waste at the source is done well, it will help reduce the environmental impact

favorable for treatment and save land used for landfills,... However, domestic solid waste classification programs in localities, are currently experimental, not synchronous, and drastic so that the efficiency could be higher.

Lao Cai city is located in the Northern part of Lao Cai province, about 286 km Northwest of the center of Hanoi. Lao Cai city has an area of 282.13 km². The population in 2019 was 130,671 people, and the population density reached 463 people/km². The collection, transportation, and treatment of domestic solid waste in Lao Cai city is in charge of Urenco Lao Cai.

Since 2016, people in Lao Cai city have started to classify domestic solid waste at source; The implementation of domestic solid waste classification in Lao Cai city is implemented very effectively, and the classification of domestic solid waste has become a daily habit of most people here.

2. Research methodology

Methods of collecting materials from reports, topics, and studies on collection, transportation, solid waste treatment, solid waste collection, transportation and treatment report of Lao Cai Urban Environment Joint Stock Company (Urenco Lao Cai).

Field survey method at the solid waste treatment plant of Urenco Lao Cai.

Methods of consultation of officials and employees of Urenco Lao Cai.

3. Research results

3.1. Overview

Lao Cai municipal waste treatment plant has been built and operated since January 2016. The goal is to treat all solid

waste in Lao Cai city, Sa Pa town, and Bat Xat district. The waste treatment plant in Lao Cai city has a 147 tons/day capacity, currently receiving 75 tons/day of treatment. Lao Cai Urban Environmental Joint Stock Company operates the operation of the plant.

In the early days of plant operation, plant operation was complex due to unclassified solid waste at the source. However, the plant has a sieve and magnetic recruitment system,... to classify solid waste before putting it in the subsequent processing stages. However, the complex, unclassified solid waste component makes handling very difficult. The plant has strengthened more than 20 workers, even having to work overtime to classify on the solid waste disposal line. However, the efficiency of solid waste classification could have been better.

In the 2019, Ministry of Natural Resources and Environment report on survey results, a survey of the status of live solid waste management shows that domestic solid waste in most localities has not been classified at the source; Local classification programs are also experimental, asynchronous, and have not been formalized; Infrastructure, equipment, essential vehicles for the collection, transportation, and disposal of domestic solid waste have not been focused on synchronous investment.

Hanoi city has also implemented a source-based solid waste sorting project funded by the Japan International Cooperation Agency (JICA). The project was piloted on four wards of Hanoi's inner city including Phan Chu Trinh, Nguyen Du, Thanh Cong, and Lang Ha. From 2006 to the end of 2009, 18,000 families were trained on how to classify solid waste at source. However, after the

project was over, the classification of solid waste living on the Hanoi land table was not maintained. The main cause is the asynchronous collection, transportation, and disposal after solid waste classification. Several other provinces and cities also have similar projects: Ho Chi Minh city (2002), Hung Yen (2012 - 2014), Bac Ninh (2014), Thai Binh (2017 - 2018), Dong Nai (2016 - 2018), Da Nang (2017), Ha Tinh (2019),... However, the collection effect is quite modest.

3.2. Implement solid waste classification at the source

Suppose the classification of active solid waste at the source is well done. In

that case, it will reduce the pressure on workers of the Lao Cai municipal waste treatment plant to classify solid waste, increase the plant's disposal efficiency, and, at the same time, reduce the amount of solid household waste that needs to be buried.

Recognizing the above issues, on December 29th, 2015, the People's Committee of Lao Cai province approved the project "Solid waste separation at Source on Lao Cai, Bat Xat, and Sa Pa". The implementation project carried out the pilot for 6 months from January 1st, 2016, to June 20th, 2016, on the 12 wards in Lao Cai city.



Figure 1: Guidance on the classification of solid waste living on the Lao Cai land table in 2023 (In Vietnamese language)

According to the pilot phase summary report, the project implementation has obtained favorable results: The proportion of households, organizations, and individuals who have made a solid waste classification at source in 12 wards of Lao Cai city is relatively high (reaching over 70 %). Each ward has 2 to 3 representative streets (100 % of households collect solid waste sorting

and have solid waste containers under the regulations). In the implementation process at this stage, difficulties such as propaganda and guidance for tourists could be improved. The classification of solid waste needs to be more thorough, and the ratio of inorganic solid waste to organic waste is still high. Some areas still have households that have not classified solid waste at the source and

do not dump discharge waste on time and in the right place. Only the drastic entry of departments and local departments directly implemented the project, without some steering committee members' close coordination and positive direction.

By February 6, 2017 People's



Figure 2: Collection of solid waste living on Lao Cai land table

According to the evaluation of the results of the implementation of the 2018 solid waste classification scheme, although levels, sectors, and localities were actively involved, drastically directing the implementation of the organic waste solid waste put into the treatment plant is of low quality, high proportion of inorganic solid waste in organic solid waste (40 - 45 %), some public areas, night markets, shelters, renting people's houses without sorting garbage, difficult collection work, irregular propaganda activities, no rich form of attraction, pervasive in the community, solid waste classification rates have a downward direction in localities. Therefore, on April 12, 2019 People's Committee of Lao Cai province issued the plan 151/KH-UBND Committee - planning on implementing a solid waste classification project at the 2019 expansion phase source.

To further maintain and promote the effectiveness of the Lao Cai municipal

Committee of Lao Cai province continues to issue plan No. 29/KH-UBND Committee - planning implementation of the solid waste classification project at source on Lao Cai city, and districts: Sa Pa, Bat Xat, Bao Thang extended period (since 2016 - 2020).

waste classification project, Sa Pa district, Bat Xat district from 2016 - 2020, as well as to comply with the 2020 Environmental Protection Law, on 19/07/2021 Lao Cai Provincial People's Committee issues document No. 3229/UBND-KT on guiding the implementation of the classification of solid waste at source in Lao Cai province. The content specifies the classification and storage of domestic solid waste, Collection, transportation, and disposal of household solid waste after treatment, and the organization of implementation on the provincial desk.

3.3. Achievements

Before 2016, domestic solid waste was not classified in the city. Lao Cai, Sa Pa town, Bat Xat district still collects organic and inorganic waste, then transports the ward's Dong Tuyen in Lao Cai for disposal by landfill form, then use probiotics and chemicals to kill flies, deodorize odors. That affects urban civilized living creases,

occupying large land areas for landfills, polluting groundwater, soil environment, and surrounding residential areas, and environmental complaints of people occur. According to a report by the Department of Natural Resources and Environment of Lao Cai province, in 2022, the total volume of solid waste generated in the whole province was about 140,741 tons/year/year, of which:

- Municipal solid waste: 78,330 tons/year. The ratio of inorganic waste

accounts for 45 %, and the proportion of organic waste accounts for 55 %.

- Solid waste living in rural areas: 61,941 tons/year. The ratio of inorganic waste accounts for 48 %; Muscle retirement waste accounts for 52 %.

- Other solid waste: 470 tons/year, including 161 tons of waste generated as packaging and bottles of chemical protection plants; 309 tons of waste generated from health facilities.



Figure 3: Lao Cai waste treatment plant

In 2022, the total volume of domestic solid waste was 125,489 tons, and the provincial average reached 89.46 %. Which: In urban areas: Collection rate, handling of 75,943.53 tons (square of approximately 96.95 %), % compared to the amount of waste generated in urban areas). In rural areas: The total amount of waste collected and treated was 49,545.57 tons (on average, 80 % of the complete solid waste generated in rural areas).

The classification rate of solid waste in Lao Cai province is 62 %, including 03 localities: Lao Cai City, Sa Pa town, and Bat Xat town; Bat Xat district maintains an average classification rate of 75 - 95%. Bao Thang and Muong Khuong districts have a classification rate of 75 - 80 %. The remaining 4 districts (Si Ma Cai, Bac Ha, Van Ban, and Bao Yen) must still implement waste classification at the source.

In Lao Cai City: The percentage of households implementing the classification of domestic solid waste at the source in 2016 reached 50 %, the quality of classification 40 % by 2020, and 90 % were classified with 80 % classification quality.

In 2022, in Lao Cai City, waste collection and disposal reached 87 %, of which the waste collection and disposal rate in 10 wards reached 97 %, and 5 communes reached about 60 %. Currently, 2 communes still need to implement waste collection: Ta Phoi and Hop Thanh. People mainly treat it with incinerators at home.

In Lao Cai city, Sa Pa town has formed many civilized streets, model streets that perform good environmental hygiene criteria and classify waste at source. Every year, many typical individuals and households are commended by localities

for being conscious of their environmental protection.

The implementation of the source-based solid waste sorting scheme has been remarkably effective for the Lao Cai municipal waste treatment plant; the number of direct workers decreased, the amount of recovered compost humus increased from 3.44 % to over 10 % with quality and price raised, recyclable, reusable inorganic waste will generate revenue, reduce landfill area, minimize environmental pollution,... More importantly, the people's awareness is increased, and they have correctly classified and dumped garbage on time, without causing urban metropolis loss. This is a very effective model in the context of the status of solid waste that needs to be thoroughly treated, and there are many inadequacies in management, collection, and handling.

4. Conclusion

Implementing the source-based solid waste sorting Scheme in Lao Cai province from 2016 to now has re-engaged many benefits for the people. People's awareness step by step is raised maximum reduction of direct-buried solid waste should limit many negative environmental impacts such as pollution of groundwater and surface water, and soil quality. The classification of domestic solid waste at the source reduces classification pressure at the waste treatment plant, ensuring the plant's processing efficiency and creating stable quality manure. After recyclable classification reuse, inorganic solid waste will generate revenue, together with the income from microbiological production will partially support the operation of the plant and reduce the budget burden to invest in substance treatment solid waste.

To achieve the above success, first mention the drasticness of government, represented by a series of steering documents. I am implementing the "Solid Waste Separation at Source on Lao Cai, Bat Xat, and Sa Pa" project in 2016. Then the documents, implementation plan, summarizing the results of each year, each stage.

The documents, decisions, and plans of the Lao Cai People's Committee have delegated responsibility, connecting the participation of stakeholders.

Government involvement: The Provincial People's Committee established a steering committee for the solid waste classification project at the source with the prominent participation and staff of the Department of Natural Resources and Environment of Lao Cai province, along with the Department of Finance, Department of Information and Communications; Department of Sports and Tourism Culture; Department of Industry and Trade; Department of Transportation - Construction; Department of Education and Training; and other related industries and People's Committee of Lao Cai city,...

Participation of unions and socio-political organizations: There are the Fatherland Front Committee, Lao Cai province, Youth Union, and Women's Association at all levels of propaganda and awareness raising for organizations/ individuals/residential community in implementing solid waste classification at the source. According to the 2023 Department of Natural Resources and Environment report, the total number of propaganda in the province was over 1,000 meetings in 2022.

With the participation of the business

of collecting, transporting, and treating solid waste living: The combination of the collection unit, in increasing the frequency of collection, adjusting the collection route, and collection time accordingly, as well as the separate transport of solid waste types of household waste that have been classified at the source.

Involvement of people and businesses, business households on the table: Economic life is growing, people's awareness is increasing, and people's support in classifying solid waste at the source has created the scheme's success. Now, the classification of solid waste that lives at the source on the Lao Cai has become a habit of the people here.

In addition to maintaining replication of collection and effectively classifying domestic solid waste, the province needs a supportive policy mechanism in the collection and disposal of solid waste living in urban areas, continued propaganda, strict handling of cases of dumping of domestic solid waste in the wrong place and planning of waste stations for collection, transport of domestic solid waste is favorable, limiting the impact on the environment and people around it.

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