

Behaviours of the Community Regarding Classification of Domestic Solid Waste at Source in Hanoi City

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Abstract: Classification of domestic solid waste (DSW) at source is essential in the processing of DSW treatment towards *reduce, reuse, and recycle*. The support and participation of the communities have important role in the success of this process. This study was performed to investigate behaviours of the communities for classifying DSW at source in Hanoi City. The social survey comprised of 300 questionnaire sheets, investigating, interviewing and literature reviewing was conducted toward achieving the study's purposes. The results show that Hanoi City generates about 5,000 tons of DSW daily but DSW classifying at source has not been adequately done yet. However, 100% of interviewees in the studied area have usually classified DSW at source mainly to sell to metal scrap collectors. For plastic and paper wastes, segregation rate at source in rural areas (97.3% and 93.2%, respectively) is higher than in urban areas (55.3 % and 67.8%, respectively). Even for biodegradable and recyclable solid wastes (such as compost and glass), people hardly segregate at source and mostly discard them. The rate of discarding food and leftovers in the urban is 87.3%, while the discarding glass rates in rural areas and urban are 64.4% and 87.5%, respectively. The percentage of reusing and trading solid wastes in rural areas is always higher than that in the urban. The investigation also indicates that the proportion of people supporting solid waste segregation at source is very high (86.7% in rural areas and 88.7% in the inner city). Solutions to better participation and involvement of the communities in solid waste classification at source in the upcoming years have been proposed.

Keywords: Urban domestic wastes, Hanoi, classification, waste, recycle.

1. Introduction

Classification of domestic solid waste (DSW) at source has been implemented in many countries. It demonstrates an increasingly important role in the management and treatment of DSW towards reduction at source and

growth of reusing and recycling rates. According to their experience, the national recycling industry will have and a stable supply of good - quality raw materials which bring both economic and environmental benefits provided that DSW classification works well [1-5]. The solid waste segregation at source contributes not only to reducing investment costs for the end-of-pipe handling systems but also to mitigating risks and hazards to workers.

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Communities play a very important role in environmental management in general and the management and treatment of solid waste in particular [1,6]. DSW segregation at source is implemented by the communities, then, the performing role of communities is highly valued for the success. Additionally, the application of DSW classification at source will help raise people's awareness, consciousness to DSW reduction and environmental protection [7].

This study was conducted to survey DSW segregation activities in Hanoi and the community's behaviours toward these activities, then to obtain practical bases to formulate policies promoting DSW classification at source in the whole city.

2. Objectives and Methods

2.1. Objectives

Objectives of this study is the activities of DSW classification at source, level of residential interest in these activities in Hanoi city.

2.2. Research methodology

2.2.1. Methods of collecting materials, inheriting published studies: Collect documents and data on the situation of arising DSW in Hanoi, report on the implementation of the Project of DSW classification at source in some wards in Hanoi.

2.2.2. Surveying methods:

* Survey and work directly:

The survey was conducted in Gia Lam District, where sorting at source of DSW was piloted. The agenda includes: Working directly with the People's Committee of Da Ton and Trau Quy about the pilot activities of classifying DSW at source and surveying the state of DSW classification operations at some specific houses.

* Social questionnaires:

- Purpose of the survey is to learn about the behaviour of people towards DSW daily activities (for each type of recycled DSW such as: food, food waste, plastic, metal, electronics etc.), people's awareness of DSW sorting at source and their support to the implementation.

- Number of surveys: the research consists of 300 surveys

- Subjects of investigation: Due to the fact that the composition and volume of DSW of each household depends on their living standard and place of living, the subjects are divided into two main categories: 150 surveys for rural people (most of whom are farmers with average living standard in Dai Mo, Tu Liem District) and 150 surveys for urban people (those work in socio-economic organizations and currently live in districts of Dong Da, Hai Ba Trung, Cau Giay). Respondents must be ones who regularly handle family domestic waste (mostly women). General information about the investigation is presented in Table 1.

- Main content of the questionnaires includes:

+ How the respondents classify recyclable DSW (food, food scraps, plastic, glass, metal, plastic-bag, paper, packaging, wood, rags, batteries...)

+ Knowledge of the respondents about classification of DSW at source. Sources of those information.

+ The respondents' supports towards activities of classifying DSW at source and their suggestions for better implementation of these activities in practice.

+ The support of respondents to the recycled products.

- The survey results are processed by the Processing Software SPSS 16.0.

Table 1. General information in the questionnaire

No	Living Place	Occupation	Number	Characteristics of Living standard
1	Rural areas: Dai Mo, Tu Liem	Farmers	105	Average living standard in rural areas
		Workers	20	
		Pensioners	15	
		Housewife	10	
2	Urban areas	Employees (public servants, teachers, engineers, bankers, etc.)	90	Average living standard in urban areas
3		Workers	15	
4		Pensioners, Housewife	18	
5		Businessmen	27	
Total			300	

3. Results and Discussion

3.1. Real situation of generated DSW and some projects of solid waste segregation at source in Hanoi

Approximately 5020 tons of domestic solid waste are generated in Hanoi every day (3160 tons/day and 1860 tons/day, respectively, in urban and rural areas). The DSW collection rate reached 70-100% in urban areas and about 60-80% in rural areas. 74,8% of DSW after collection was brought to central processing areas of the city. Notably, at present, 287 of 435 communes (67%) in rural areas that do not bring DSW to the above areas, but left all the domestic solid waste on vacant land, burned freely or naturally decomposed instead. This is one of very serious environmental polluting sources in rural areas [8].

Activities of DSW segregation at source have not been widely applied, only been piloted on a small scale in Hanoi city then most of garbage arising has not been used perfectly for recycling and reusing.

Pilot project of DSW segregation at source was applied in Hanoi from 2003 & 2004 in Phan Chu Trinh Ward. This project was implemented by Hanoi Urban Environment

Company (URENCO Hanoi) and funded by the People's Committee of Hanoi. However, due to overspending on plastic-bag distribution, the study was suspended. In 2006, the so-called "Support for the implementation of the 3R initiative in Hanoi contributed to sustainable social development (3R-HN project)" project was conducted in Hanoi with technical assistance by the Agency for Japan International Cooperation Agency (JICA). The project had been implemented in 4 wards in the inner city of Hanoi and it ended in 2009.

The project of DSW segregation at source, fertilizer production in Gia Lam District is one of the priority objectives in co-operation project between Hanoi and the Ile-de-France (France) in order to improve Gia Lam district environment (project officially put into operation in 2010). Up to now, the project has been implemented in six communes and towns of Gia Lam district and achieved 70-80% of DSW classification in these communes.

Although the results of sorting DSW at source in pilot projects are quite good, Hanoi still has not a plan to put the project into reality. Most domestic solid waste of the city are discarded with no classification at all.

3.2. Behaviors of community to DSW classification at source

3.2.1. Situation of DSW classification at source in residential community

The team conducted investigations, surveys about activities of DSW segregation in residential communities in Hanoi City. The survey results on the classification of certain types of waste by people is below.

- Food, excessive food:

Food, excessive food is a major component in DSW of people in Hanoi. According to calculation, there appear 2200 tons of DSW arising daily in Hanoi. The interviewing results of people's behaviors toward this type of domestic solid waste are shown in Figure 1 below:

Interviewing results showed that there are different behaviors for excessive food between rural areas and the inner city of Hanoi. While 79.8% of the interviewees from rural areas planned to reuse excessive food, this figure in urban areas was 27.5%. Additionally 16.7% of rural people tend to sell excessive food but only 1.3% of urban people do in this way. Up to 87.3% and 10.7% respectively in rural and urban areas choose to dispose all the excessive food. This result is entirely consistent with actual rural farming activities, so the amount of food waste is also used thoroughly at home or sold other livestock families (low percentage of comments for disposal option in rural areas belongs to workers, retired officers or non-farming family). Meanwhile, households in urban areas who do not raise any livestocking

animals normally discard their leftovers. A few urban people usually separate the excessive food for the ones who want to collect these food, but this activity is not as common as many years ago. There are more than 70% opinions of urban people who want to provide excessive food to whom it may need, however, the obstacle is that the address of these excessive food collectors is not available. In short, if there is no plan for the classification and collection of DSW from managers, a large volume of excessive food in urbana reas of the city will be dumping waste.

- For other waste can be recycled:

The recyclable waste composition in DSW of Hanoi is diverse. The team surveyed people's behavior for some types of waste: paper, plastic, plastic-bag, fabric, wood, glass, metal, batteries, batteries. The results obtained are presented in Figures 1 to 9.

- According to the survey results, 100% of people said they are doing classification activities for all types of recyclable DSW to reuse or sell to the collectors. The segregation of DSW at source, therefore, is very popular and it becomes a good habit of people. This feature could make the implementation of classification DSW at source campaign much easier. However, people still tend to dispose of recyclable DSW in both rural and urban areas at high percentage. The results showed that there appear only two types of waste: plastic (2.7% and 30.5%, respectively in rural and urbana reas) and paper (0% and 26.7%, respectively), a little of which are disposed.

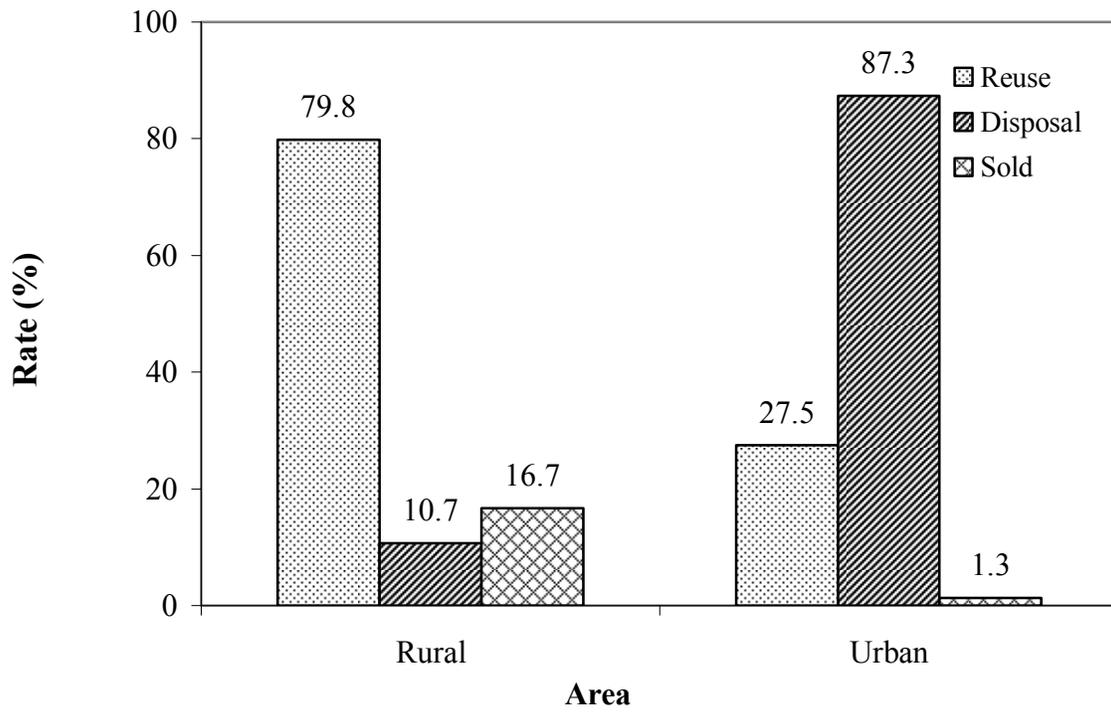


Figure 1. Behavior of people interviewed for food and excessive food.

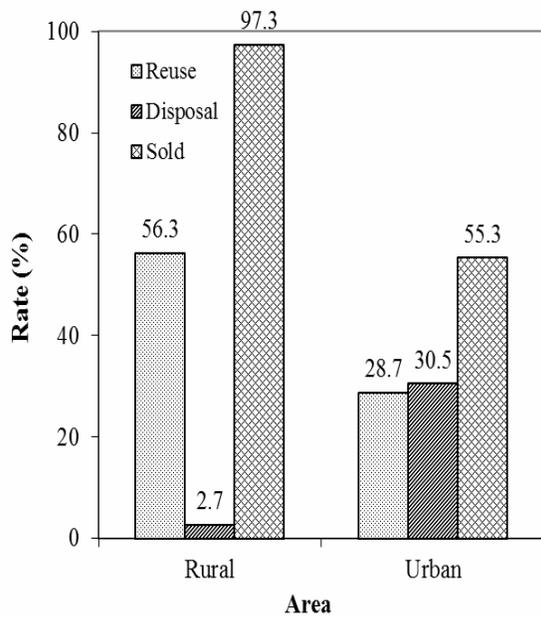


Figure 2. Behavior of people interviewed to plastic waste.

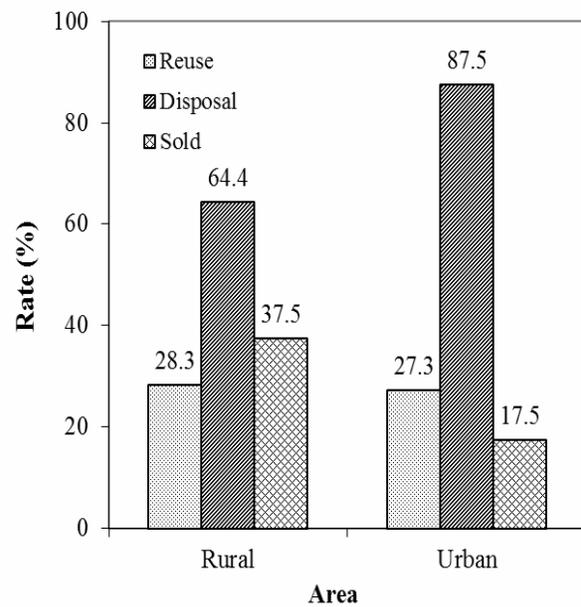


Figure 3. Behavior of people interviewed to waste glass.

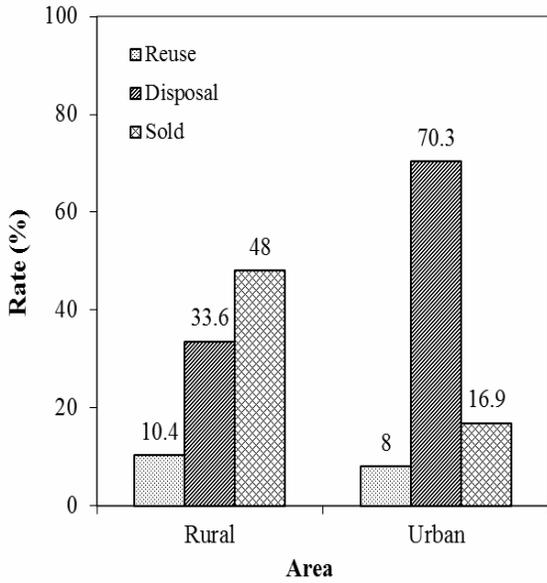


Figure 4. Behavior of people interviewed to waste batteries and accumulators.

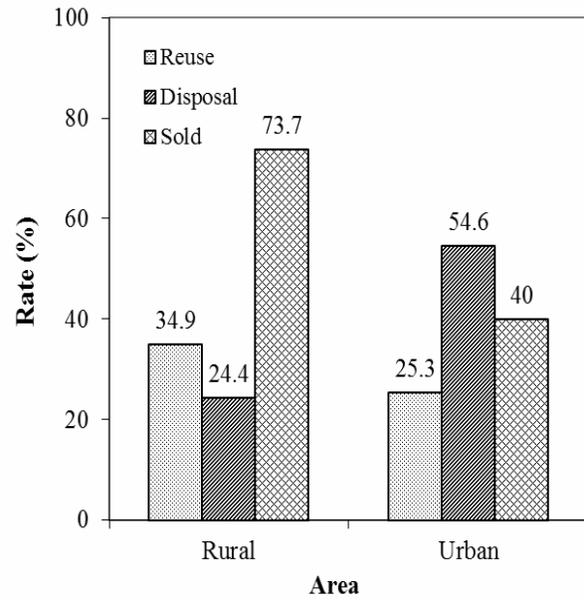


Figure 5. Behavior of people interviewed to metal waste.

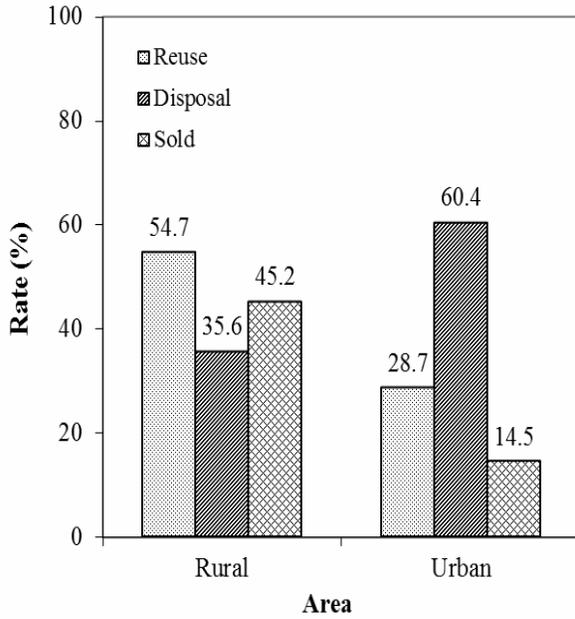


Figure 6. Behavior of people interviewed to plastic-bag waste.

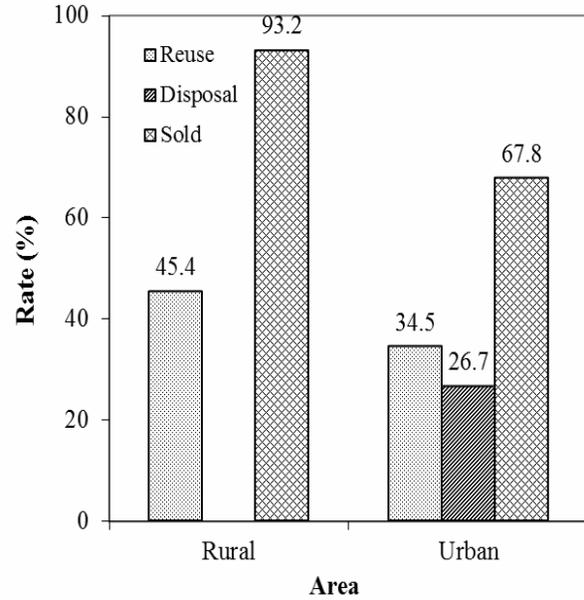


Figure 7. Behavior of people interviewed to waste paper.

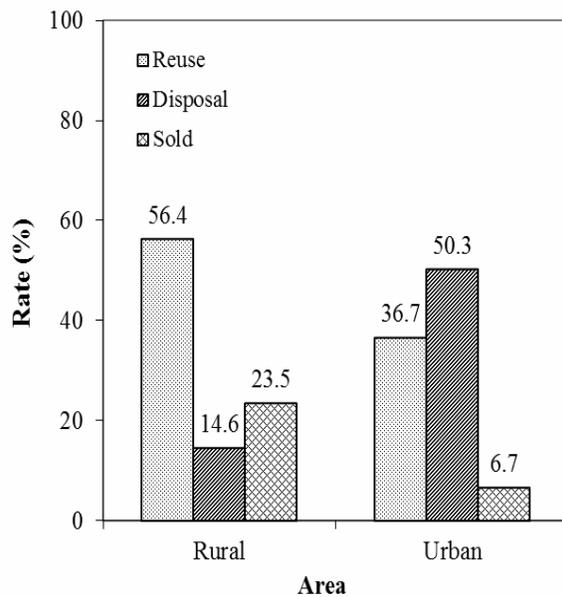


Figure 8. Behavior of people interviewed to wood waste.

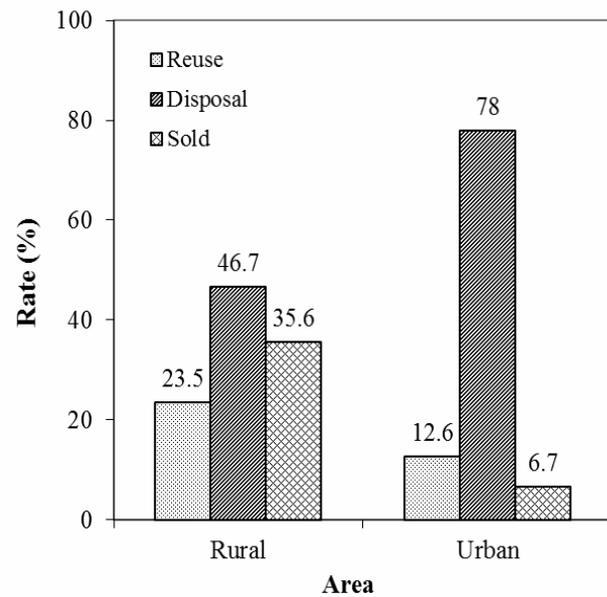


Figure 9. Behavior of people interviewed to waste rags.

- Many types of waste which can be recycled at the rate of 100% [4] is hardly classified or sold but is disposed, such as glass (ratio of glass disposal option is very high: 64.4% in rural areas and 87.5% in urban areas), rags (46.7% in rural areas and 78% in urban areas). Adversely, some products, such as plastic, paper, the classification and selling option's percentages are high (plastic selling: 97.3% in rural areas and 55.3% in urban areas; paper selling: 93.2% and 67.8%, respectively). The main reason is the need from the scrap collectors. The awareness of recyclable waste depends on waste collectors. Additionally, the survey results showed that scrap collectors in rural areas purchase more types of waste than in urban areas and it became a factor that makes scrap selling percentage higher in rural areas.

- Percentage of recyclable waste disposal in urban areas are much higher compared to rural areas of all wastes, 50% of the interviewees

choose to dispose of 6 out of 8 types of waste. Especially, there appear many kinds of waste that the scrap collectors are very active in collecting while in urban areas, the percentage of disposal option is still very high (30.5%, 54.6%, 60.4% and 65.7% respectively to plastic, metal, plastic-bag and battery). The reason is that people in urban areas who were interviewed have average and stable income and they are busy so they often choose to dispose the garbage, especially for the kinds of recyclable and cheap DSW (plastic bottles, batteries, paper, etc.). However, rural population is agricultural people with low income and they always classify and collect the waste that can be sold.

It can be observed that, in the future, if there are no sanctions about DSW classification at source, the trend of disposing recyclable waste will grow due to the increasing standard of living.

- Percentage of reuse is quite high. Reuse ratio in rural areas is much higher than that in urban areas with all kinds of waste. Plastic-bag, wood and rags are some of waste that have big dissimilarity between rural and urban areas (54.7%-28.7%; 56.4%- 36.7%; 23.5%-12.8%, respectively)

3.2.2. Accessing the community support for operation of DSW classification at source

With questions about the willingness to participate in and support waste separation activities, the responses are shown in the following chart:

These responses are also consistent with reality occurring in Gia Lam district. According

to our research, the deployment of sorting DSW at source at pilot wards achieved good results by the following reasons: High consistency in policies and implementation at local government level (wards); Participation of all associations and organizations in communes, wards in propaganda activities, guidance, monitoring DSW classification activities (especially that the Women Union of District has been operating very effectively is a major factor contributing to success of activities of DSW segregation at source in district) and the propagation and guiding in DSW classification is done with rich content, appropriate to each people.

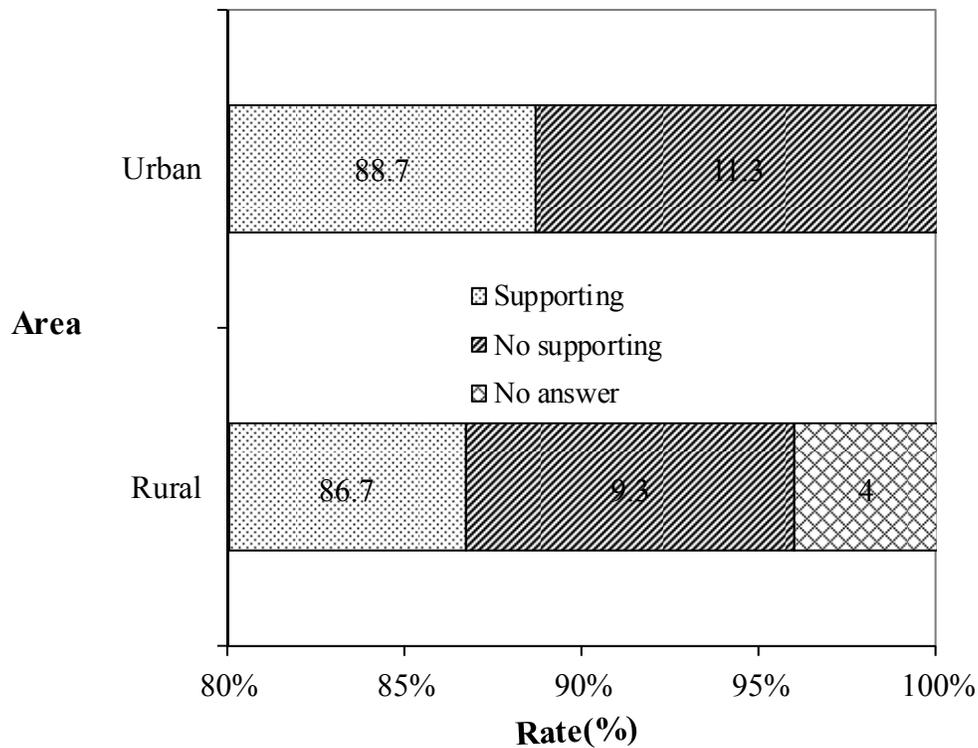


Figure 10. Opinions of people about operating classification DSW at source.

Therefore, if we do well with the propaganda campaign in order to raise awareness and consciousness of people about their right and responsibility in DSW classification activities, these DSW segregation at source will receive strong support from community.

4. Conclusion

Research shows that DSW Classification at source has been conducted by 100% of Hanoi people for a long time mainly in order to sell them to scrap collectors and to earn money. However, with non-stop improved living standard, the activities of DSW segregation at source have been shrinking, typically in the case of urban Hanoi people (the percentage of DSW reused and sold is always much less than in rural areas). On the other hand, to meet the need of scrap collectors, many recyclable wastes (glass, rags, wood...) have been sold uncategorized and incompletely collected. Especially, waste from excessive food which accounted for a large volume (this could be a very good source of compost production) were mostly discarded without sorting (87.3% of urban people agreed to discard this kind of waste).

According to the survey, 86.7% of opinions collected in rural area and 88.7% of opinions in urban areas over the total number of the

interviewees demonstrated the willingness to perform and support activities of DSW segregation at source. Some solutions have been proposed to ensure the best classification DSW at sources including: Propaganda to each people, Specific instructions of how to identify and classify DSW, Equipping essential tools for people and Appropriating penalties to offenders in DSW classification activities.

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Nghiên cứu ứng xử của cộng đồng đối với hoạt động phân loại chất thải rắn sinh hoạt tại nguồn trên địa bàn Thành phố Hà Nội

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Tóm tắt: Phân loại chất thải rắn (DSW) tại nguồn là một công đoạn rất quan trọng trong hoạt động xử lý DSW theo hướng giảm thiểu, tái sử dụng, tái chế và chỉ được thực hiện tốt khi có sự ủng hộ và tham gia của cộng đồng. Bài viết này thể hiện các kết quả nghiên cứu về ứng xử của cộng đồng đối với hoạt động phân loại DSW sinh hoạt tại Thành phố Hà Nội. Bằng các phương pháp nghiên cứu như điều tra xã hội học (300 phiếu), khảo sát trực tiếp, khảo cứu tài liệu... nghiên cứu đã chỉ ra hiện nay toàn Thành phố phát sinh hơn 5000 tấn DSW sinh hoạt/ngày và hoạt động phân loại DSW tại nguồn vẫn chưa được triển khai trên toàn Thành phố. 100% ý kiến trả lời phiếu điều tra cho biết có thực hiện phân loại DSW nhưng chủ yếu để bán cho người thu gom phế liệu. Đối với nhựa và giấy loại, tỷ lệ thực hiện phân loại tại nguồn đạt cao hơn ở khu vực nông thôn (lần lượt đạt 97,3% và 93,2%) so với khu vực nội thành (lần lượt đạt 55,3% và 67,8%). Đối với DSW có khả năng tái chế thành phân bón hoặc đồ thủy tinh người dân cũng ít thực hiện phân loại tại nguồn và hầu hết là thải bỏ. Tỷ lệ thải bỏ thức ăn, thực phẩm thừa là 87,3% ở khu vực nội thành; thủy tinh là 64,4% đối với khu vực nông thôn và 87,5% đối với khu vực nội thành... Tỷ lệ dùng lại và bán DSW tại khu vực nông thôn luôn cao hơn khu vực nội thành. Kết quả nghiên cứu cũng cho thấy tỷ lệ người dân ủng hộ thực hiện phân loại DSW tại nguồn là rất cao (86,7% ý kiến ở khu vực nông thôn và 88,7% ý kiến ở khu vực nội thành). Nghiên cứu cũng chỉ ra một số giải pháp cần thiết nhằm huy động tốt sự tham gia của cộng đồng trong hoạt động phân loại DSW tại nguồn trên địa bàn Hà Nội trong những năm tới.

Từ khóa: Chất thải đô thị, Hà Nội, phân loại tại nguồn, phế thải, tái chế.