

Solid Waste Collection System in Hoi An City – The Status, Problems and Challenges

Dinh Cuong Le^{1,2}, Takeshi Fujiwara¹, Song Toan Pham Phu^{3*}

1: Graduate School of Environmental and Life Science, Okayama University, 700-8530, Japan

2: University of Science, Hue University, 77 Nguyen Hue Street, Hue City, 49000 Vietnam

3: The University of Danang – University of Technology and Education, 48 Cao Thang Road, Hai Chau District, Danang City, 550000, Vietnam

*corresponding author: ppstoan@gmail.com

Keywords: Optimization, Solid Waste Collection, GIS, GPS, Hoi An

INTRODUCTION

Hoi An city is a tourism destinations of many tourists in the world as a World Heritage Site. This led to the sky-rocketing in solid waste generation and the burden of the existing solid waste management system for the last decade. Enhancements in the solid waste management system is a mission in the research area. Solid waste collection system is an important part of the solid waste management system which accounts between 50% and 90% of cost for solid waste management. As a result, understandings of the present solid waste collection system in Hoi An city is an urge for making enhancements of the solid waste management system. The aim of this study is to (i) examine the existing solid waste collection of the Hoi An city; (ii) create the scientific base for the enhancements of the solid waste collection system towards sustainability.

MATERIALS AND METHODS

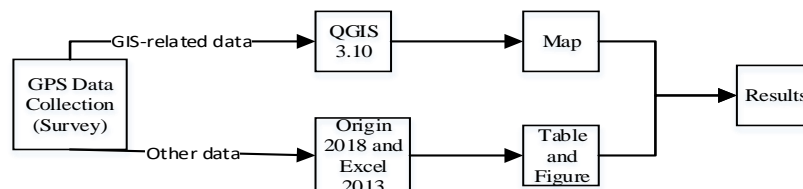


Figure 1 The process applied of the study

Figure 1 shows the process of research that was used in this study. The survey was conducted from the December 2019 to December 2020. GPS loggers was used to collect GIS-related data. All data was imported and analyzed by specific software (Figure 1).

RESULTS AND DISCUSSION

The existing solid waste collection system in Hoi An city

The details of the solid waste collection routes were shown in Table 1. Thursday, Friday, and Saturday accounted for the most enormous workload with 36, 34, and 40 trips, respectively. The total working time for these days were 103.86, 96.12, and 109.6 hours while the total traveled distances were 733.76, 719.21, and 848.12 kilometers (Table 1).

Table 1 Details of solid waste collection by days

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of trips		27	36	29	23	34	40	21
Number of driver		11	11	11	7	11	11	7
Number of worker		26	30	27	16	29	30	16
Distance	Moving without waste	191.65	219.35	215.01	145.54	231.80	290.62	117.10
	Collection	210.91	297.42	226.74	169.20	265.30	281.24	152.37
	Moving with waste	187.89	217.00	199.37	150.02	222.12	276.26	131.45
	Total	590.46	733.76	641.12	464.76	719.21	848.12	400.92
Time	Moving without waste	9.00	10.38	9.38	7.06	10.51	12.74	5.35
	Collection	48.24	66.73	49.60	40.55	60.13	64.73	33.84
	Moving with waste	8.74	10.01	9.15	7.48	10.12	12.52	5.87
	Break(Breakfast)	3.67	3.50	4.03	2.68	4.22	3.58	3.03
	Break(Middday)	4.39	13.24	8.82	7.23	11.14	16.03	4.22
	Total	74.04	103.86	80.99	65.00	96.12	109.60	52.31

The smallest figures were belonged to the Thursday and Sunday with 23 and 21 trips a day, respectively. The figures of working time and total distance traveled for Thursday were 464.76 kilometers and 65 hours while these figures for Sunday were 400.92 kilometers and 52.31 hours (Table 1).

The existing problems and challenges of solid waste collection system in Hoi An city

The inefficiency of waste separation at source program and the illegal solid waste collection were observed in Hoi An city. The waste treatment facilities were limited. The climate of Hoi An city was also a difficulty of solid waste collection activities. The misbehaviors of drivers and workers towards the solid waste collection as a service provider. The improper time frame and frequency of the solid waste collection system were also the problems in the system.

CONCLUSION

The results showed that the solid waste collection activities were the most complex with the highest workload in Tuesday, Friday, and Saturday. The conducting waste separation at source and illegal solid waste collection, improbability in solid waste collection activities and the limitation in waste treatment facilities were the problems and challenges regarding solid waste collection system in Hoi An city. The optimization of the existing solid waste collection system in Hoi An city is urgent towards sustainability.

ACKNOWLEDGEMENT

The authors are thankful to Hoi An Public Work Company for supporting the survey as well as Graduate School of Environmental and Life Science, Okayama University for financial support.