

Evaluating Current Status and Proposing Solutions for Domestic Solid Wastes Management in Tuson Town, Bacninh Province, Vietnam

Nguyen Thi Nham Tuat¹, Ngo Van Gioi²

^{1,2}Faculty of Natural Resource and Environment Thai Nguyen University of Sciences

Abstract: This report studied status of domestic solid waste (DSW) management in Tuson town, Bacninh province Vietnam; Proposing some solutions to improve the effectiveness of DSW management. The results showed that the source of DSW at the study area is mainly from households; the main component of DSW is organic waste; the total amount of DSW is 150 tons/day; the average emission factor is 1.16 kg/per/day; The DSW management in Tuson town in recent years has achieved many positive results, but has not yet completely solved the amount of DSW generated, specifically: The classification of DSW at source has not been implemented; collection rate of DSW is about 98%; In the studied area, there is no centralized waste treatment plant yet, however, there are 6 small capacity incinerators that are operating stably in 4 localities (Dinhbang ward (3 incinerators), Phukhe commune (1incinerator); Chaukhe ward (1 incinerator), Dongnguyen ward (1 incinerator); The amount of treated DSW is estimated at about 62%; Many localities do not have waste treatment facilities yet, so the amount of waste remaining at the waste gathering places is quite large (about 30,000 tons), which reduces the beauty and affects the environmental quality in the region. In order to improve the effectiveness of DSW management in the studied area, it is necessary to: Raise awareness of the community on how to identify types of waste and the importance of sorting DSW at source; Implementation of solutions for effectively and thoroughly DSW classification at source; Collecting all DSW generated from households; Strengthening waste treatment at source; Effective use of currently operating incinerators and speeding up the investment in building solid waste treatment facilities in localities.

Keywords: Environment; solid waste; management; pollution; Bacninh city.

I. INTRODUCTION

Tuson town is one of the two economic- cultural- education centers of Bacninh province (behind Bacninh city), developed towards modernity, with many socio-economic indicators standing in the top of the province and the country, classified as an urban center of Grade III (Recognized on December 1, 2018). Along with the socio-economic development, the increase in domestic solid waste (DSW) has become an urgent environmental problem in Tuson town, Bacninh province. Many communes/wards do not yet have a domestic solid waste treatment plant. A lot of waste accumulated in waste gathering places near residential areas reduces the beauty and affects the environmental quality and human health in the area. Before that situation, topic "Evaluating current status and proposing solutions for domestic solid wastes management in Tuson town, Bacninh province" was implemented with the purpose: Assessing the status of DSW management, thereby proposing appropriate solutions to improve the effectiveness of DSW management in Tuson town, Bacsinh province, contributing to reducing umbrella environmental pollution, ensuring sustainable development of social economy in the region.

II. OBJECTS AND METHODS

2.1. Research Subjects

The paper focuses on studying DSW management in Tuson town, Bacninh province.

2.2. Research Methods

Method of inheriting documents:

Collecting, processing and analyzing documents and data related to the research content of the topic.

Methods of actual investigation and survey at the research area:

Conduct fieldwork to collect, add and edit the information, at the same time assess the status of DSW management in the studied area.

III. RESULTS AND DISCUSSION

3.1. Current Status of Domestic Solid Waste Management

3.1.1. The origins of domestic solid waste:

Tuson town has 12 administrative units including 7 wards (Chaukhe, Dinhbang, Dongngan, Dongky, Dongnguyen, Tanhong, and Trangha) and 5 communes (Huongmac, Phuchan, Phukhe, Tamson and Tuonggiang). The total natural land area is 61.33 km². The current population of Tuson town is 174,988 as of April 30, 2019. DSW in Tuson town is generated from many different sources including human daily-life activities in domestic settings, markets, commercial and services centers, institutions, educational, industrial and medical establishments ... (Figure 1)

3.1.2. Composition and volume of domestic solid waste in Tuson town, Bacninh province, Vietnam:

The study showed that the total volume of DSW in Tuson town is about 150 tons/day, the average emission factor is 1.16 kg / person / day and increases by about 10% every year [1].

The composition of DSW includes organic matter, paper, carton board, plastic, nylon, metal, glass... (Table 1). According to calculations by the World Bank, organic matter

accounts for the largest proportion, hazardous waste is negligible [2].

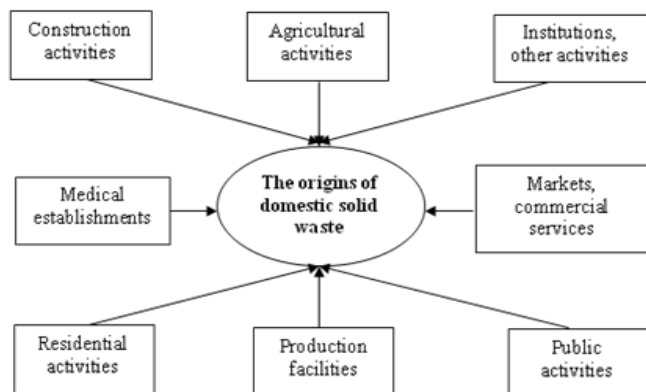


Figure 1. The origins of domestic solid waste

TABLE 1. Estimated composition of domestic solid waste

No	Waste component	% (by weight)
1	Organics	50,2-68,9
2	Plastic and nylon	3,4-10,6
3	Paper and carton	3,3-6,6
4	Metal	1,4-4,9
5	Glass	0,5-2,0
6	Inert	14,9-28,2
7	Rubber and leather	0,0-5,0
8	Tissues	1,5-2,5
9	Hazardous waste	0,0-1,0

3.1.3. Current status of DSW collection and transportation

The results showed that all villages, hamlets and neighborhoods have set up environmental sanitation teams to collect DSW, (3-5 people/team) and have been equipped with waste collection vehicles meet the standards. The frequency of collection is 2 days/time for rural areas and 1 day/time for urban areas. The amount of DSW collected from households to the transfer stations is estimated at about 98% [3].

The study also showed that in Tuson town, there are 30 newly built DSW collection sites under the provincial support program and 28 traditional dumps. Most of these have promoted investment efficiency. Typically as Daucau Dot dumping ground (Dinhbang); Trangliet and Binhha quarters (Trangha); the copper area of Locdang, Richgao village; the copper area of Namtan, Phuloc village (Phuchan); the copper area of Haongoai, the copper area of the old Brick Kiln quarter (Tuonggiang); Chi hamlet, Duongson village; Tay hamlet, Tamson village; Phuctinh village (Tamson commune); Caucao - Dahoi area (Chaukhe ward) ...

Bacninh province currently has 08 units transported DSW from the transfer stations to the district-level centralized waste treatment areas with 31 specialized vehicles, all of that are equipped with GPS devices to monitor and control the collection route. The collection rate of domestic solid waste is over 90% [1], [4]. Thus, the collecting and transporting of DSW in Tuson Town, Bacninh province has been strictly implemented in accordance with the current Vietnam's Law on Environmental Protection [5].

3.1.4. DSW classification and treatment

In Tuson Town, Bacninh province has not been piloted any model of DSW classifying at source so the classification of DSW at source have a lots of restrictions.

Tuson town does not have any centralized waste treatment plant yet. However, with the current socialized capital in Tuson town, 4 localities have installed incinerators and are operating effectively including: Dinhbang Ward (3 incinerators with a total capacity of 62 tons/day, handling 18 tons/day); Phukhe commune (1 incinerator with a capacity of 750 kg/h, handling about 16.2 tons/day); Chaukhe ward (1 incinerator with a capacity of 48 tons/day, handling 20 tons/day); Dongnguyen ward (1 incinerator with a capacity of 48 tons/day, handling an average of 18 tons/day).

For localities that do not have incinerators, the amount of DSW is currently stored and temporarily treated at the gathering points. These localities are also proposing the competent authorities to allow the survey of locations to set up investment projects and build DSW treatment facilities (Table 2) [6].

TABLE 2. Survey locations for setting up investment projects and construction of DSW treatment facilities in localities in Tuson town, Bacninh province, Vietnam

No	Communes/Wards	Location	Area (ha)
1	Dongky Ward	Nghe quarter	0,2
2	Trangha Ward	Trangliet quarter	0,25
3	Tanhong Ward	Noitri quarter	0,5
4	Phuchan commune	Phuloc village	0,28
5	Tamson commune	Duongson village	0,4
6	Tuonggiang Commune	Hoiquan village	0,4

With these practical solutions, the rate of DSW treatment in the studied area is estimated at about 62%.

In general, the management of DSW in the studied area has achieved positive results, however, there are still shortcomings such as: Most of the gathering points of the localities that do not yet have centralized waste treatment area are overloaded, the waste spills out. Although local authorities have taken measures such as spraying probiotics and piling up to reduce odor and increase usable area. The total amount of domestic solid waste remaining in the studied area is estimated at 30,000 tons [1]. The investment for DSW management is limited, not meeting the actual needs. Waste treatment efficiency in treatment areas is still low; solid waste classification at source is limited. The management of solid waste is not consistent with the trend of reuse and recycling in the world. The majority of recycling facilities are small in scale; the level of technology investment is not high; most technologies are outdated; old machinery and equipment, causing secondary environmental pollution.

The cause of this situation is due to the low awareness of people in maintaining sanitation in public places; a part of the people who do not support the investment of the concentrated waste treatment area in their locality has tried to obstruct, making it difficult for the implementation of the project. Many issues do not have specific provisions such as: The process of conditions and capacity allows organizations and individuals to collect, transport, recycle, reuse and dispose of solid waste

in general and domestic solid waste in particular; regulations on appraisal of foreign-invested DSW treatment technology. Socialization of investments in solid waste treatment is limited. Lack of investment support policies for the field of waste treatment; lack of investment capital for waste treatment facilities;

3.2. Proposing Solutions to Improve the Effectiveness of DSW Management

In order to improve the effectiveness of DSW management in Tuson town, Bacninh province, the following measures need to be applied:

a. Raise awareness of the community on how to identify types of waste and the importance of sorting DSW at source

Localities need to raise public awareness of DSW or provide each household with a poster about the list of inorganic, organic and recyclable waste. Posters should be posted on the wall near trash and in public waste collection points.

b. Implementation of solutions for effectively and thoroughly DSW classification at source

One of the weaknesses in the DSW management in Bacninh province in particular and the country in general is the waste classification at source.

Waste will become a recycling resource to serve human life if the process of sorting - collecting - transporting and disposing of waste is done scientifically and thoroughly. An important step in this process is waste sorting at source. Domestic solid waste can be classified into three main categories: organic waste, inorganic waste and recyclable waste. Inside:

- Organic waste: is easily decomposable and recyclable waste. They can be used for composting fertilizing crops and making food for animals. It is originated from uneaten or spoiled foods that cannot be used by human. For example: Damaged vegetables, tubers, fruits; Uneaten food, expired foods; Grass, leaves, plants, flowers, straw; Fruit peels and seeds; Tea residues, coffee residues; Animal carcasses...

- Inorganic waste: is the type of garbage cannot be used anymore, is less recycled and often carried to landfill. For example: crockery, bricks, coal slag, nylon...

- Recyclable waste: is waste such as newspaper, plastic, metal ... They will be transferred to facilities for recycling into new products.

In order for the classification of domestic solid waste at source to be effective, it is necessary to apply the following measures:

+ Require households to use three-compartment dustbins or three separate dustbins to store three types of different waste (inorganic, organic and recyclable waste). The nylon bags using for containing DSW inside each separate compartment/dustbin must be the same color with the compartment/dustbin to be convenient for the collection of different types of waste anywhere. Besides, it must be necessary to have pictures/letters to symbolize the types of waste in each compartment/dustbin so the waste classification at source will be easier and more effective.

+ The color of the bag/compartment/dustbin, and the pictures for each type of waste that need to be synchronized in all management areas are extremely important. Therefore, everywhere we will not be confused when implementing waste classification solutions at source.

+ There must be a handling and discipline for organizations and individuals that do not classify wastes at source.

The sorting of domestic solid waste helps to recover the types of waste that can be recycled and reused (heavy metals, plastics, paper ...); reduce the amount of waste generated in households. Therefore, it will reduce the amount of remained waste in localities that do not have incinerators or centralized waste treatment plants; reduce transportation costs and improve the operational efficiency of incinerators and waste treatment plants in the area.

c. Collecting all DSW generated from households

In order to thoroughly collect three types of waste separately classified at the source, the waste collection and transport vehicles must also have three separate compartments and the color of the waste collection device must be the same as the color of the compartments/dustbins placed at households/ public waste collection point. Or there must be three types of waste collection vehicles to collect three different types of waste (one kind of vehicle for organic waste collection, one kind of other vehicle for inorganic waste collection and one kind of vehicle for recyclable waste collection). Therefore, the DSW classification at source is really effective and useful. If the thoroughly DSW classification at source and collecting all DSW generated from households that are done well, the effectiveness of DSW treatment plants will be improved and the DSW management process will be greatly improved. DSW will certainly no longer pose a threat to regional health, environment and aesthetics but will be a valuable resource in the community.

DSW after collection will be transported to waste treatment and processing areas. For example: incinerator; compost processing plant from organic waste; factories manufacturing construction bricks from waste materials such as plastic bags, stones, gravel...; recycling facilities of paper, plastic, metal...

d. Strengthening waste treatment at source

Organic waste easily decomposes and is composted into compost right in the vacant lot of households. The treatment of organic waste in households aims to increase the reuse of organic waste, create a clean fertilizer for crops, while reducing the amount of DSW generated at the source, contributing to reducing transportation and handling costs.

e. Effective use of DSW transfer stations

For the amount of remaining DSW at the transfer stations, it must be neatly stacked, temporarily treated by the method of spraying biological products such as EM, SagiBio-1, ... to minimize odors and speeding up the process the organic waste decomposition at dumps and waste gathering places in Tuson town, Bacninh province.

f. Effective use of currently operating incinerators and speeding up the investment in building solid waste treatment facilities in localities...

g. Research and develop technology to treat domestic solid waste in the direction of reducing the amount of burial solid waste, increasing the rate of recycling, reusing and recovering energy from waste; Promote the development of pilot models on recycling, reuse and recovery of energy from domestic solid waste in order to select suitable models for replication throughout the study area; Apply modern and environmentally-friendly recycling technologies to replace old and outdated technologies at recycling establishments.

h. Some other solutions

- Study and formulate preferential mechanisms and policies, support and encourage the collection, transportation and investment of waste treatment facilities suitable to local socio-economic development conditions;
- Promulgate preferential policies to encourage businesses to invest in equipment and technologies to treat DSW in the direction of environmentally friendly manner;
- Strengthen the inspection and examination of DSW collection, transportation and disposal activities to prevent, promptly detect and handle violations;
- Promote the dissemination of legal documents on waste and scrap management widely to all levels, sectors, communities, organizations and individuals; enhance exchange, visit and learn experiences in implementing waste management, focusing on feasibility and suitability when applying the same waste treatment model among localities;
- Study to put the contents of environmental education including waste management into the main curriculum of general education levels; organize training courses for businesses about cleaner production, activities to minimize generation of solid waste at source.

IV. CONCLUSION

The process of socio-economic development in Tuson town, Bacninh province has made the amount of domestic solid waste in the province tend to increase over the years, creating a lot of pressure on environmental management in the area. The results showed that the source of DSW at the study area is mainly from households; the main component of DSW is organic waste; the total amount of DSW is 150 tons/day; the average emission factor is 1.16 kg/person/day. The DSW management in Tuson town in recent years has achieved many

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