氏　名	NGUYEN HONG DANG		
授与した学位	博　士		
専攻分野の名称	学　術		
学位授与番号	博甲第　　５８３８　　号		
学位授与の日付	平成３０年　９月２７日		
学位授与の要件	環境生命科学研究科　　環境科学専攻 （学位規則第４条第１項該当）		
学位論文の題目	Assessment of waste collection systems and separate collection alternatives in Vietnam （ベトナムにおける廃棄物の収集システム及び分別収集手法に関する評価）		
論文審査委員	准教授　松井　康弘	教授　　藤原　健史	教授　　川本　克也
	教授　　西山　　哲		

学位論文内容の要旨

This dissertation consists of 6 sections, the contents of each section are shown as follows:

Section 1 introduces the research background, overview of solid waste collection in Vietnam and Japan, particularly in Da Nang city and A city. Author also reviewed all the materials concerning with the topic of this dissertation. First of all, the information on solid waste amount and solid waste collection was reviewed. Then applying GPS/GIS in waste system, the operation on waste collection in other researches were also synthesized and compared among systems in different countries. The information on various factors which affect collection system e.g collection frequency, truck capacity was also be reviewed. Lastly, scenario analysis from other studies was referred to understand the current status in research as well as the novelty of this study. The outline of whole study was also shown in this section. And the research area, and the scope as well as objectives of the study were presented.

Section 2 described the methodology of this study, an overview of the research areas and research framework was proposed. Data collection processes were described, including field surveys such as time motion study survey for waste collection system by video recording and GPS/GIS, and survey by tachometer in Japan. Besides, the analytical procedures for operation efficiency, modelling as well as scenario analysis were presented in detail.

Section 3 focused on the major alternatives to waste collection and transport practices used in Da Nang city. GPS devices and a GIS software were used to survey and analyze the detailed tracking data on 3 current practices. The operation efficiency indicators, such as unit operation time, person-hours/t and operation velocity were calculated using a detailed operation category: moving forward and backward, waste collection waste, unloading and other activities. To provide the scientific base for rational planning of waste collection and transport, the authors aimed to models of operation parameters (e.g moving velocity) related to area characteristics as population density, moving distance, road category. Lastly, author also tried to clarify the current problems of waste collection system in Da Nang city such as low operation efficiency, low recyclable waste recovery, informal sector.

In Section 4, the author collected basic data that contributes to the design of efficient collection and transportation system, and collect the actual work in a Japanese City where data on collection and transportation is being developed. From these data, author clarified the relation between working time, distance, work efficiency and regional factors of waste collection and transport. And this separation waste type collection system could be a feasible solution for developing countries in term of operation efficiency and recyclable material recovery as well as growth restriction of informal sector.

In Section 5, the authors intended to estimate the operation efficiencies of waste collection and transport scenario which are simulated from Vietnam and Japan system. The data for scenarios was synthesized from previous sectors. And author also clarified the impacts of policy factors such as truck capacity and collection frequency. Moreover, the operation efficiency in unit person-hour/ton for each practice was also estimated. In addition, the author also tried to estimate the operation efficiency of separate collection of bio-waste as well as different waste types collection as the most likely alternatives in the near future.. The results showed that with low collection frequency, waste separation collection could increase the collection efficiency as well as reduce the financial burdens.

Finally, section 6 summarizes the main conclusions of the dissertation and shows the reasonable suggestions for improving and managing solid waste collection and transport system. Additionally, recommendations for future research and the possible development are represented.

論文審査結果の要旨

ベトナムでは,近年の経済発展に伴って急速に廃棄物の発生・排出が増加してきており,その適性処分,ごみ減量の推進が大きな課題となっている。2015年に公布された政令においては,廃棄物を①リユース・リサイクル可能物,②生物分解可能物,③その他の3つに分別することが規定され,今後ごみの分別・3Rの推進に向けた戦略的な計画策定が必要と考えられる。

本研究は,こうした3R推進計画の策定に資する科学的情報・評価の枠組みを提供することを目的とし,ベトナムにおける,資源化による経済的便益の解明に取り組んだものである。

日本及びベトナムにおいて,GPS/GISを援用して収集･運搬実態データを収集･解析し,収集･運搬効率に対する地域変数･政策変数等の影響,各種変数の不確実性を分析した。また,日本における各種資源の分別収集に関する基礎データ・解析結果を用いて,ベトナム･ダナン市を対象にこれら分別収集を導入した場合の得失をシナリオ評価した。ベトナムでは,廃棄物関連の法律･国家戦略において分別収集の導入が謳われており,今後分別収集の導入が進展するものと予想され,本研究で提示する知見はそうした計画策定に資するものと期待される。こうした本研究の枠組みは他の都市にも適用可能な共通性のある方法論であり,社会的意義の高い研究成果であると考えている。

本研究はベトナムの既往研究に見られない有望な萌芽的研究であるが同国廃棄物マネジメント分野の評価の枠組みを提示する研究事例として高く評価できるものであり,博士学位に値する内容と判断する。