

**STRUCTURAL ANALYSIS OF CONSCIOUSNESS
ON ENVIRONMENTAL CONSERVATION BEHAVIORS
AND EFFECTIVENESS OF ENVIRONMENTAL
EDUCATION AS AN ENHANCEMENT APPROACH:
FOCUSING ON THE COMMUNITY-BASED WASTE
MANAGEMENT IN INDONESIA**

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Structural Analysis of Consciousness on Environmental
Conservation Behaviors and Effectiveness of Environmental
Education as an Enhancement Approach: Focusing on
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Chapter 1

Chapter 1. Background and Objectives

1.1 Background

1.1.1 Environmental issues in Indonesia

The Republic of Indonesia is a unitary sovereign state and transcontinental country located mainly in Southeast Asia with some territories in Oceania¹⁾. Situated between the Indian and Pacific oceans, it is the world's largest archipelago with more than seventeen thousand islands. Indonesia has more than 350 tribes with different customs, different dietary habit and various types of food. Since earlier times, people in Indonesia have been using leaves, such as banana, jati and bamboo leaves, for food wrapping. In some small cities, this practice remains, while in big cities it becomes rare and instead plastics are often used¹⁾.

Economic growth also takes a significant role in the change of lifestyle of people in big cities. As an example, people in big cities often eat out and buy food in disposable packages. This habit is one of the causes of inorganic waste increase in big cities.

Along with population growth, changes in lifestyle, economic growth, income increase, urbanisation and industrialization, increase of waste volume with various types becomes an unavoidable issue in big cities. This situation affects the environment and causes burden to the community due to high costs required to overcome the issue²⁾.

Table 1.1 Population growth of 5 city in Indonesia²⁾

Name of City	2012	2013	2014	2015	2016
1 Medan	2,122,804	2,123,210	2,191,140	2,210,624	2,467,183
2 Bandar Lampung	881,801	1,101,101	1,129,894	1,166,761	
3 Bandung	2,444,617	2,458,503	2,470,802	2,339,463	2,490,622
4 Malang	834,527	840,803	845,973	808,945	856,41
5 Padang			889,561	902,413	914,968
6 Surabaya	2,805,718	2,821,929	2,821,929	2,845,900	2,862,406

Population growth in big cities are not supported by proper infrastructure and this causes

problems in waste management. Budi Yuwono³⁾ (Ciptakarya workshop) mentioned that in general, waste management in Indonesia still applies open dumping system to final landfills, show in Fig. 1.1, although in some big cities sanitary landfill system has already been applied. The latter system is very suitable for the condition in Indonesia where domestic waste are dominated by organic waste. With sanitary landfill system, leachate (waste water) can be priorly handled so it will not cause danger.



Fig. 1.1 Landfill in Bandar Lampung

Table 1.2 Garbage Computation in Indonesia⁴⁾

Compotition	Settlement with income			Market	Mall	garbage from the street	TPS	TPA
	Low	Medium	High					
Organic waste	78,72	73,41	73,41	86,36	67,03	42,23	82,76	87,78
The leaves	1,70	3,51	3,51	1,25	0,05	29,30	3,76	
Paper	6,10	9,32	9,32	5,77	0,05	18,16	4,94	4,60
Textiles	1,94	1,69	1,69	0,45	17,38	0,19	1,03	0,76
Rubber	1,80	0,19	0,19	0,14	2,89		0,07	0,35
Plastic	6,31	9,15	9,15	5,67		8,16	4,85	4,71
Skin	0,85	0,52	0,52		11,96		0,06	0,10
Wood	0,77	0,55	0,55		0,29		0,43	1,13
Glass	0,51	0,80	0,80	0,19	0,29		0,28	0,10
Metal	0,79	1,18	1,18	0,09	0,10		0,19	0,12
Etc	0,51	0,69	0,69	0,08	0,01	1,96	1,16	1,35
TPS : Temporary dump		TPA : Landfill						

Based on the research performed by Research Centre of Science and Technology (*Puspitek*) - Research, Technology and Higher Education (*Ristekdikti*) reveals that currently, instant and disposable lifestyle becomes a trend for people in Indonesia, especially people in big cities. This lifestyle even spreads to people living outside the cities. We can find mineral water in refillable packages and instant noodles in villages and traditional

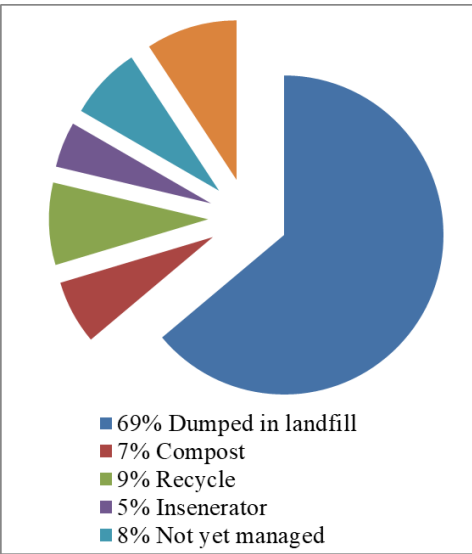


Fig. 1.2 Waste treatment in Indonesia²⁾

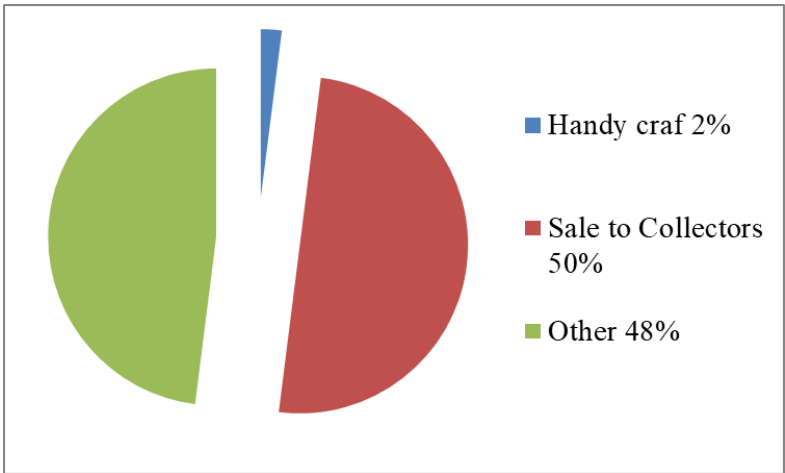


Fig. 1.3 Type of waste management in waste bank²⁾

Communities. Instant and disposal habits are a reflection of a modern lifestyle. In developed countries all aspects of life are made fast, instant and disposal. Development in science and technology, as well as new inventions in resources, such as petroleum products, encourage productions of styrofoam, plastics, ⁴⁾ etc. In Indonesia, one of the examples of this new lifestyle can be seen in a wedding party, where food and beverage are mostly served on disposal utensils, such as bottles, plastic glasses, styrofoam plates, disposable plastic spoons and forks. It seems that the more modern the community is, the more disposable goods are used for the reasons of practicality, easiness and simplicity.

Table 1.3 Percentage of households by province⁴⁾

Percentage of Households by Province and Behavior of Sorting Garbage
Easy to Decompose and Not easy to Decompose in 2013–2014

	2013				2014			
	Sorted and partially	Sorted later thrown away	Total	Not Sorted	Sorted and partially	Sorted later thrown away	Total	Not Sorted
Sumatera Utara	10,94	8,67	19,61	80,39	7,66	7,36	15,02	84,98
Sumatera Barat	3,67	13,80	17,47	82,53	4,80	8,25	13,05	86,95
Lampung	5,46	10,83	16,29	83,71	6,88	8,43	15,31	84,69
Jawa Barat	14,93	15,59	30,52	69,48	11,28	11,36	22,64	77,36
Jawa Timur	9,91	10,01	19,93	80,07	8,39	7,10	15,49	84,51

Composition of waste type generated in big cities is affected by changes in people's consumption pattern and lifestyle. Accordingly, current waste handling applying direct waste dump to final landfills without any prior treatment is considered no longer suitable. Moreover, space for final landfills is becoming narrower and limited. Considering these facts, a solution is required to extend the lifetime of landfills and to educate people in sorting their waste at home. In table 1.3 is the Types of waste management in Indonesia. The below table shows that waste management in Indonesia has not been conducted properly. The data is sourced

from⁴⁾. Most of the waste has not been sorted, has not undergone treatment prior to dumping and is still in the same condition as when it was picked from the sources. Sorting should be performed as it will make waste handling easier⁴⁾.

Table 1.4 Population growth rate by province⁴⁾

Provinsi	Populasi Growth Rate by Province				
	1971-1980	1980-1990	1990-2000	2000-2010	2010-
Sumatera Utara	2.6	2.06	1.32	1.1	1.36
Sumatera Barat	2.21	1.62	0.63	1.34	1.33
Lampung	5.77	2.67	1.17	1.24	1.24
Jawa Barat	2.66	2.57	2.03	1.9	1.56
Jawa Timur	1.49	1.08	0.7	0.76	0.67

1.1.2 Present situation of waste management

(1) Waste management in Indonesia

Population growth for some big cities in Indonesia from 2010 to 2015 increases as shown on the table below. Along with the population growth, increment on waste volume occurs and it causes decreasing of the lifetime of final landfills. It can be seen from the table showing waste volume increase in some big cities.

Population growth relates to waste volume increase. However, it is not supported by proper infrastructure, thus causing problems to waste management. A waste issue actually has been a universal issue in all countries in the world. What makes it different from one country to another is the waste volume and the waste management system. Present condition of waste in Indonesia is considered as an urgent issue. Waste volume produced is as much as 175,000 ton/day or equal to 64million ton/year. 69% of the volume is directly dumped to final landfills and only 7.5% is classified as processed waste. Ironically, the majority of final landfills in Indonesia apply open dumping (54%)⁵⁾.

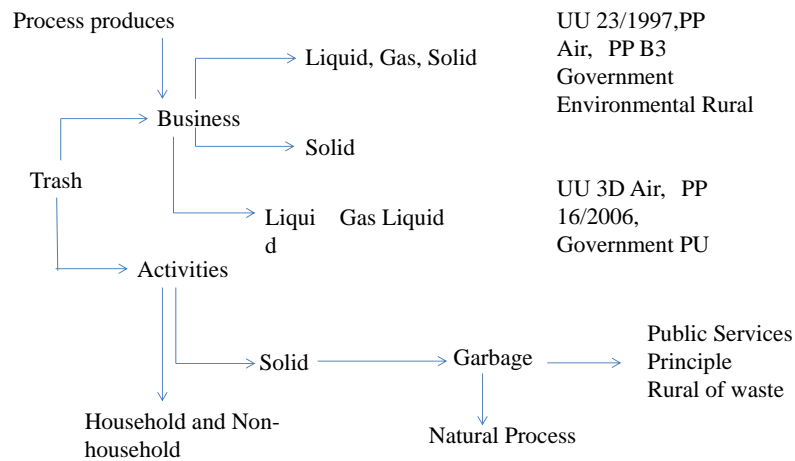


Fig. 1.4 Waste management concept⁵⁾

Tabel 1.5 Indonesia population in the last 5 years²⁾

	Population growth rate by province per years				
	1971-1980	1980-1990	1990-2000	2000-2010	2010-2015
Aceh	2.93	2.72	1.46	2.36	1.203
Sumatera Utara	2.6	2.06	1.32	1.1	1.36
Sumatera Barat	2.21	1.62	0.63	1.34	1.33
Riau	3.11	4.3	4.35	3.58	2.62
Jambi	4.07	3.4	1.84	2.56	1.83
Sumatera Selatan	3.32	3.15	2.39	1.85	1.48
Bengkulu	4.39	4.38	2.97	1.67	1.71
Lampung	5.77	2.67	1.17	1.24	1.24
Kepulauan Bangka Belitung	-	-	0.97	3.14	2.22
Kepulauan Riau	-	-	-	4.95	3.11
DKI Jakarta	3.93	2.42	0.17	1.41	1.09
Jawa Barat	2.66	2.57	2.03	1.9	1.56
Jawa Tengah	1.64	1.18	0.94	0.37	0.81
DI Yogyakarta	1.1	0.57	0.72	1.04	1.19
Jawa Timur	1.49	1.08	0.7	0.76	0.67
Banten	-	-	3.21	2.78	2.27
Bali	1.69	1.18	1.31	2.15	1.23
Nusa Tenggara Barat	2.36	2.15	1.82	1.17	1.38
Nusa Tenggara Timur	1.95	1.79	1.64	2.07	1.7
Kalimantan Barat	2.31	2.65	2.29	0.91	1.66
Kalimantan Tengah	3.43	3.88	2.99	1.79	2.36
Kalimantan Selatan	2.16	2.32	1.45	1.99	1.84
Kalimantan Timur	5.73	4.42	2.81	3.81	2.64
Sulawesi Utara	2.31	1.6	1.33	1.28	1.15
Sulawesi Tengah	3.86	2.87	2.57	1.95	1.69
Sulawesi Selatan	1.74	1.42	1.49	1.17	1.12
Sulawesi Tenggara	3.09	3.66	3.15	2.08	2.18
Gorontalo	-	-	1.59	2.26	1.64
Sulawesi Barat	-	-	-	2.68	1.94
Maluku	-	2.79	0.08	2.8	1.81
Maluku Utara	-	-	0.48	2.47	2.18
Papua Barat	-	-	-	3.71	2.63
Papua	2.67	3.46	3.22	5.39	1.97
INDONESIA	2.31	1.98	1.49	1.49	1.38

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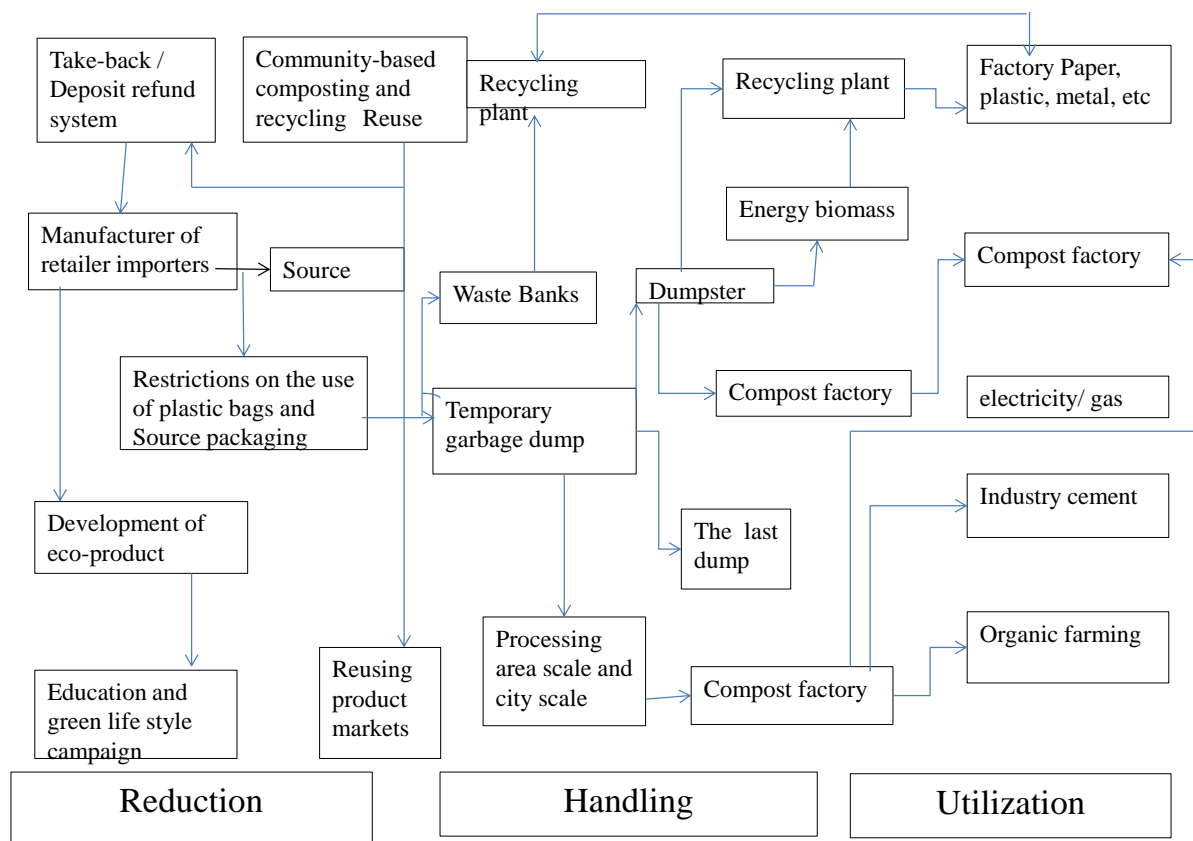


Fig. 1.5 Flow chart Waste handling system⁵⁾

Referring to the statistic of waste in Indonesia⁵⁾ (MEF data, 2014) as shown on the chart below, 69% of waste is directly dumped to final landfills and only 7.5% of waste is priorly processed. This condition requires special attention considering the fact that waste can not continuously be dumped to final landfills. One of the solutions is by sorting waste at the source point. Some waste can be recycled into goods which have economic value. It is time for people to handle waste from the source point and one of the ways to do it, is by applying 3R (Reduce, Reuse and Recycle) program through a waste bank. One of the effort in waste management is to change paradigm complying with the content of Law No. 18, 2008 on Waste Management by implementing different perspective, considering waste as something that has functional and beneficial values.

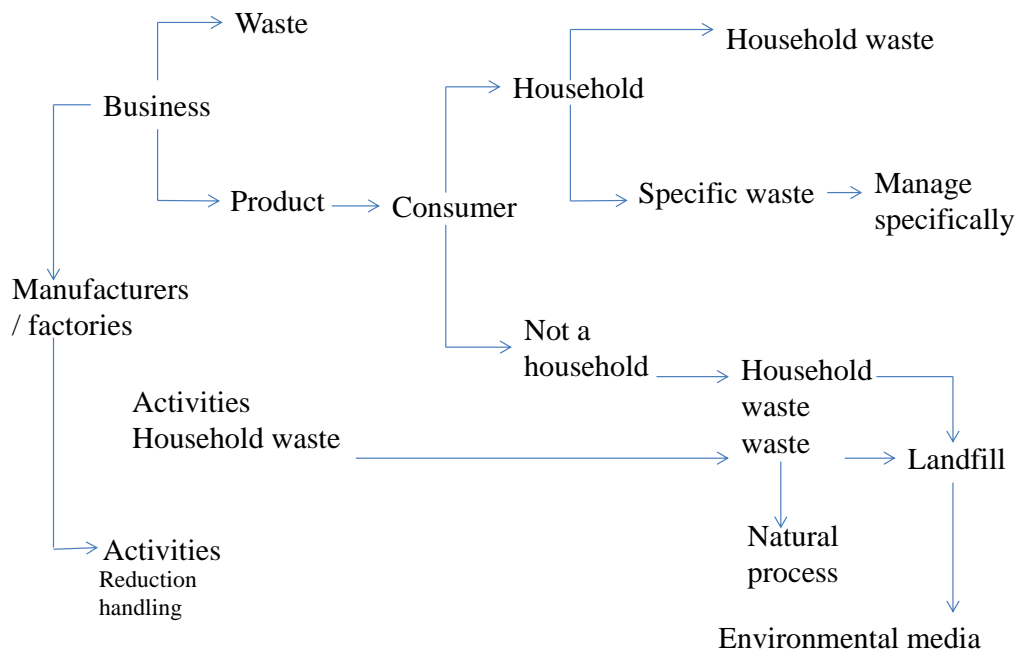


Fig. 1.6 Relation Of Source of waste with its management⁵⁾

Therefore, disposing waste without prior process, is considered as an improper action. A phrase sourced from a waste practitioner, ie. “When waste converts to wealth”, is a right expression to describe the change of paradigm on waste, from the previous paradigm, ie. collect-transport-dump, to a new paradigm, ie. reduce and handle. Reducing and handling of waste involves all elements in the community including the government, entrepreneurs and people through 3R program.

However, in reality waste management applying 3R program has not become people’s culture and habit, as recycle and reuse seem to remain a discourse. One of the constraints to application of reuse, recycle and utilize waste is that people is not accustomed to sorting waste at both the source points and temporary landfills. Whilst sorting waste at its source points is one of the keys to 3R program success. The values of waste will increase significantly when it is clean and sorted by the types (MEF).

Policies on waste management:

- a) Law of the Republic of Indonesia No. 18, 2008 on Waste Management.
- b) Law of the Republic of Indonesia No. 30, 2007 on Energy.
- c) Government Regulations No. 81, 2012 on Management of Domestic Waste and Waste Similar to Domestic Waste.
- d) Regulation of the Minister of Environment of The Republic of Indonesia No. 13, 2012 on Guidelines for Implementation of Reduce, Reuse and Recycle program through Waste Bank.
- e) Regulation of the Minister of Environment of The Republic of Indonesia Regulations No.7, 2011, ammended by Regulation of the Minister of Environment of The Republic of Indonesia Regulations No.1, 2013 on Guidelines for Implementation of Adipura Program.

Hierarchy of waste management

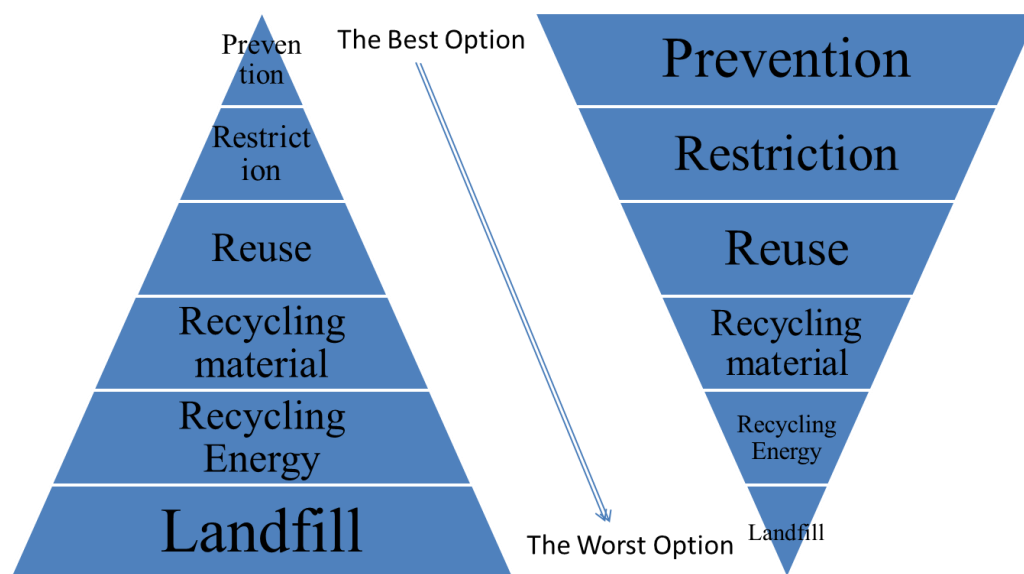


Fig. 1.5 Hierarchy of waste management⁵⁾

Data Solid Management KLHK, 2016

Fig. 1.7 Hierarchy of waste management⁵⁾

countries. By considering the Millennium Development Goals (MDGs) on poverty reduction, and strategy to increase the recycle rate, the main challenge in MSW management for developing countries is to find the best solution for developing the quality of life, working condition and recycling efficiency in this informal sector. Suttibak et al. suggested that the most effective way to solve this serious problem is to integrate the waste recycling effort into existing MSW management.

(2) Community-based waste bank

Indonesian Government encourages people to sort waste through Waste Bank program. Waste bank applies a principle that waste management should be initiated at the waste source point, ie. houses, by sorting waste that can be recycled. Indonesian Government has been encouraging waste bank program through the years and the program has been implemented in almost all regions in Indonesia.



Fig. 1.9 Photo of waste bank activity

Through this program, the communities are not only encouraged to reduce waste but also to participate in the development of community-based economy. Waste bank is basically a waste management system which is designed similar to banking mechanism. In waste bank, people save waste and it is validated in the account books of their account numbers. Through waste bank, people are not only encouraged to sort their waste, but also to learn saving their money.

Each waste bank has its own mechanism in managing the waste. However, all waste banks apply the same vision and missions. The vision is implementation of independent waste banks to support development of community-based economy, as well as to create clean and green environment aiming to a healthy community.

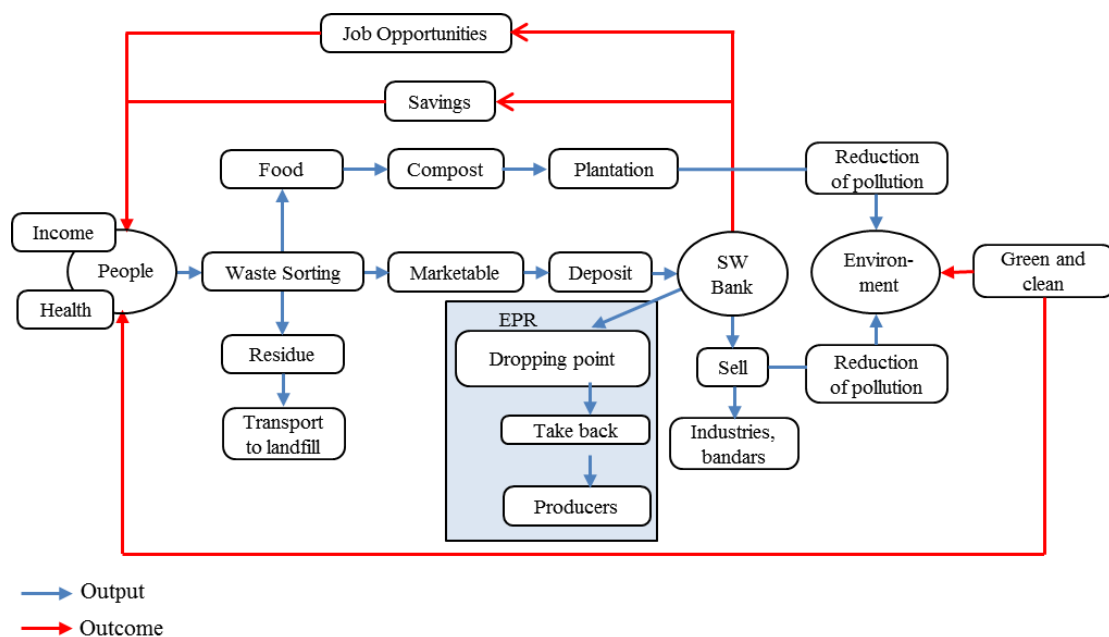


Fig. 1.10 Framework of solid waste bank¹⁵⁾

While the missions are to reduce waste volume loaded to final landfills, to improve people's knowledge on 3R program, to increase community participation level on waste handling by recycling waste into useful goods which have economic value and are potential to give benefit to the community, to change people's behaviour in handling waste properly and in

environment-friendly manner, to create clean and healthy neighbourhood, to create jobs and to develop community-based economy. The Ministry of Environment and Forestry (MEF) through Directorate of Waste Management continuously encourages development of waste banks in Indonesia in order for them to actively participate in waste handling from the source points.

Based on MEF data in 2016 the number of waste banks in Indonesia reached 4,280. The analysis on waste management at waste banks reveals that the effectivity of a waste bank is significantly determined by the number of customers, waste availability, alternative technology applied for 3R process and recycled product guarantee. However, statistically high number of waste banks should be followed by active customers who can boost development of the waste banks. Participation of all parties is required to support waste bank development as one of the effort in reducing waste at the source point.

As mentioned previously, the current number of waste banks in Indonesia is 4,280, spread in 30 provinces and 206 regencies/cities. The number of waste bank customers in 30 provinces are 163,128 with the turnover of IDR 1,151,477,446/month and the waste volume of 91,616,37 ton/month.

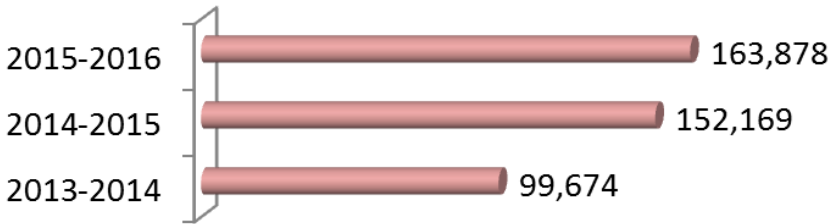


Fig. 1.11 The constumer number of waste banks⁵⁾

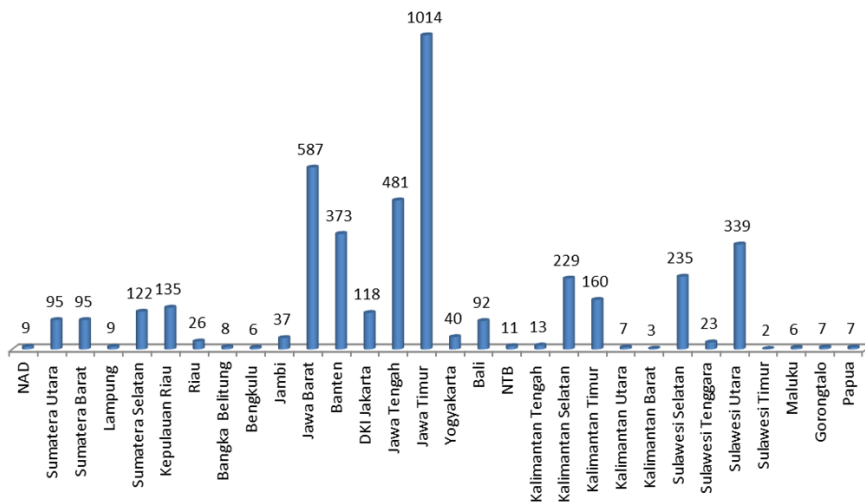


Fig. 1.12 The number of waste bank per province in Indonesia⁵⁾

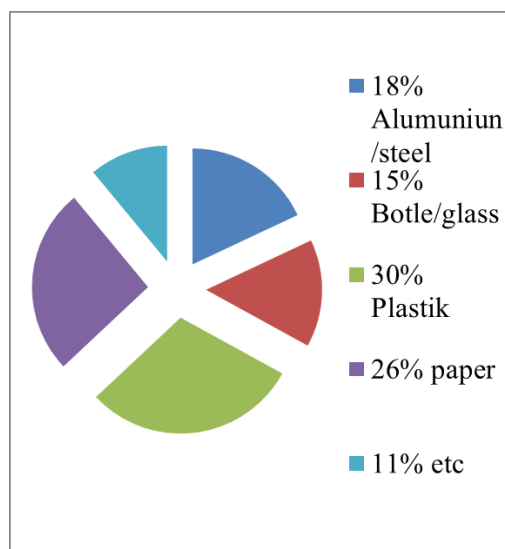


Fig. 1.13 Percentage of waste types at waste banks⁵⁾

Accoding to MEF report, there are approximately 30 types of waste collected at waste banks, dominated by paper, cardboard, plastic, glass/bottle and aluminium.(Directorate of Waste Management of MEF, Directorate General of *PSLB3* of MEF, 2016).

Recent years in Indonesia, the problem of waste has been getting worse due to rapid economic growth and progress of urbanization. In order to solve this problem and to addition to building social systems such as improvement of infrastructure for treatment and disposal of

waste, construction of waste collection system, the improvement of environmental awareness and change of behavior of residents are necessary. Under such conditions, in recent years, "Waste Bank" has been attracting attention in Indonesia. Waste bank was established at the first time in Yogyakarta City, Indonesia in 2008, and currently has more than 1,000 locations in Indonesia (1,195 places in June 2013). Local governments, private enterprises, neither of them, as a waste management method of the community-based approach, its significance is increasing.

1.1.3 Present situation of environmental education in Indonesia

(1) Environmental education

Environmental education (EE) in Indonesia was initiated by Institute of Teacher Training and Educational Science (*IKIP*) Jakarta in 1975. In 1977/1978 the Outlines of Environmental Education Teaching Program was tested in 15 elementary schools in Jakarta.

The present obstacle to the implementation of environmental education is limited comprehension of the educators on environmental education itself, which is reflected on their varied perceptions on the subject. Lack of commitment is also another obstacle that affects the success of environmental education. In a formal education, some of the school policies still considers environmental education as an unimportant subject and as a result, this condition limits flexibility and creativity of teachers who try to conduct environmental education comprehensively.

The applied materials and methods of environmental education has not been properly transferred, therefore the comprehension on environment preservation of the targeted groups is considered not applicable and does not support environmental problem solving in the neighbourhood. Another issue in environmental education is improper facility and infrastructure which hold important role in supporting environmental education. There has

been a misunderstanding on what is meant by the facility and infrastructure, as they are often assumed as high-technology physical utilities that require high costs and accordingly, it demotivates implementation of environmental education. Lack of support from the government and improper budget allocation for environmental education have also been obstacles to the implementation and development of environmental education. In addition, lack of coordination between relevant agencies and educators hampers the development of environmental education. It can be seen from environmental education activities (formal and non-formal, informal) which are sporadic, not synergistic and overlap one to another.

Referring to Law No. 23, 1997:

- a) Formal environmental education is educational activities on environment, conducted by schools, consisting of primary, secondary and higher education, and conducted in structured and tiered methods, through integrated or monolithic curriculum (separately) as the approaching method.
- b) Non-formal environmental education is educational activities on environment, conducted outside schools and conducted in structure and tiered methods (eg. AMDAL, ISO 14000, *PPNS* trainings).
- c) Informal environmental education is educational activities on environment, conducted outside schools in non-structured and non-tiered methods.
- d) Environmental education institutions include all levels in a community, including participants, organizers and educators of environmental education in formal, non-formal and informal sectors. In order to support the success of environmental education program in Indonesia, the government established Adiwiyata program.

(2) Environmental education Adiwiyata program.

This year the Regulation of the State Minister of Environment No. 02 of 2009 on Guidance

of Implementation of the Adiwiyata Program. The purpose of fostering awareness of environmental conservation, the role of environmental education is effective for a long term. Environmental education in Indonesia, there is a green school award system called Adiwiyata¹⁾. The program consists of (a) the school's environmental policy, (b) the practice of environmental education curriculum, (c) participatory environmental activities, and (d) management of environmentally friendly support facilities (compost etc.). It is evaluated based on certification criteria. There are totally 251,415 schools in Indonesia (elementary schools, junior high schools, senior high schools), but the number of schools that received the national level certification in 2014 year is only 56 schools yet. Fig. 1.14 show the situation of Adiwiyata model school.

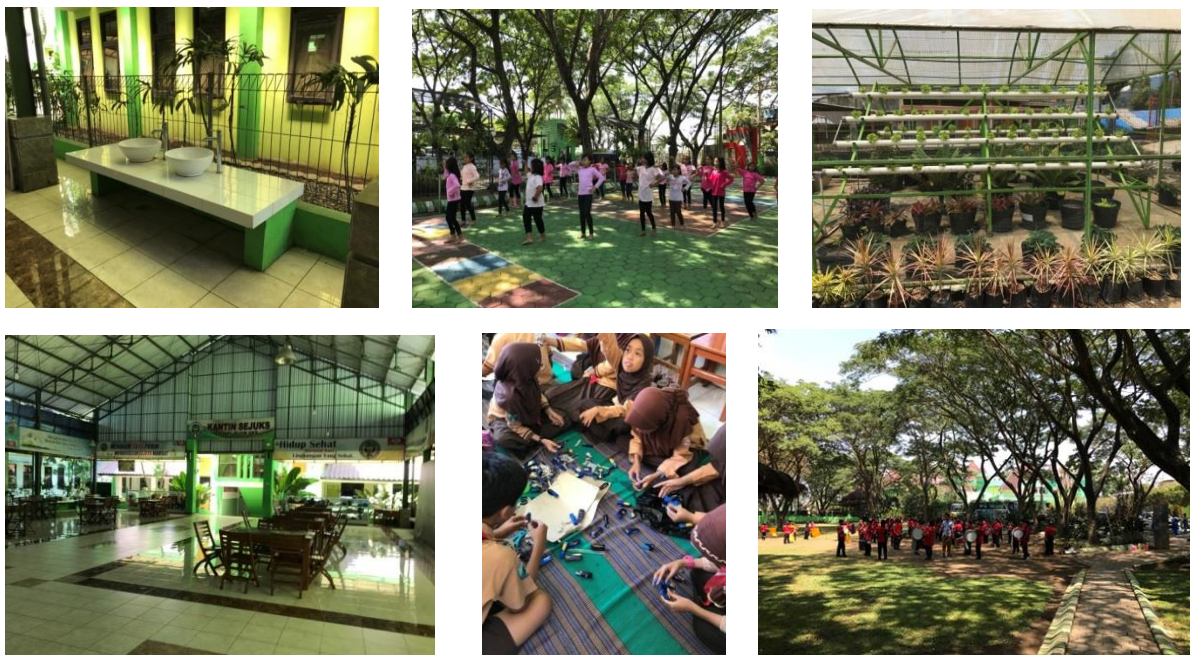


Fig. 1.14 The Adiwiyata model school activity in Malang City

Environmental education practiced in the program is a school form and many teachers do not have sufficient teaching skill in the environmental education curriculum. Also, many schools do not have timetable for regular lecture. These are another obstacle to achieving Adiwiyata's

goals. In Indonesia, PBL learning method ²⁾ is not yet popular, and the teacher's ability to apply this method is not enough. However, if improvement of the curriculum and strengthening of the ability of the teacher can be aimed, it seems to have modelability to Asian countries.

Table 1.6 Comparative content of teacher and facilitator

	Teacher	Fasilitator
Role in Knowledge	Present and present New	Guide students to new knowledge
How to understand	Understand the presented	Finding the necessary
Direction of guidance	Show correct answer (Teachers)	Do appropriate

Learning using Problem-Based Learning (PBL) methods, encouraging students to figure out problems, solve the problems and make conclusions. PBL is an abbreviation for Problem-based Learning, which is a problem discovery and solution class by a small group 2). In SBL (Subject-based Learning) which is a learning based on subjects that tend to be classroom oriented classes, teacher-led communication and consolidation of knowledge is the main activity/purpose. On the other hand, PBL basically doesn't explain and present learning matters such as lecture, and it starts with problem rising. The reason PBL such as a class format is that its educational style is based on constructivism. In constructivism, learners themselves comprehend understanding of learning objects themselves and deepen their understanding through classes assembled on the basis of the concepts and knowledge already existing among learners. For this reason, students themselves decide the necessary contents of learning to solve the problem, and the students themselves acquire knowledge using various approaches. At that time, the role of the teacher changes from Teacher (Professor) to Facilitator (Progressor). Table 1.6 shows the comparison between Teacher and Facilitator.

1.2 Relevant studies

1.2.1 Community-based waste management

R.M.Widyaningsing⁷⁾, waste is reduction data of the composition of the waste reduced by the waste bank, garbage collectors, and the informal sector. Community participation in waste management is still low but the community's enthusiastic if there is waste management facilities and infrastructure.

E.T.Wahyuni⁸⁾, the research is to find out effort required to optimize waste management through participation of the community and study of Extended Producer Responsibility (EPR). Application of EPR will reduce package waste dumping into final landfills, and accordingly the lifetime of final landfills can be extended.

K.Nandini⁹⁾, the community of participation has a direct bearing on effective solid waste management. Greater level of community engagement in reduction of waste at the source through campaigns in a scientific manner is needed.

A.S.Oberlin¹⁰⁾, the city council decided to consider involving community in solid waste management (SWM) by supporting and promoting the establishment of Community Based Organizations (CBOs) that were interested in participating in solid waste collection activities. The study has shown that CBOs were found to be involved in the provisioning of solid waste management services.

F.Wulandari¹¹⁾, this research purposed to evaluate the waste management through the waste bank and to explains the sustainability prospect of waste bank. Waste management through

waste bank has sustainability prospect since from the view point of economic aspect, it can secondly from the additional income and reduce the operational cost of municipal waste management.

M.Ahmadi¹²⁾, community-based waste management (CBWM) reports the roles and actions of the community level stakeholders, process and their relationship with the city authorities. That must be included simultaneously to improve the planning, implementation and evaluation of municipal solid waste management.

Desa¹³⁾, solid waste can also be defined as the useless and unwanted products in the solid. Students' awareness about environmental problems and solutions can be increased through education. Students with some knowledge and skills on environmental education are more motivated to take part in environmental protection activities.

Retnayu¹⁴⁾, the enormous population in Surabaya has contributed to the overcrowded solid waste volume that reached a thousand ton per day. According to system dynamic analysis, community participation is assessed to be very effective alternative for the future solid waste management system. Women and scavenger development may also give solution for both environmental sustainability and economic matter.

S.Raharjo¹⁵⁾. SWOT analysis suggests that some strategies such as creating a local regulation may be adopted to utilize the potency of SW bank for local MSW management improvement.

Many researches result in a conclusion that people's participation in waste management is still considered low. However, they also revealed that many people in the communities have

willingness to participate in waste handling at their houses. Another research mentions that people's knowledge, awareness and behaviour in relation to waste management are still low, whereas people's participation in waste management is considered as an alternative for future waste management. In accordance to the above issue, a study analyzing the structure of people's awareness on environment-friendly behaviour is required. The previous research applying SWOT analysis reveals that some strategies, such as establishing related regional regulations, can be adopted to support community-based waste management system. A SWOT analysis is required on a possibility of a region to become a role model with certain type of community that can perform independent waste management.

1.2.2 Environmental education

A.G.Poyyamoli¹⁶⁾, environmental education for sustainable development (EESD) is emerging as an important approach to encourage students to conserve and protect the natural environment in their schools and in their neighbourhoods. The main Objectives of this research were to foster the acquisition and transfer of the necessary knowledge, skills, attitudes and behaviour with reference to the protection of the environment and sustainable development.

M.Onyeka¹⁷⁾, the indiscriminate dumping of solid wastes in the streets, to the spread of diseases and pollution of the environment. It is in the light of these problems that the paper discussed the importance of education and awareness creation on solid waste management. The paper recommends that educating the citizens both formally, informally and non-formally should be sustained. The print, electronic media, environmental education materials should all be utilised in creating awareness.

S.Peiris¹⁸⁾, management of solid waste is a critical problem because current disposal techniques are harmful to the environment and contaminate community resources. Waste management education programs is important. Nevertheless, no matter how effective a program can be by solving these specific factors, it will not be enough to overcome the lack of support many schools give to waste management education programs. It must become a core requirement in schools to be effective.

M.Gence¹⁹⁾, The purpose of this study is to investigate the effect of project-based learning on students' attitudes toward the environment. In the study that was performed with 39 students who take the "Environmental Education" course, attitude changes toward the environment were investigated in students who developed projects on environmental problems. A mixed-method explanatory design was used to flesh out study results. After being informed about basic environmental concepts and project-based learning, students engaged themselves in group work to develop projects regarding environmental problems. The developed projects were presented with the aim of informing students. According to research results, although a significant gender difference in environmental attitudes was not found, project-based learning had a positive effect on students' environmental attitudes. Students defined project-based learning use in environmental education as an approach that is beneficial, enhancing creativity, encouraging research and providing permanent learning. Students believed this practice helped them define environmental problems more clearly and take on more active tasks in the solution process.

Jonathon²⁰⁾, by using PBL as a tool for sustainable education, it is an ideal way to solve the sustainability problem, making it possible for students to see from diverse "perspectives" and effective. Meanwhile, it took resources and time, and there was a practical problem of

requiring a facilitator for each group of 8~12 students.

Clara²¹⁾, discusses the effectiveness of teaching environmental education by using PBL, but at the same time said that in order to improve the learning outcome of the student, it was necessary to identify appropriate teaching methods.

Cindy²²⁾, point out that active learning is extremely effective for children in the age of primary school and can think more deeply. As an effective method, it was effective to use the logical order between objects and objects with the help of integrated hierarchical multimedia.

I.Maryani²³⁾, Adiwiyata program is placed on two principles as follows: Participatory, and Sustainable (sustainable), often referred to as green school program have four indicators, namely: development of environmentally sound school policy, development of environment based curriculum, development of participative based environmental activities, and or management of environmentally friendly school support facilities

A.S.Fridantara²⁴⁾, this study aimed to describe the implementation Adiwiyata program in SMA N 2 Klaten and school efforts to increase student's participation by evaluating them through five point of view of Management Education. Constraints faced is lack of cooperation and lack of personel in the maintenance of facilities.

R.D.Iswari²⁵⁾, behavior of environmental awareness is still low, even among students. One effort to create behavior of environmental awareness among students through Adiwiyata program, which is integrate in formal education at all, levels of school. Thus, there is relationship between implementation of Adiwiyata program to build knowledge, attitude and

action toward environment.

Kadorodasih²⁶⁾, the results of the research is the Adiwiyata program implemented by managing some school policies which containing efforts to protect and manage environmental life, implementation of learning environment, teachers and students produce the work of utilize waste, environment action activities, extracurricular integrated by environmental education, school cooperation, management facilities and infrastructure environmental friendly. Barried factors, diverivication of students background, difficulty of making RPP in the lesson who integrated PLH, the habit not yet good planted, students, boredom and implementation time was limited.

Muslicha²⁷⁾, the Adiwiyata program implemented by managing some school policies which containing efforts to protect and manage environmental life, implementation of learning environment, teachers and students produce the work of utilize waste, environment action activities, extracurricular integrated by environmental education, school cooperation, management facilities and infrastructure environmental friendly.

Based on the previous study, environmental education is considered as significant subject. However, an effective learning method resulting in maximum and positive impacts on students' knowledge, awareness and behaviour, has not been discovered. The previous research applied Problem-Based Learning (PBL) method in one session and one learning theme and it only gave impact on change of knowledge. A case study using worksheet with PBL method was then performed. The content of the worksheet is various problems related to environmental issues. Students worked in groups, discussing the problems and solutions to the problems, and then making conclusions of the discussions. The roles of teachers on PBL

method are more in giving directions and making conclusions. This study covers testing of the effectiveness of Environmental Education (EE) with PBL method as an approach to the community-based waste management.

1.3 Objectives of this study

This study focuses on environmental awareness and behaviour and the effectiveness of environmental education with PBL method as an approach to the community-based waste management in Indonesia. In regard to the above mentioned issues, a study was performed to confirm that the success of waste bank is closely related to participation of people in the community. Following the confirmation that the success of waste bank is closely related to participation of people in the community, a question arises on what type of community that tend to participate. It was concluded that communities owning high environmental knowledge, awareness and behaviour are the ones who participate in environmental-related activities, especially in waste management and becoming members of waste banks.

On the initial study, data collection on participation and cooperation factors on waste banks in Bandung City, was performed. The result shows that people have high participation and cooperation on waste banks. The next study analyzed the levels of awareness, participation and cooperation of people in utilizing waste banks which have benefit value.

A study performed on Karang Joang Village shows a role model village, where people own environmental awareness in managing their waste. This study applied SWOT analysis method to see the potential of a region in performing independent waste management, and analyze the needs of people in the region.

The next study focuses on an effective education required to create young generation who own environmental knowledge and awareness. A test on learning method for environmental education was then required, to prove that the method is effective and give positive impacts

on students in developing their knowledge, awareness and behaviour. Environmental education is one of the efforts to improve people’s knowledge and changing in people’s behaviour towards environmental issues, especially on waste management. The challenge is in implementation of an effective learning method, that can change people’s behavior to become environmental-friendly behaviour.

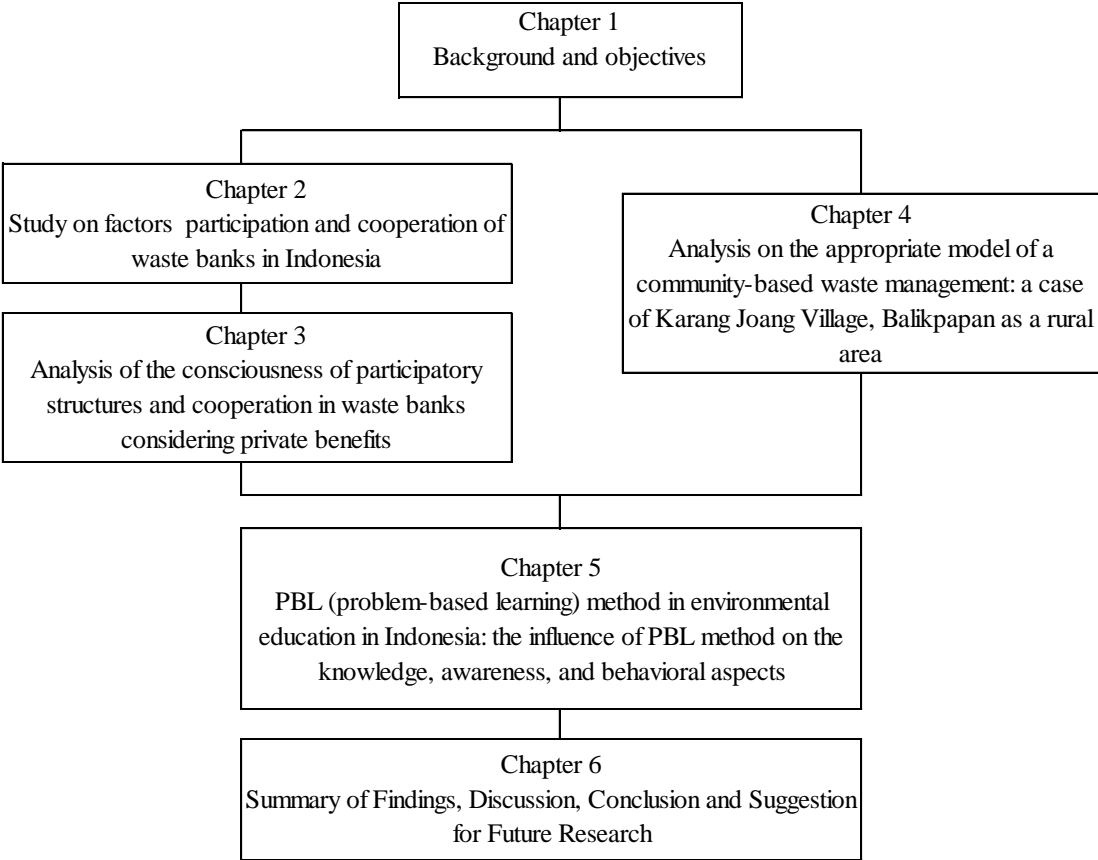


Fig. 1.15 Frame work of the research

Recently in Indonesia, environmental education has been performed through Adiwiyata Program which was established by the Ministry of Environment in cooperation with the Ministry of Education. This program is still undergoing obstacles in achieving the objective. The most significant obstacle is the teaching technique of environmental education. This is proven by related complaints from teachers due to their limited skills in conveying

environmental education. Kitakyushu City in Japan is a city which has been successful in educating the community to become environmental-aware community. One of the keys to success is by implementation of environmental education in all elementary schools in the city. In implementation of the environmental education, the Ministry of Education provides worksheet called “Midori no Noto”, which is distributed to students to be filled during their summer vacations. Accordingly, the next study applied Environmental Education Worksheet “Midori no Noto” used in Kitakyushu, with Problem-Based Learning (PBL) Method.

The success of Kitakyushu in educating the people through formal education becomes inspiration for educational environment in Indonesia and the method is then applied in Indonesia. In order to find out whether application of “Midori no Noto” worksheet with PBL method can improve students’ knowledge, awareness and behaviour in environment, a test was performed in 18 elementary schools in 6 big cities in Indonesia.

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Chapter 2

Chapter 2. Study on Factors of Participation and Cooperation of Waste Bank in Indonesia

2.1. Introduction

The waste bank is a mechanism whereby residents bring in recyclable garbage and the income which generated when garbage are sold to the recycling company is returned to the residents, Fig.2.1. Although there are differences depending on waste banks in the method of allocating incomes, in many cases 80% or more of incomes is distributed to those who brought garbage. There are members and non-members in waste banks, and members can save for income when garbage is sold, but non-members can't save it. Also, depending on the size of waste banks, non-members can't participate in some places.

The Ministry of Environment of Indonesia has decided and published the implementation guidelines in 2012¹⁾. There are specified on facilities, members, weighing and recording methods, etc., but there is not all waste banks are in line with this. The waste bank has the following advantages, which is one way to solve waste problems in Indonesia and plays a role as strengthening the community.

- a. Due to the amount of waste/garbage on administrative routes decreases, the cost of administrative waste disposal is reduced.
- b. As recycling is promoted by separating and collecting resource waste, it is expected that residents' awareness of environment consciousness will be improved.
- c. By collecting resource waste at waste banks, it leads to reduction of transportation costs and strengthened price negotiation capability with buyers.
- d. Microfinance for economically difficult households is possible.
- e. It can be used as funds for community activities such as local festivals, construction and

renovation of places of prayer/worship

2.2. Purpose of the Study

There are many researches²⁾ in regarding to garbage disposal systems in developing countries, but quantitative analysis on Indonesian waste bank has not progressed much³⁾. Furthermore, there are many reports on Japan regarding to structural factor analysis of garbage separation behavior, but not many for developing countries.

This research aims to clarify the consciousness structure participating in the garbage bank of the residents from the viewpoint of public interest such as improvement of garbage problem and recycling of resource by the garbage bank concerning the establishment requirement of waste bank in Indonesia.

In order to clarify the consciousness structure concerning whether to participate in garbage banks, it is important to understand the motivation for participation, in particular to clarify the difference between members and non-members. For that purpose as well, we conducted questionnaire surveys and interview surveys for waste banks in Bandung City, Indonesia. Furthermore, by applying cluster analysis, factor analysis, and covariance structure analysis based on the questionnaire result, the consciousness structure of participants shall be clarified.

2.3. Research Method

In this research, we analyze the participation factors of residents to waste banks using covariance structure analysis. Covariance structure analysis⁵⁾ is an extension of factor analysis and multiple regression analysis (path analysis), and is a statistical method to analyze the relationship of various factors behind observation data obtained by questionnaire survey and others. In covariance structure analysis, it is possible to quantitatively evaluate the causal relation between observed variables and latent variables by using "latent variables" which

can't be observed directly. Therefore, it is used in various fields including psychology.

a) Factor Model of Environmentally Conscious Behavior

Many studies aimed at modeling the relationship between goals and actions in people's environmental conscious actions exist. Hirose⁶⁾ structured as 'environmental risk recognition', 'responsibility attribution recognition', and 'countermeasure effectiveness recognition' has an influence on 'environmentally friendly target intention', and "environmentally friendly target intention", "feasibility evaluation", "benefit cost evaluation" and "social norm evaluation" has an influence on "environmentally friendly action intention".

As mentioned in above, waste banks which are subjects in this research have characteristics that promote recycling and environmental consciousness awareness can be expected. Therefore, the participation of waste bank can be regarded as environmentally conscious behavior and this model shall be incorporated.

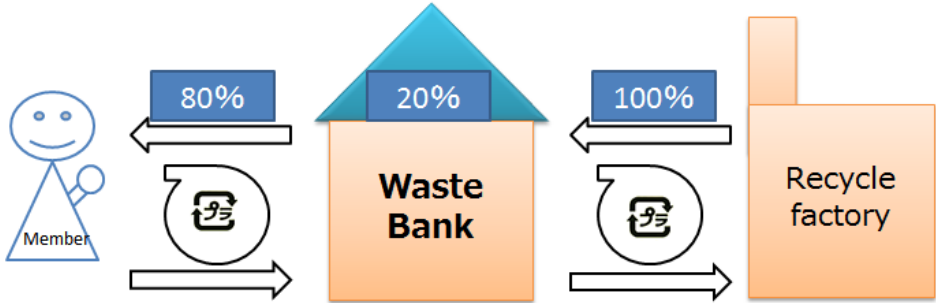


Fig. 2.1 Method of activity of waste bank

2.4. Overview of Survey

Table 2.1 show the list of observations and table 2.2 shows the outline of the survey. The survey period is 15th ~ 27th September 2015, the target area is Bandung City, Indonesia. Bandung is the capital city of West Java province of Indonesia, which have population about 2.5 million people, the fourth of biggest population city in Indonesia. The population has

rapidly increased in recent years. As a result, the treatment of waste, which increases year by year, is an urgent and serious problem of the city. Especially, there is a lack of public awareness and participation in the waste/garbage problem and the absence of regulations on waste disposal at the national and local levels. Currently, there are about 135 waste banks in the city.

Table 2.1 List of observations

Period covered	2015/9/15 ~ 2015/9/27		
Area	Indonesia : Bandung City		
Recovery method	Visiting detention method		
Distribution sample number	250		
Number of collected samples	137		
Recovery rate	548		
Name of waste bank	1. Tamansari	An individual	360
	2. Recycle Bank of Unpas	University	160
	3. Sampurasun	#	#
	4. recycle bank of Mr. Satori's	An individual	150
	5. Pundi Sampah	City	670

Table 2.2 Outline of the survey

Attribute		Number of people	Attribute		Number of people
Sex	Men	53	Member	Member	53
	Women	84	Non-member	Non-member	84
Education	Elementary	3	Member of family	1 People	6
	Junior school	5		2 People	7
	Senior School	65		3 People	27
	Vocational school	24		4 People	53
	University	40		More than 5	44
Age	20	11	Residence years	>5 years	38
	30			6~10years	27
	40			11~20years	44
	50			21~30years	21
	more than 60			31~40years	1
				41~50years	5
Profession	employee	20	Frequency of participation	more than 5 year	1
	self employed	3		Always	18
	housewife	22		Sometimes	49
	A student	68		Staff	5
	Freeter	4		Never	56
	Unemployed	12		Other	9
	Other	8			

The questionnaire and hearing survey was conducted with residents and waste bank staff. The visited facilities are 6 places of waste banks and 3 places of city and public environmental corporation. Distribution and collection of questionnaire survey was carried out by the visiting. In the questionnaire survey of residents, the number of distribution was 250, the number of collection was 137, and the collection rate was 54.8%. In the questionnaire survey of waste bank staffs, the number of distribution was 25 and number of collections was 19, and the collection rate was 76.0%. consists of total 24 questions, from 16 questions on waste banks and garbage problem (hereinafter referred as “question”) and 8 questions on respondents (hereinafter referred as “attribute”). The way to answer questions on waste banks and garbage problems was evaluated in 5 stages, from "Strongly Agree" until "Strongly Disagree".

2.5. Overview of Questionnaire Survey of Residents

Table 2.3 The outline of resident questionnaires

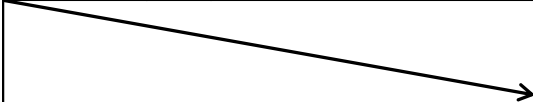
Q	Q1	Garbage is scattered in the city	attribute	Q17	sex
	Q2	The garbage problem is a problem to be solved		Q18	age
	Q3	Responsibility for the garbage problem is in the administration		Q19	Final Education
	Q4	I am responsible for the garbage problem		Q20	Profession
	Q5	Garbage bank can solve waste problem		Q21	Members / non-members
	Q6	Garbage banks also help solve regional problems		Q22	Family structure
	Q7	I think I will attend		Q23	Residence years
	Q8	I am busy with work, I do not have time to participate		Q24	Frequency of participation
	Q9	I will join if I have time			
	Q10	I know how to separate garbage			
	Q11	It's serious, but the city is beautiful			
	Q12	It is serious but it will be a problem solving the area			
	Q13	Surrounding people are active in participating in garbage banks			
	Q14	I can recommend people around you to participate in garbage banks			
	Q15	If you do not participate you will be concerned with the eyes of the surrounding people			
	Q16	I'm joining			
		Answering questions	1	I think so.	
			2	I agree a little	
			3	Neither	
			4	I do not think so much	
			5	I do not think at all	

Table 2.3 shows the outline of resident questionnaires, with 16 questionnaires item and 8 questionnaires first sheet and answering questions.

2.6. Analysis of Survey Results

2.6.1 Cluster Analysis

In order to investigate the relationship between interests and attributes in waste bank and garbage problems, we analyzed clusters using 16 questions, grouped all respondents, and cross-tabulated the groups and attributes. As a result of cluster analysis, respondents could be divided into 3 groups. Table 2.4 summarizes the average values of each question calculated for each cluster.

Tabel 2.4 Average value of each question for each cluster

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16
Active layer	2.75	1.31	1.81	1.34	1.41	1.28	1.19	4.03	1.44	1.59	1.16	1.41	2	2.06	2.5	1.38
Passive layer	1.87	1.26	1.42	1.62	2.43	2.49	2.34	2.21	2.34	2.38	1.72	2.26	2.92	3.09	3.15	2.85
An intermediate layer	1.39	1.16	1.31	1.61	1.94	1.92	1.96	2.67	2.14	1.9	1.51	1.92	2.29	2.29	2.53	2.02
Significant difference	○	×	○	×	○	○	○	○	○	○	○	○	○	○	○	○

Next, we examined the features of each cluster from Table 2.5 is clusters can be interpreted as "active layer", "middle layer", and "passive layer", respectively. Approximately 24% of the "active layer" is an interest in waste banks, and it is also highly responsible for the garbage problem. Approximately 37% of the total in the "middle layer" is interest in waste bank, but the sense of responsibility for the garbage problem is low. Approximately 39% of the "passive layer" has low concern for waste bank and responsibility for garbage problem. Cross-tabulating each cluster with attributes and performing a chi-square test revealed that the attributes with significant differences were gender, members/non-members, and participation frequency. Regarding participation frequency, people who answered "always" in "active layer"

are greater than the entire 20%. People who answered "always" as an middle layer and passive layer are lower than the overall average, people who answered "sometimes" in the middle layer are the most frequent. Many people answered "nothing" for the passive layer. As seen in the average value of each question, people who are more concerned about waste banks and responsibility for garbage problem tend to participate more frequently.

Regarding to gender, as a whole, there are many women, while women are particularly active in active layers, but the ratio of men and women in both the middle and passive layers is almost half. Regarding members and non-members as a whole, there are many non-members, but similarly to the frequency of participation, attention to waste banks and the sense of responsibility to garbage problem are directly reflected in the ratio of members/non-members. From these results, many women are interested in waste banks and garbage problems, and it can be seen that people with such consciousness have a positive tendency towards participation of waste banks.

2.6.2 Factor Analysis

In order to find necessary latent variables for conducting covariance structure analysis, factor analysis was conducted using 13 questions from the results of the resident questionnaire survey. Factor analysis used maximum likelihood method, Varimax rotation. The factor extraction result after rotation is result of the analysis, four factors could be extracted. Next, the factor obtained by factor analysis was set as a latent variable, and the question included that factor was set as an observation variable. The explanation of the latent variable is as follows:

- a. Countermeasure Effectiveness recognition: recognition that there is some effect on garbage problem by participating in waste banks.
- b. Cognition of responsibility attribution: cognition and responsibility that the cause of the

garbage problem is also in myself and must accompany behavior change.

- c. Evaluation of social norms: Judgment whether their actions are consistent with local norms and expectations.
- d. Feasibility evaluation: Knowledge necessary for participation of waste banks, presence or absence of opportunity.

2.6.3 Modeling by Covariance Structure Analysis

Based on the result of the factor analysis, participation factor model was created in order to consider the structure of participation intention formation in waste bank. The participation factor model for all samples (n=137). In the model diagram, the straight line arrows indicate the relationship between cause and result, and the curve line arrows in both directions of the curve indicate that there are associated with each other. In this model, the Formation X-Axis interesting and Y-Axis responsibility, show in tabel 2.5 is for Based on the result of the factor analysis, the graph below shows the distribution of groups A, B and C based on average answers and the average corespondent answers the questions. On the next count is, average Q.2 Q.4 Q.9. Q11 and Q12 become the line for Y and Average of Q1, Q5, Q6, Q7, Q10, Q16 becomes line X. The result is group 1 (positive) has X: 1.60 and Y: 1.33, group 2 (negative) has X 2.39 and Y: 1.84 while for group 3 (intermedite) has value X: 1.86 and Y: 1.67, participation factor model was created in order to consider the structure of participation intention in waste bank. Fig. 2.1 shows the participation factor model for all samples (n=137). In the model fig. in this fig. shows the average distribution of the questions and 3 groups of calculations. In this model, the formation of responsibility about the garbage problem is a problem to be solved, responsible for the garbage problem, will join if I have time, It's serious but the city is beautiful and It is serious but it will be a problem solving the area. The number of respondents is separated into 3 groups: groups A, B and C. Below is a Fig. 2.1 showing the

number of correspondents in 3 groups show in Fig. 2.1 is the distribution of groups A, B and C based on average answers and the average correspondent answers the questions. Tabel 2.6 show the distribution point of group A, B and C in X-Axis interesting and Y-Axis responsibility and total population. Fig. 2.2 show Characteristics by cluster with 3 group.

Tabel 2.5 Devinition of X-Axis and Y-Axis

X-Axis Interesting	
Q.1	Garbage is scatters in the city
Q.5	waste bank can solve waste problem
Q.6	Waste bank also help solve regional garbage area
Q.7	I think I will attend
Q.10	I know how to separate garbage
Q.16	I'm joining

Y-Axis Responsibility	
Q.2	The garbage problem is a problem to be solved
Q.4	I am responsible for the garbage problem
Q.9	I will join if I have time
Q.11	It's serious but the city is beautiful
Q.12	It is serious but it will be a problem solving the area

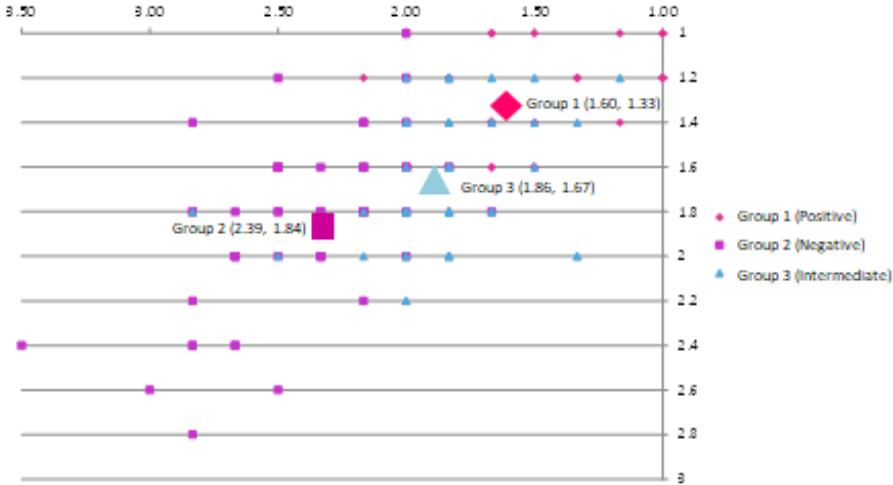


Fig. 2.2 The distribution of groups A, B and C based on average answers and the average

correspondent answers the questions

Table 2.6 the distribution point of group A,B dan C

	X	Y	Population
	Interesting	Responsibility	Population
Active layer	1.60	1.33	33
Passive layer	2.39	1.84	53
An intermediate layer	1.86	1.67	51

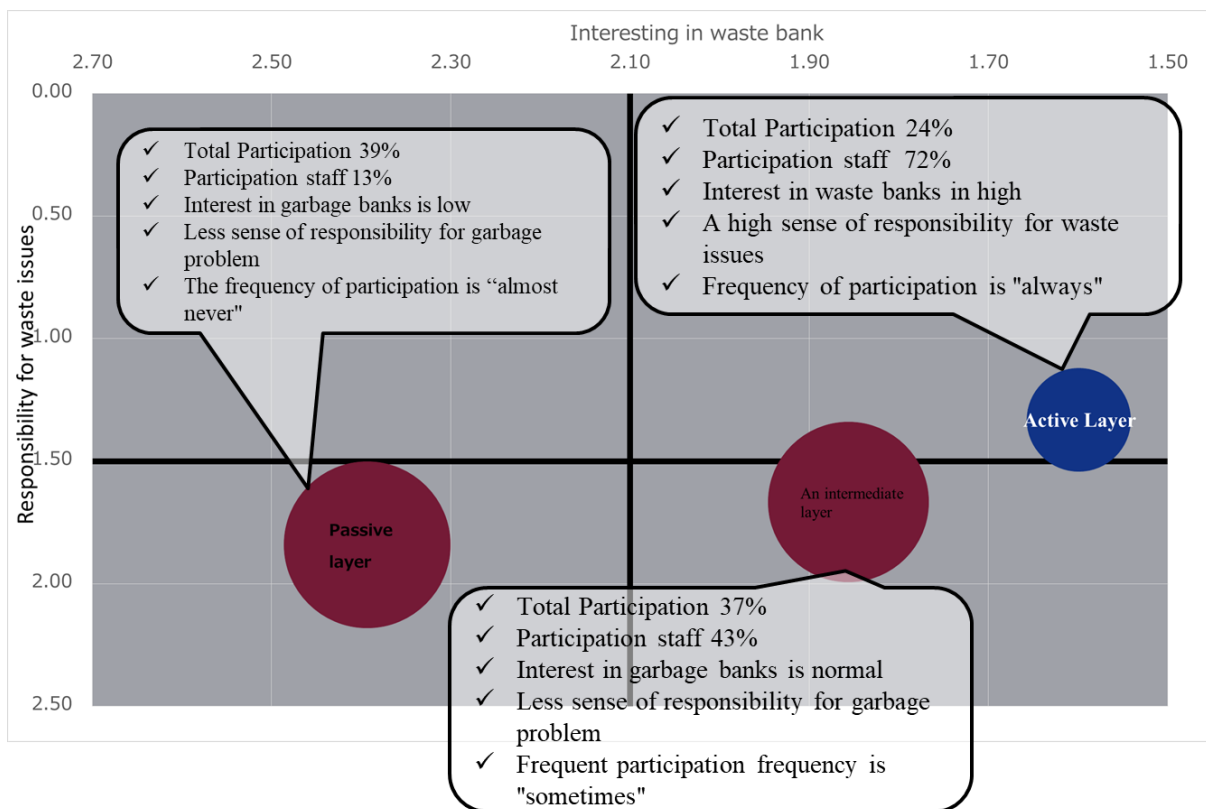


Fig. 2.3 Characteristics by cluster

Interested line is about Garbage is scateres in the city, waste bank can solve waste problem, Waste bank also help solve regional are, Garbage think will attend dan separate garbage and I'm joining The number of respondents is separated into 3 groups: groups A, B and C. Below is a fig. showing the number of correspondents in 3 groups: but when looking at the final result, it is found that group C has a higher value than the previous group, show in fig. 2.3

Interested line is about garbage is scattered in the city, waste bank can solve waste problem, Waste bank also help solve regional are, garbage think will attend dan separate garbage and I'm joining The number of respondents is separated into 3 groups: groups A, B and C. Below is a graph showing the number of correspondents in 3 groups: But when looking at the final result, it is found that group C has a higher value than the previous group.

It leads to a question on what kind of approach should be done to make correspondents of Group C have the same paradigm as those of Group B. Based on the obtained data, it is shown that if 10% of correspondents of Group C undergo improvement on the level of awareness and knowledge, the graph increases to a better direction. The point is how to improve the level of awareness. The initial step to take is performing cooperation between central government and local government or local community organizations for make some activity for environmental education for citizen. Government's role in performing cooperation will determine the success of changing people's paradigm. Fig. 2.4 shows the change of interested and responsibility use with the average of Q4.

Government, in cooperation with local community organizations, will be able to develop better infrastructures, facilitate waste management to final landfill and find solutions to waste issues. One of the solutions is by raising tax for waste handling, which is expected to motivate people in conducting 3R toward their domestic waste, at their own houses.

There are two methods which are considered suitable and powerful in solving issues related to paradigm, ie. ecoliteracy and eco-design concepts. Ecoliteracy emphasizes more in building people awareness on the importance of sustainable environment through education, starting from elementary level to higher education. Building ecological awareness should be initiated from the early age. The education includes introducing a simple way in waste handling, teaching on how to sort domestic waste into organic and non-organic waste, introducing waste handling model to the community and educating people who live in the surrounding areas of

final landfills.

Government owns the authority to establish policies enacting all industries to produce more environment-friendly products from year to year, and applying a high tax on non-recyclable waste. These policies are expected to force people to give more thoughts on choosing products they will consume. Government may also establish eco-design policies, such as policies on producing minimum-waste products. Following the policies, people are then directed to choose the products, products in refill packages. All their lives, people will always produce waste. The issue is how government, along with community organizations, figure out a way to involve people to actively participate in waste management. This kind of involvement is expected to change people's paradigm to a better way.

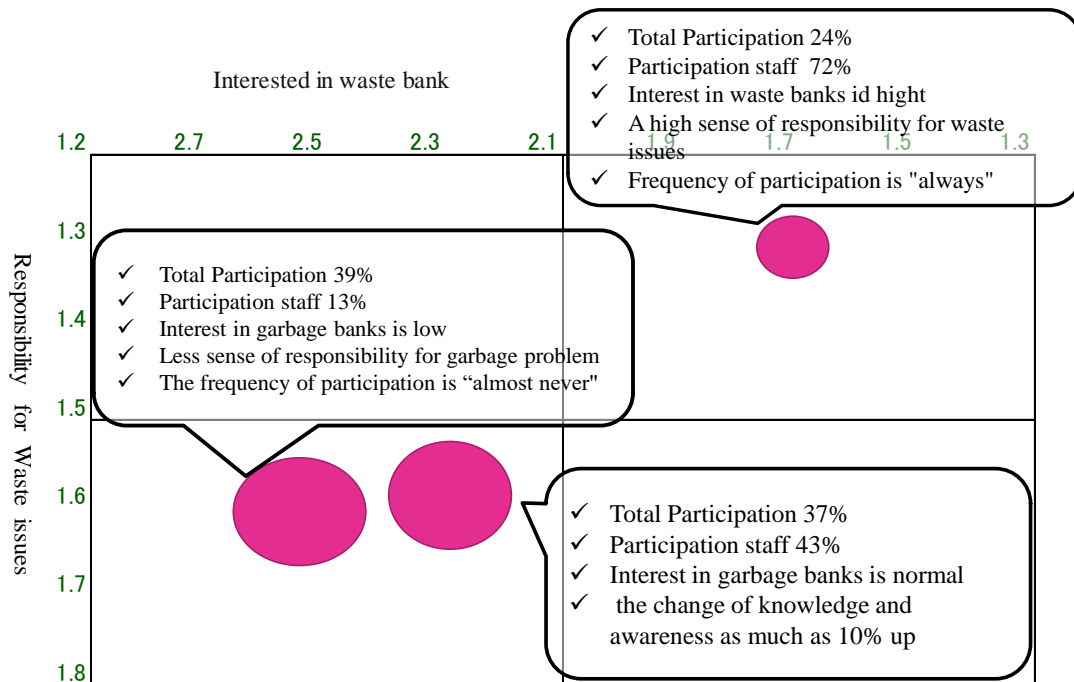


Fig. 2.4 Shows the change of knowledge and awareness group C

Tabel 2.5 Factor extraction result after rotation

Question	Factor			
	1	2	3	4
Waste bank activities can solve the garbage problem	0.760	0.235	0.242	0.155
Waste bank activities can solve problems other than garbage	0.711	0.243	0.162	0.118
It is serious but it will be a problem solving the area	0.679	0.203	0.115	0.407
Surrounding people are actively participating in activities	0.106	0.892	0.116	0.113
People from around are advised to participate	0.144	0.727	0.156	0.057
If you do not participate you will be concerned of the surrounding people	0.136	0.477	0.081	0.028
I know how to separate garbage	0.091	0.187	0.746	0.141
It is serious but the city becomes beautiful	0.389	0.008	0.484	0.183
I am responsible for the garbage problem	0.076	0.098	0.427	-0.127
I am busy with work, I do not have time to participate	-0.004	-0.148	-0.072	-0.531
I will join if I have time	0.211	0.018	0.498	0.527
Garbage is scattered in the city	-0.236	0.004	0.103	-0.470
Responsibility for the garbage problem is in the administration	-0.109	0.021	-0.018	-0.152

Tabel 2.6 Latent variable and observation variable details

Question	
Countermeasure	Waste bank activities can solve the garbage problem
Effectiveness perception	Waste bank activities can solve problems other than garbage It is serious but it will be a problem solving the area
Social norm	Surrounding people are actively participating in activities
Evaluation	People from around are advised to participate If you do not participate you will be concerned of the surrounding people
Responsibility attribution	I know how to separate garbage It is serious but the city becomes beautiful
Recognition	I am responsible for the garbage problem
Feasibility	I am busy with work, I do not have time to participate
Perception	I will join if I have time Garbage is scattered in the city Responsibility for the garbage problem is in the administration

2.6.4 Covariance Structure Analysis Result for All Samples

Four indices of GFI, AGFI, CFI, RMSEA were considered for model adaptation. Generally, if GFI, AGFI, CFI is 0.9 or more and RMSEA is 0.05 or less, the data fitting is said to be good. As shown in Figure 3, the index of this model, GFI is 0.914, CFI is 0.968, RMSEA is 0.044 and meets standard value. Therefore, adaptability of this model is considered good.

Table 2.7 shows the standardization factor and significance probability of participation factor models in all samples. The standardization factors are all statistically significant except for causal relationships related to feasibility evaluation. Attention is paid to the causal relation in which significant is seen here. The large standardization factor to "Action intention" is "Objective intention", and the next large standardization factor is "Social norm evaluation". The large standardization factor to "Target intention" is "Effectiveness recognition", and the next large standardization factor is "Responsibility attribution recognition". From this, it can be considered that recognition of the effectiveness of waste banks is more responsible for the formation of target intent than responsibility for garbage problem.

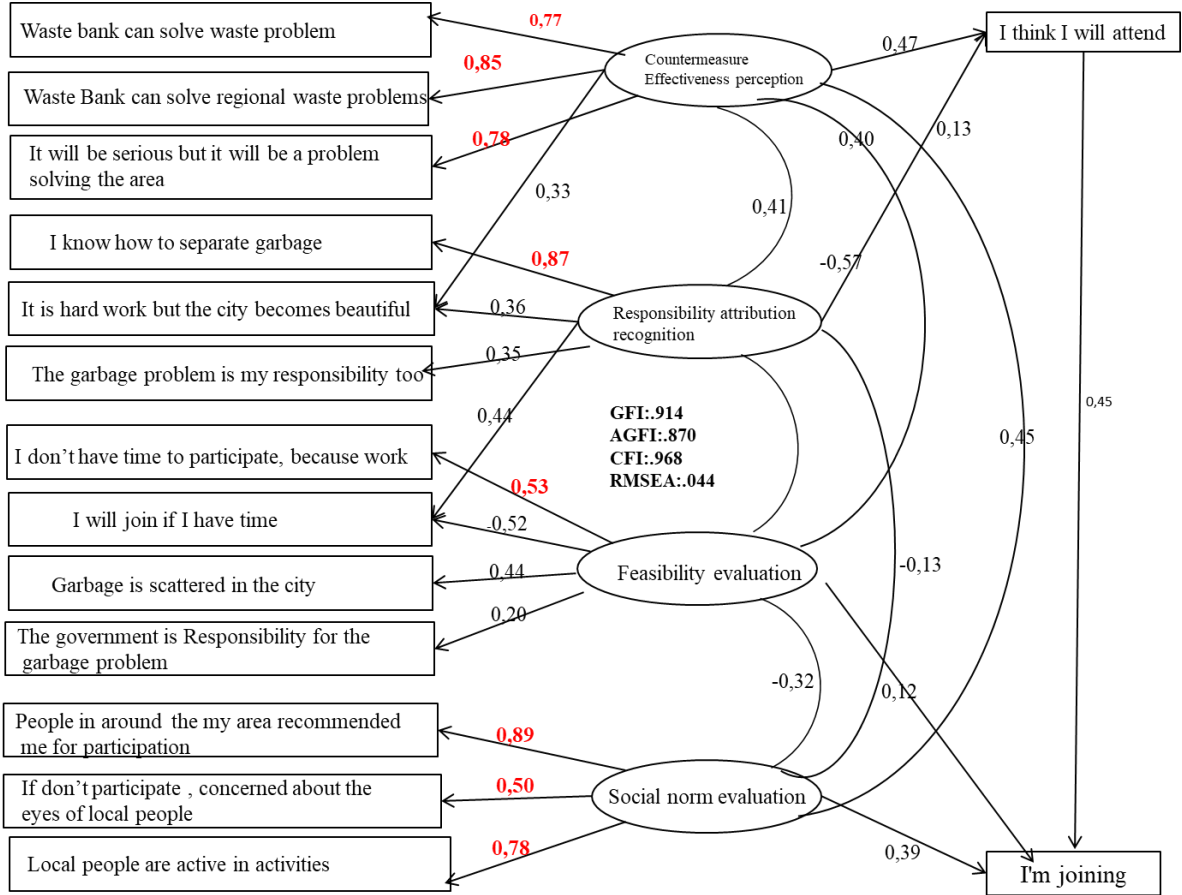


Fig. 2.5 Participation factor model in all samples

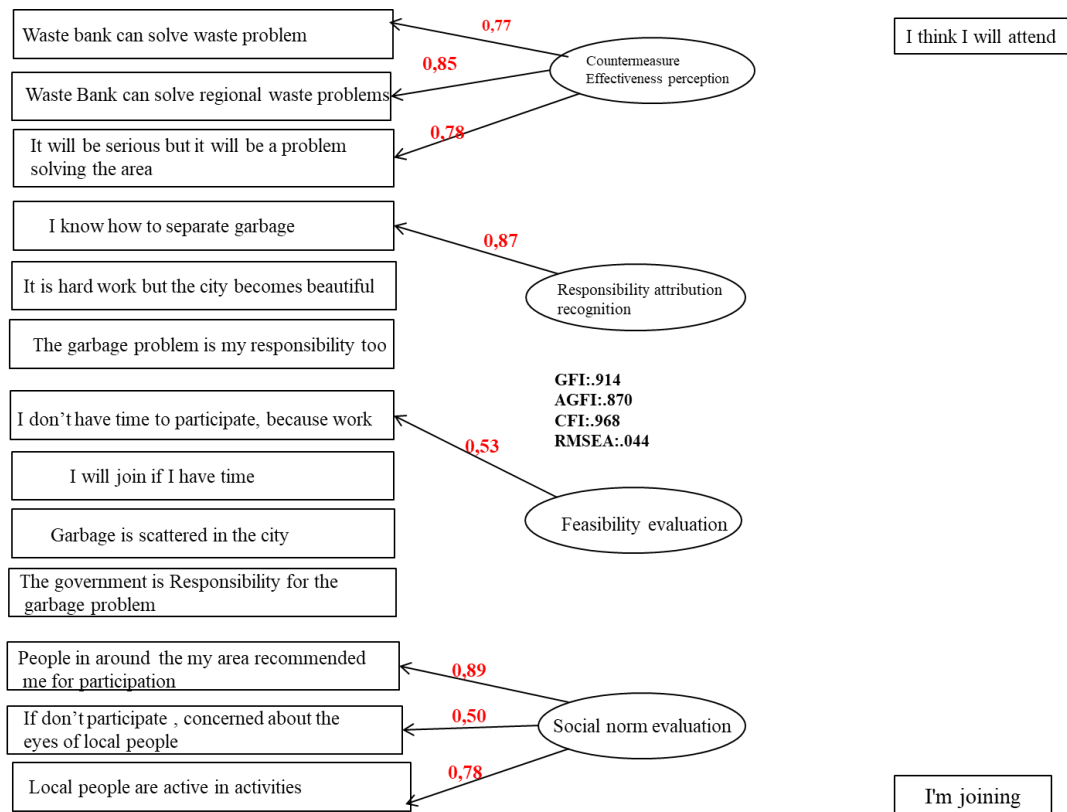


Fig. 2.6 Participation factor model in all samples more than $p < 0.5$

Table 2.7 Standardization factor and significance probability of all samples

Relationship between latent variables and observed variables			Standardization Factor	Significance probability	Significance
Garbage bank can solve waste problem	←	Countermeasure Effectiveness perception	0.778	.	o
Garbage Bank can solve regional problems	←	Countermeasure Effectiveness perception	0.766	***	o
Local people are active in activities	←	Social norm evaluation	0.855	***	o
If you do not participate you will be concerned about the eyes of local people	←	Social norm evaluation	0.775	.	o
People in the area can recommend participation	←	Social norm evaluation	0.886	***	o
I have responsibility for garbage problem	←	Responsibility attribution recognition	0.351	.	o
It is serious but the city becomes beautiful	←	Responsibility attribution recognition	0.362	0.006	o
I know how to separate garbage	←	Responsibility attribution recognition	0.868	***	o
Government Responsibility for garbage problem	←	Feasibility evaluation	0.198	.	o
Garbage is scattered in the city	←	Feasibility evaluation	0.444	0.088	x
I will join if I have time	←	Feasibility evaluation	-0.519	0.086	x
I do not have time to participate in work etc.	←	Feasibility evaluation	0.530	0.081	x
I will join if I have time	←	Responsibility attribution recognition	0.437	0.003	o
It is serious but the city becomes beautiful	←	Countermeasure Effectiveness perception	0.334	***	o
Countermeasure Effectiveness perception	⇔	Responsibility attribution recognition	0.409	0.011	o
Social norm evaluation	⇔	Responsibility attribution recognition	0.386	0.012	o
Social norm evaluation	⇔	Feasibility evaluation	-0.317	0.140	x
Countermeasure Effectiveness perception	⇔	Feasibility evaluation	-0.573	0.087	x
Responsibility attribution recognition	⇔	Feasibility evaluation	-0.287	0.210	x
Countermeasure Effectiveness perception	⇔	Social norm evaluation	0.454	***	o
I think I will attend	←	Responsibility attribution recognition	0.398	0.002	o
I think I will attend	←	Countermeasure Effectiveness perception	0.468	***	o
I'm joining	←	Social norm evaluation	0.391	***	o
I'm joining	←	Feasibility evaluation	-0.125	0.264	x
I'm joining	←	I think I will attend	0.433	***	o

The Fig. 2.5 show about participation factor model in all samples and Fig. 2.6 show the result all samples more than $p < 0.5$ with red color, about participation factor model.

The large standardization factor to "Countermeasure for Effectiveness" is "The regional problem can be solved by waste bank". Money accumulated in waste banks for selling of the garbage is used for local areas such as local festivals and construction and repair of places of worship. In the fact, the large standardization factor for "Countermeasures for Effectiveness" is considered to be an expectation for how to use this money. However, due to the standardization factor for "The regional problem can be solved by waste bank" and "It is serious but it will be a problem solving in the region" is also nearly equivalent, recognition that the waste bank can solve garbage problems and regional problems is important for the formation of "Countermeasure for Effectiveness".

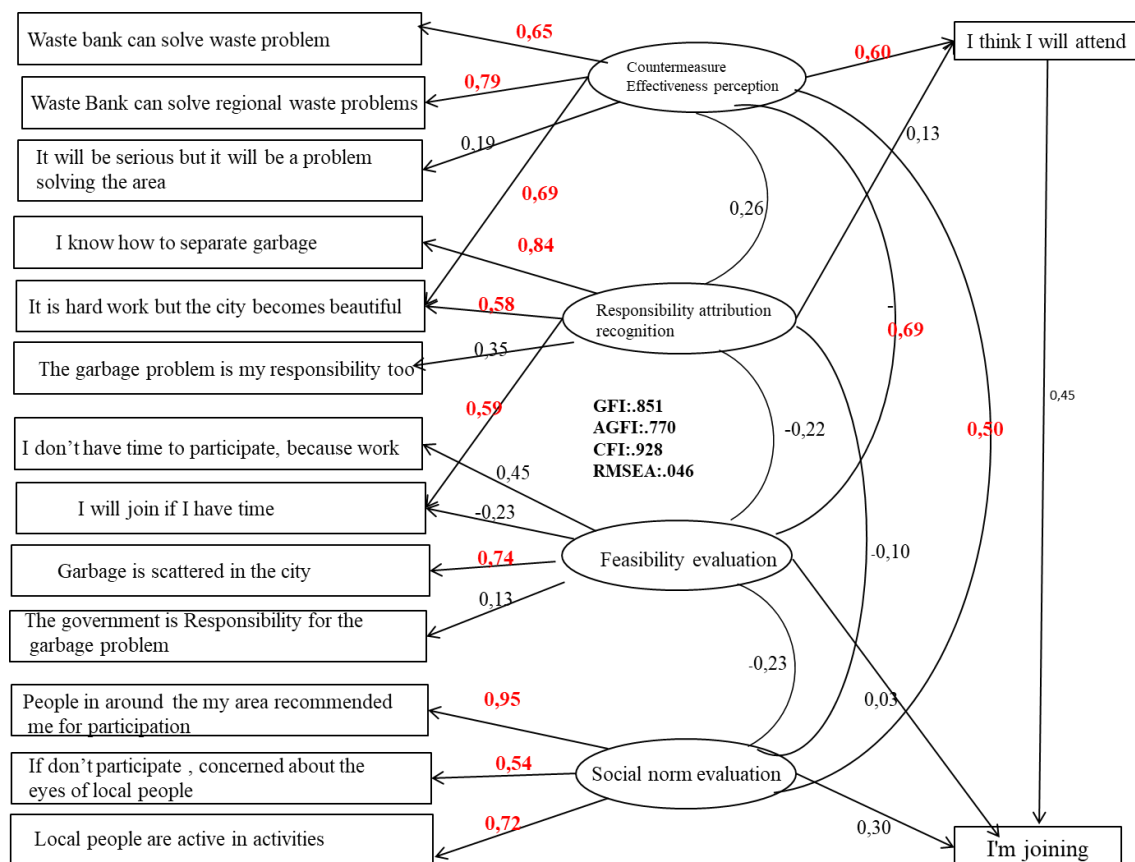


Fig. 2.7 Participation factor model by members

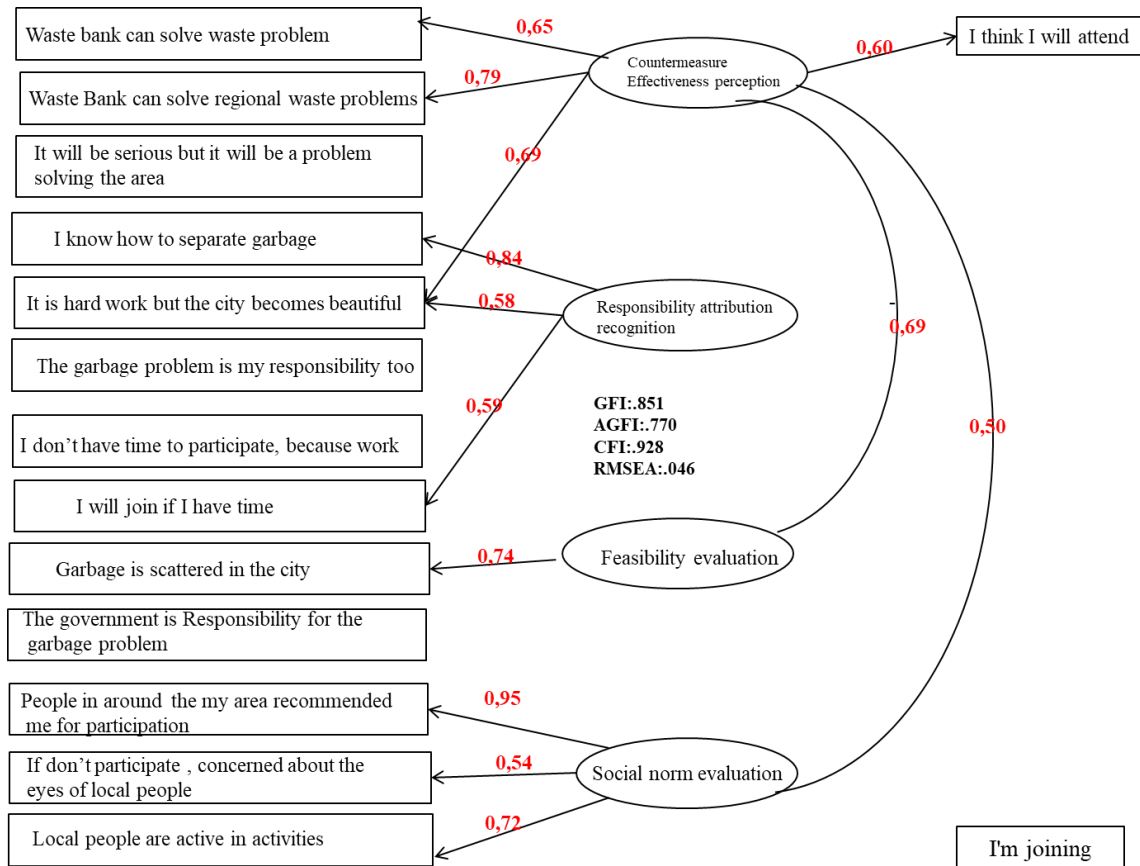


Fig. 2.8 Participation factor model by members more than p<0.5

The large standardization factor to "Responsibility attribution recognition" is "I know the way to separate garbage". In Indonesia, separation of garbage is not rooted as a habit, so people who know how to separate garbage are feeling responsible for the garbage problem, or it is also considered that participation in waste banks has become a catalyst for learning how to separate garbage. Causal relation can be interpreted in the direction opposite to the direction of arrow ⁵⁾.

The large standardization factor for "Social norm evaluation" is "It is recommended to participate from the local people", the next largest is "activities of local people are aggressive". From this, it can be said that it is important whether local people are aggressive with waste banks and whether they are trying to spread it to other people around them. Regarding to

participation of waste banks, due to it only separates garbage and brings it is, the burden on individuals is not so big. Therefore, it can be said that activities can be expanded by participating people should recommend to participation in the neighborhood.

In addition, the standardization factor between "countermeasure effectiveness recognition", "responsibility attribution recognition", and "social norm evaluation" is significant, the standardization factor for "countermeasure effectiveness recognition" and "responsibility attribution recognition" is 0.409, the standardization factor of "responsibility attribution recognition" and "social norm evaluation" is 0.386, and the standardization factor of "social norm evaluation" and "countermeasure effectiveness recognition" is 0.454. From these facts, there is a correlation between these latent variables, and it is considered that there is a strong relation between "social norm evaluation" and "countermeasure effectiveness recognition" in particular.

From the above, it is considered that the most affecting participation of waste banks is recognition of the effectiveness of waste bank and the next is aggressiveness on the activities of waste banks from local people. The Fig. 2.7 show about participation factor model by members and Fig. 2.8 participation factor model by members more than $p < 0.5$.

2.6.5 Analysis result by member/non-member

Based on participation factor model, models analyzed by members/non-members are summarized in Fig. 2.9 show participation factor model by non members and Fig. 2.10 show the participation factor model by non members more than $p < 0.5$. The table 2.8 shows the standardization factor and the significance probability of participation factor models by members/non-members.

From table 2.8, the large standardization factor for "action intention" is "target intention". And the large standardization factor to "target intention" is "countermeasure effectiveness

recognition". Recognizing the effectiveness of waste banks has a great influence on the participation of waste banks. Moreover, the standardization factor between "countermeasure effectiveness recognition" and "social norm evaluation" is 0.503. From Table 2.9 the large standardization factor for "action intention" is "social norm evaluation". Activities of local people are affecting the participation of waste banks. The standardization factor between "countermeasure effectiveness recognition" and "social norm evaluation" is 0.302.

For these reasons, members understand and participate in waste banks. Non-members participate in waste banks when affected from around. Members are strongly related to "social norm evaluation" and "countermeasure effectiveness recognition". Participating in the waste bank from the situation where local people are active in their activities is not only a positive influence on the environment but also it is thought to be a trigger to widely acknowledge the effectiveness of waste banks. The Fig. 2.9 show the participation factor model by non members and Fig. 2.9 show the participation factor model by non members more than $p < 0.5$

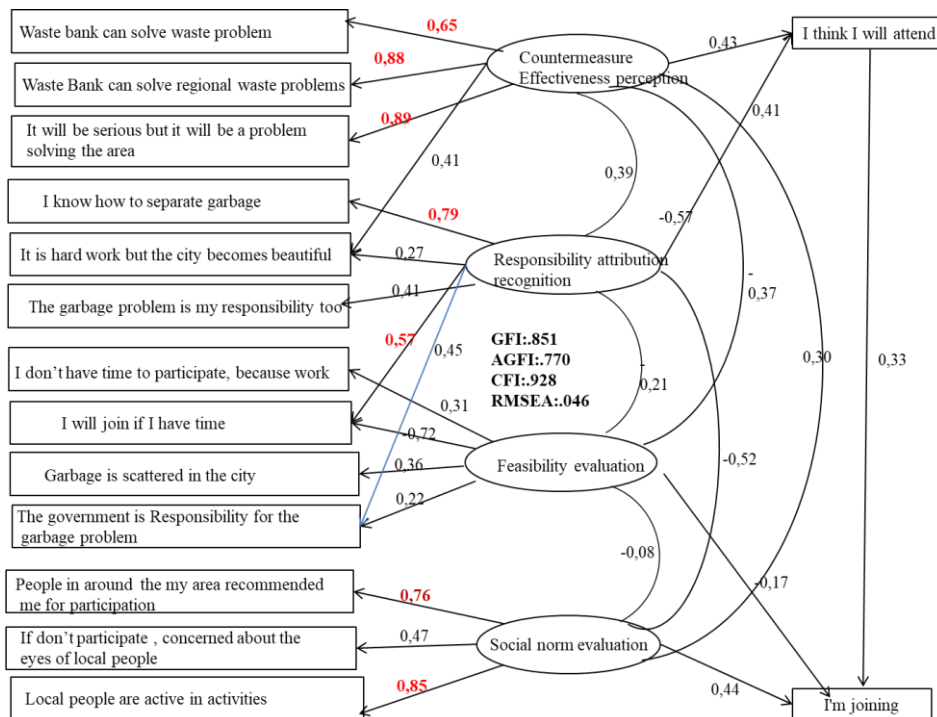


Fig. 2.9 Participation factor model by non members

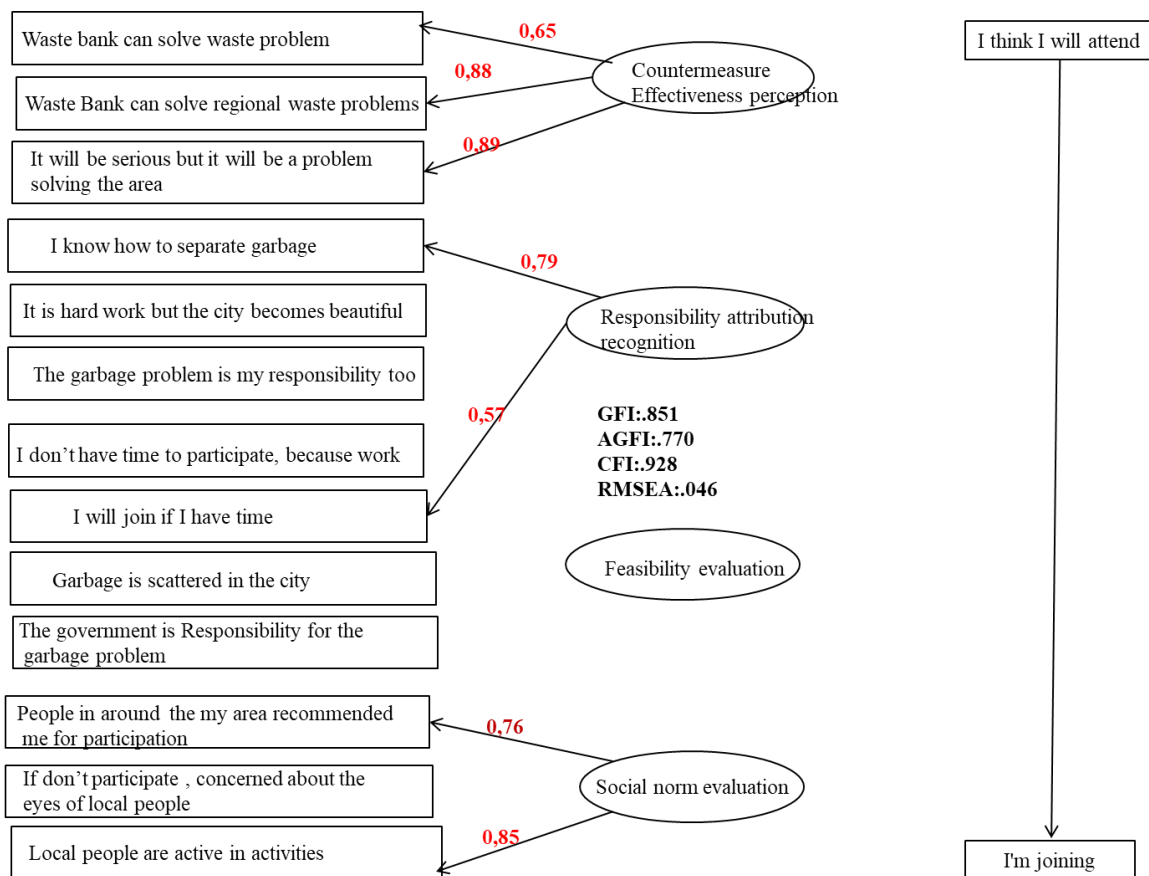


Fig. 2.10 Participation factor model by non members more than $p < 0.5$

Table 2.8 Standardization factor and significance probability by non member

Relationship between latent variables and observed variables	Standardization Factor		Significance probability		Significance	
	Member	Non-member	Member	Non-member	Member	Non-member
Garbage bank can solve waste problem ← Countermeasure Effectiveness perception	0.653	0.876	***	***	○	○
Garbage Bank can solve regional problems ← Countermeasure Effectiveness perception	0.786	0.888	***	***	○	○
Local people are active in activities ← Social norm evaluation	0.720	0.845	-	-	○	○
If you do not participate you will be concerned about the eyes of local people ← Social norm evaluation	0.543	0.467	***	***	○	○
People in the area can recommend participation ← Social norm evaluation	0.946	0.764	***	***	○	○
I have responsibility for garbage problem ← Responsibility attribution recognition	0.451	0.409	-	-	○	○
It is serious but the city becomes beautiful ← Responsibility attribution recognition	0.578	0.272	0.009	0.062	○	×
I know how to separate garbage ← Responsibility attribution recognition	0.842	0.790	0.004	0.003	○	○
Government Responsibility for garbage problem ← Feasibility evaluation	0.125	0.221	-	-	○	○
Garbage is scattered in the city ← Feasibility evaluation	0.737	0.361	0.477	0.170	×	×
I will join if I have time ← Feasibility evaluation	-0.234	-0.724	0.520	0.145	×	×
I do not have time to participate in work etc. ← Feasibility evaluation	0.510	0.384	0.479	0.163	×	×
I will join if I have time ← Responsibility attribution recognition	0.592	0.574	0.008	0.021	○	○
It is serious but the city becomes beautiful ← Countermeasure Effectiveness perception	0.191	0.405	0.168	***	×	○
Countermeasure Effectiveness perception ↔ Responsibility attribution recognition	0.258	0.386	0.212	0.045	×	○
Social norm evaluation ↔ Responsibility attribution recognition	-0.103	0.517	0.538	0.019	×	○
Social norm evaluation ↔ Feasibility evaluation	-0.226	0.083	0.537	0.677	×	×
Countermeasure Effectiveness perception ↔ Feasibility evaluation	-0.694	-0.371	0.483	0.222	×	×
Responsibility attribution recognition ↔ Feasibility evaluation	-0.224	0.209	0.571	0.490	×	×
Countermeasure Effectiveness perception ↔ Social norm evaluation	0.503	0.302	0.017	0.270	○	○
I think I will attend ← Responsibility attribution recognition	0.214	0.411	0.143	0.012	○	○
I think I will attend ← Countermeasure Effectiveness perception	0.596	0.434	***	***	○	○
I'm joining ← Social norm evaluation	0.304	0.435	0.004	***	○	○
I'm joining ← Feasibility evaluation	0.029	-0.170	0.830	0.881	×	×
I'm joining ← I think I will attend	0.653	0.333	***	***	○	○

In this study, various statistical analysis methods including covariance structure analysis were applied to clarify factors participating in activities of residents' waste banks in Bandung City, Indonesia. As a result, the effectiveness of the waste banks, the responsibility for the garbage problem, and the evaluation of surroundings have influenced the participation.

It also revealed that there are differences in participation factors of members and non-members of waste banks. In other words, the members influence "countermeasure effectiveness recognition" on the "target intention" of waste bank. And the non-members influence the "social norm evaluation" on the "action intention". In addition, it is thought that experiencing the activity of waste banks will lead to recognition of the effectiveness of waste banks, due to "countermeasure effectiveness recognition" and "social norm evaluation" are strongly related.

2.7 Conclusion

In this chapter, various statistical analysis methods including covariance structure analysis were applied to clarify factors participating in activities of residents' waste banks in Bandung City, Indonesia. As a result, the effectiveness of the waste banks, the responsibility for the garbage problem, and the evaluation of surroundings have influenced the participation. It also revealed that there are differences in participation factors of members and non-members of waste banks. In other words, the members influence "countermeasure effectiveness recognition" on the "target intention" of waste bank. And the non-members influence the "social norm evaluation" on the "action intention". In addition, it is thought that experiencing the activity of waste banks will lead to recognition of the effectiveness of waste banks, due to "countermeasure effectiveness recognition" and "social norm evaluation" are strongly related. For continuous activities of garbage banks, it is desirable to non-members should become members. Therefore, the people who are participating on the waste banks must actively invite

people who are not participating in waste banks. It is necessary to tell them about the effectiveness of waste banks and procedure separation of garbage, and convey the importance of environmental consideration. It can be said that it is necessary. The waste bank which targeted for survey in this study is Bandung City, but there are many existing waste banks in various forms in Indonesia. Therefore, the circumstances surrounding the waste bank and the form of operation are considered to be different from city to city. For that reason, it is necessary to conduct surveys on multiple cities and compare/analyze them.

Furthermore, this research focused on clarifying the consciousness structure, by focusing on the public benefit side provided by waste banks. Due to there are aspects of private interest for the participants such as the characteristic of waste banks that people who brought garbage can save money, a questionnaire survey that includes private interests is also necessary. Evaluation of environmental and economic effects is also an issue as waste banks coexist with government waste disposal systems.

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Chapter 3

Chapter 3. Analysis of Consciousness Structure of Participatory and Cooperation in Waste Banks in Indonesia Considering Private Benefits.

3.1. Introduction

In the last few years, Indonesia has gone through rapid economic growth and urbanization. However, slow infrastructure development has led to serious waste issues, such as waste disposal to rivers, increment of final landfill, etc. Keeping up with the growth, Government started to pay attention on methods in waste collecting and waste management. Therefore, an interesting system called Community-based Recycling Project was established. This system was initiated in Indonesia as a program called waste bank in 2008 in Yogyakarta, Indonesia.

The objective of waste bank is to reduce waste and allow people to perform recycling at the source level of the waste. Waste bank organizers perform some introductions to communities and other related activities in order to promote the concept, give understanding to the community and develop habits in storing their waste to waste banks. This way, people can obtain economic benefit from their waste.

Waste bank consists of a head office and units. Each unit manages waste and money obtained from waste trading and arranges the money as savings to the members. Waste bank units are responsible to manage waste collected and money obtained at the unit level, while the head office is responsible in managing all units under their territory. The main role and function of waste bank is as described below:

- a. Waste bank unit representative, through 3R principle penetration, functions as a facility to promote changes in behaviours in consumption process and domestic waste.
- b. Waste bank unit is a part which owns human resources development, responsible in motivating the members. It consists of administrators, personnel responsible in skill development and waste bank staff.

- c. Waste bank also manages waste to be converted into raw materials for handicrafts.
- d. Provide representative of waste bank units, in order to increase performance of small and medium enterprises.
- e. Perform proper management of waste bank, ie. protecting from waste collection by other parties.
- f. Determine waste market price (plastic, paper, can, iron/steel).
- g. Sell handicrafts produced from recycled materials.
- h. Build cooperation with schools, universities, the Ministry of Environment and Forestry, small and medium enterprises and other sectors responsible in micro-financial organizations.

In the current practice, government arranges waste management from the sources to the final landfills, including waste collection, transportation and management at the final landfills. Along with the management development, waste management is being conducted by community-based resources. Implementation of this system is through an interesting program called waste bank, which is categorized as community-based recycling system in Indonesia.

A journal written by Di Nur ²⁾, “Role of women in community-based waste management in Sukomulyo village, Lamongan (Effect on Environmental Sustainability)” reveals that at the beginning, the head of waste bank in Sukomulyo Regency faced difficulties in encouraging people to participate as members of waste bank. The head of waste bank and the staff then performed environmental educations to housewives and as the result, many housewives now participate actively on waste bank. The effect of the program can be seen on more clean and healthy surroundings.

Research by Aan ³⁾, “The influence of Gemah Ripah waste bank towards job opportunity and family income in Bantul, Yogyakarta” describes community activities in Yogyakarta Bantul Prefektur. This research is a descriptive research to clarify contribution of Gemah

Ripah waste bank in Bantul Regency, Yogyakarta, in creating job opportunity and increasing family income. In this research, samples were taken from 50 people of 331 waste bank users in 2011. Gemah Ripah waste bank successfully contributed in increasing job opportunity in Bantul Regency as much as 1,02%.

In a previous chapter⁴⁾ a research was conducted at some waste banks in Bandung, targeting municipal citizen on the effectivity of waste banks in cognitive and responsibility issues on waste. Surrounding evaluation reveals factors that influence intention to participate. In addition, it also reveals that there are distinctions factors that influence participation from members and non-members of waste banks.

In this chapter, the targeted surveyed area was extended from the previous⁴⁾, with total 6 targeted cities, ie. Bandung, Padang, Lampung and Medan, Malang and Surabaya. It is expected that approximately 2 million people in big cities will participate in waste bank.

The study will observe difference due to the existence of waste banks and difference on participation of people who have environmental knowledge and awareness.

In addition, requirement in establishing waste bank in Indonesia is that the waste bank should be purposed for public's benefits and should involve participation and coordination of the community. It should be noted that the purpose of this study is to clarify the structure of participation awareness. In the study, the program is purposed to determine public interest and personal interest with the following way. This means that waste bank program gives contribution in solution to waste issues and source of recycle. The advantage of waste bank which is related to all part of the community as "public interest". It gives opportunity to save money and participate in the program.

3.2. Overview of waste bank

In the last few years, waste bank has been spread out to all parts of Indonesia. In 2016,

4.280 waste banks have been recorded in all parts of Indonesia. The number has been increasing compared to the previous years. At this moment, activities in waste bank include waste trade, waste recycling and other social activities. However, there are also waste banks that are not active in the social sector. Government, local companies engaged in recycle business and groups engaged in environment-oriented sector have been supportive to waste bank activities. Table 3.1 shows data on cities being surveyed on the research study, the number of banks, the number of members, the amount of income and the amount of collected waste. The advantages of waste bank to a community are not only it accustoms people on waste sorting and recycling, but it also gives economic benefit to them. Waste bank is a connector between a community and a recycling company. Waste brought by people to waste bank will be further sold to a recycling company. The bank receives money from the recycling company and the money will be further distributed to waste bank members after being reduced by operational costs⁵⁾. Participants of waste bank consist of members and non-members. Members get a privilege to save the money obtained from waste trade, at the waste bank, while non-members do not have this privilege. In high-scale waste banks that have big turnover and a big number of members, waste trade from non-members are accepted, however they cannot save the money in the bank as members can.

Table 3.1 Waste bank in target cities Status

City	Total waste bank	Total member
Padang	95	65
Lampung	9	68
Medan	95	4735
Surabaya-Malang	1014	32011
Bandung	587	35619

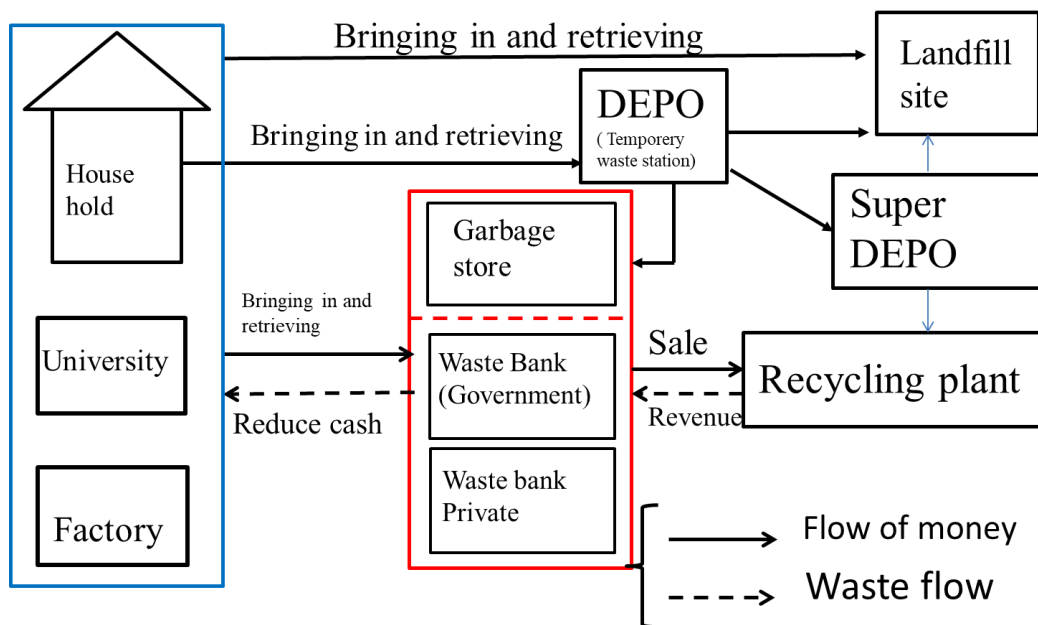


Fig. 3.1 Waste processing flow

Table 3.2 Survey summary

Survey summary		
Period covered	2015/10~2016/11	
Recovery	Visiting detention method	
Number of collected	1495	
Survey target	Kota	Name of waste bank
	Padang	Univ Andalas
		Semen Padang
		Hidayah
	Lampung	Bandar Lampung
	Medan	Induk Sicanang
	Surabaya	Mandiri
		Rewin
	Malang	Kota Malang
Batu	Sabilulungan	
	Daun Kapas	
	Tamansari	

Waste management processing flow in Indonesia shown on Fig. 3.1 is the common waste management in Indonesia. Waste is brought by people from their houses to trash storage in the neighbourhood. The waste is then brought by waste collectors to a temporary landfill to be

further transported to a final landfill. At the final landfill, waste that can be recycled is collected by scavengers. The scavengers sort waste that can be sold. This way they get benefit from waste that can be re-used. The waste is then sold to used-goods agents to be further sold to recycling companies. Waste bank applies different path to this common practice. Sorting of recycled waste is conducted by people and waste banks exist in the community. Prior to waste transportation to a temporary landfill, people sort their waste at home and waste that can be recycled is sold to a waste bank.

Table 3.3 Questionnaire outline of the questionnaire

A question	Q1	In the city where I live, there are many scattered garbage			
	Q2	The problem of garbage in the city where I live, is to be completed.			
	Q3	The government is responsible to solve garbage problem			
	Q4	There is a responsibility to solve the garbage problem in their own			
	Q5	Trash banks can solve the garbage problem			
	Q6	Bank of garbage is also effective in the resolution of regional issues			
	Q7	I think to join			
	Q8	He did not have time to participate in such work.			
	Q9	To participate if you have time			
	Q10	Knowing the method of sorting refuse to carry the waste bank			
	Q11	Activities that are difficult, but to clear the city of garbage bank			
	Q12	Activity was very, but led to the resolution of city garbage problem			
	Q13	Activities could earnings after not really take into account savings			
	Q14	Those interested in the activities of the bank trash about			
		participating in the activities of banks garbage			
	Q15	People around who participate in the activities of banks garbage			
	Q16	We are encouraged to participate from the people of the area			
	Q17	The eyes of the regions concerned and do not participate			
	Q18	It was - participated			
Q19	Do you know what mean of Reuse,recycle ,reduce				
attribute	Q20	sex			
	Q21	Final Education			
	Q22	age			
	Q23	Profession			
	Q24	Members / non-members	Answer the question	1	Strongly agree
	Q25	Family structure		2	Agree
	Q26	Residence years		3	Doubtful
	Q27	Participation frequency / role		4	Disagree
Q28	Life period of garbage bank	5		Strongly disagree	
		6		No answer	

This path shows the actual flow of domestic waste management and the role of waste bank, while in the common practice waste is collected by official waste collectors at centres of temporary landfills to be further transported to final landfills. Summary of Questionnaire Survey Table 3.2 shows the summary of a survey performed in survey period 2015. The survey was performed on 10 to 11 May 2016. The questionnaire was distributed door-to-door to people in the surrounding area of the waste bank (where the waste bank can be reached by foot from their houses). 1,495 sheets of the questionnaire got responses. This survey was performed on Padang City, Bandar Lampung City, Medan City, Malang City, Surabaya City and Bandung City, cities and 11 waste banks in total. The table 3.3 show the questionnaire outline of the questionnaire for data and table 3.4 show the attribute rate of questionnaire target the object of research. Table 3.5 show the attributes of respondents and participation rates in garbage banks in 6 cities.

Table 3.4 Attribute rate of questionnaire target

Attribute		Propotion	Attribute		Propotion
Sex	Man	42.5	Residence years	5least than	28.2
	Women	57.5		6-10years	0.1
Final Education	Elementery School	3.3		11-20years	16.8
	Junior High School	4.1		21-30years	34.9
	Senior Hight	51.6		31-40years	16.1
	College	21.2		41-50years	2.3
	University	19.8	51more than	1.5	
Age	20	65.0	Life period of garbage bank	1-2years	65.7
	30	18.2		3-4years	20.6
	40	7.8		5-6years	4.2
	50	6.4		6 yearsmore than	9.6
	60	2.6	Always participate	9.2	
Profession	Government Office	8.1	Participation frequency / role	Sometimes	23.0
	Emploment	2.2		Join as staff	58.6
	Housewife	7.4		Not going	2.0
	Student	68.7		Other	7.1
	Part time job	2.8	Members / non-members	Member	15.1
	Teacher	3.1		Non member	84.9
	another	7.6		Padang	24.3
Family structure	1person	1.8	City	Lampung	6.3
	2 person	3.0		Medan	21.6
	3 person	13.7		Surabaya	19.0
	4 person	34.8		Malang	10.3
	more than 5 person	46.7		Bandung	14.4
				Balikpapan	4.0

Table 3.5 Attributes of respondents and participation rates in garbage banks

	questionner		Presentation member
	Member	Non Member	
Padang	52	297	88,5
Lampung	68	23	57,4
Medan	39	271	84,6
Surabaya	20	252	90,0
Malang	16	132	87,5
Bandung	22	185	59,1

3.3. Analysis Methods

3.3.1 Cross tabulation

Data from the questionnaire was processed using cross tabulation method, where the data was separated between members and non-members. The data was further classified based on participation, ie. actively participate, occasionally participate and never participate. Furthermore the data was being cross-tabulated. Participation of members and non-members were cross-tabulated separately, considering participation frequency, ie. “always participate”, “sometimes participate” and “participate as staff”. Respondents answered with “never participate” were also being cross-tabulated.

3.3.2 Wilcoxon rank-sum test

Based on cross tabulation applying Wilcoxon rank-sum test methods using sum test, members/non-members, participants/non-participants were analysed on difference in awareness using Kai^2 test, applied to contingency test table. As this research applied Wilcoxon rank-sum test method, answers at the questionnaire were in a scale from 1 to 5.

3.3.3 Defining model of environmental friendly behaviours

Municipal community environmental-friendly behaviour model. The research is purposed to create a model representing relation between target and action. This Hirose⁶⁾ model is a

process model on where a person builds intention, understand, make decision and define his environmental-friendly behaviour. On this model, an assumption was made on two previous stages, ie. “purposed to environmental-friendly objective” and “environmental risks”.

Cognition ‘responsibility recognition’ validity on agreement in giving response, “good will for environment”, “intention on environmental-friendly behaviours”, “existence of intention and purposes”, “feasibility evaluation”, “effective beneficial costs” as “evaluation of social norms” influences the implementation structure. Waste bank, which is the subject of this research as explained previously, is expected to improve promotion of recycling and environmental-friendly awareness.

There is a feature showing that participation in waste bank is an environmental-friendly action which can be considered as dynamic action and people involved are studied in 2-staging model, in accordance with the previous research⁴⁾, “owning intention on environmental-friendly behaviours” and “environmental-friendly behaviours”.

3.3.4 Covariance structure analysis

On this research, covariance structure analysis was applied, analysing participation factor of people living in the waste bank surrounding areas. The covariance structure analysis was performed separately for participants and non-participants. In addition, structural-equation model was classified for members and non-members of waste banks. Comparison on participation and cooperation levels of waste bank members and non-members was then performed. This is purposed to compare factors on covariance structure analysis, expansion factor analysis and multiple regression analysis. Observation data was obtained from the questionnaire survey. Covariance structure analysis is an extension of factor analysis and multiple regression analysis. It is a statistic method used to analyse correlations of some factors behind the observation data obtained from the questionnaire survey. In covariance

structure analysis, there is possibility to quantitatively evaluate casual correlation between observed variables and latent variables applying “latent variables” which cannot be observed directly.

3.4. Survey result analysis

3.4.1 Validity on difference in participation awareness and membership system

Participation levels on waste bank members, table 3.5 shows summary of the questionnaire survey result, showing participation levels of the waste bank members on every city. A waste bank with high participation of its members is considered as an effective waste bank.

Table 5 shows that Surabaya, Malang, Padang and Medan have high participation levels of the waste bank members. The waste bank membership system has been predicted as effective.

3.4.2 Cross tabulation on members and non-members

In order to observe difference on participation awareness, cross tabulation on each questionnaire was performed separately for members and non-members. From all the distributed questioners to the respondents, then selected graphs that have a very strong answer option of the 4 cities, there are Q2, Q3, Q4, Q11 and Q19. The result Grafic show in Graf. 3.1 "Waste is a significant issue to solve in the city where I live" (Q2), Fig. 3.2 "The municipal government is responsible in taking actions in solving waste issues"(Q3), Fig. 3.3 "I am also responsible in solving waste issues" (Q4), Fig. 3.4 "In my opinion, although managing waste issues is not easy, solving the issues will make the city cleaner" (Q11), Fig. 3.5 "I participate in waste bank" (Q19).

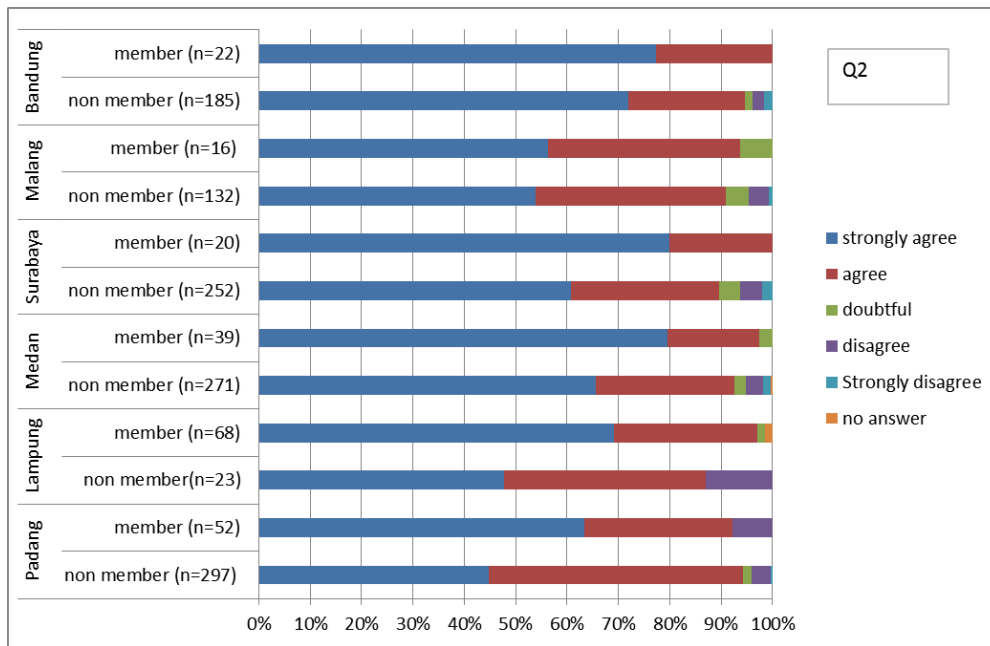


Fig. 3.1 "Waste is a significant issue to solve in the city where I live" (Q2)

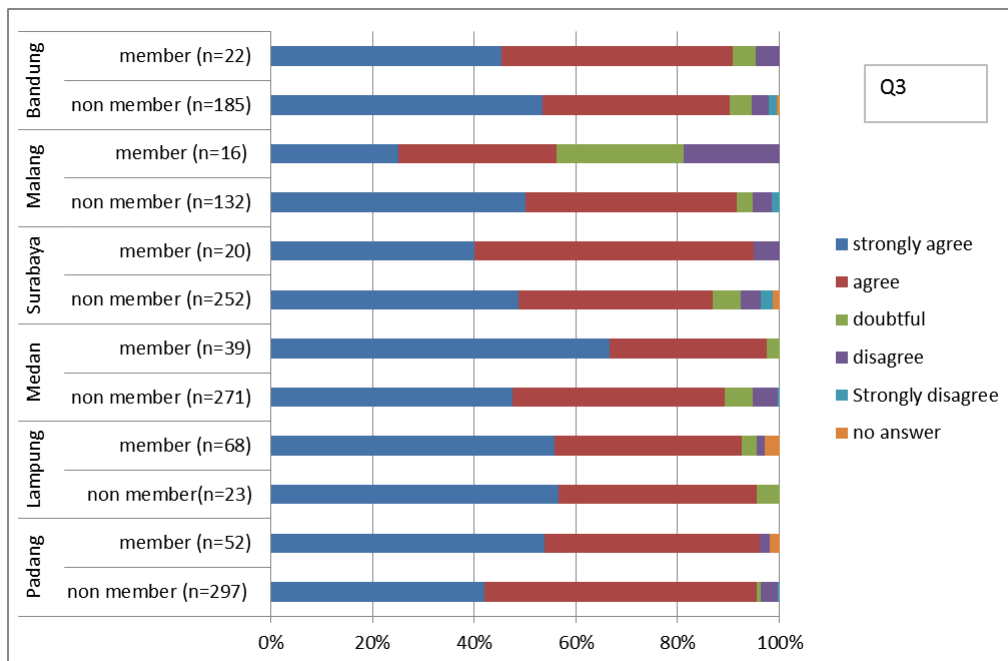


Fig. 3.2 "The municipal government is responsible in taking actions in solving waste issues"(Q3)

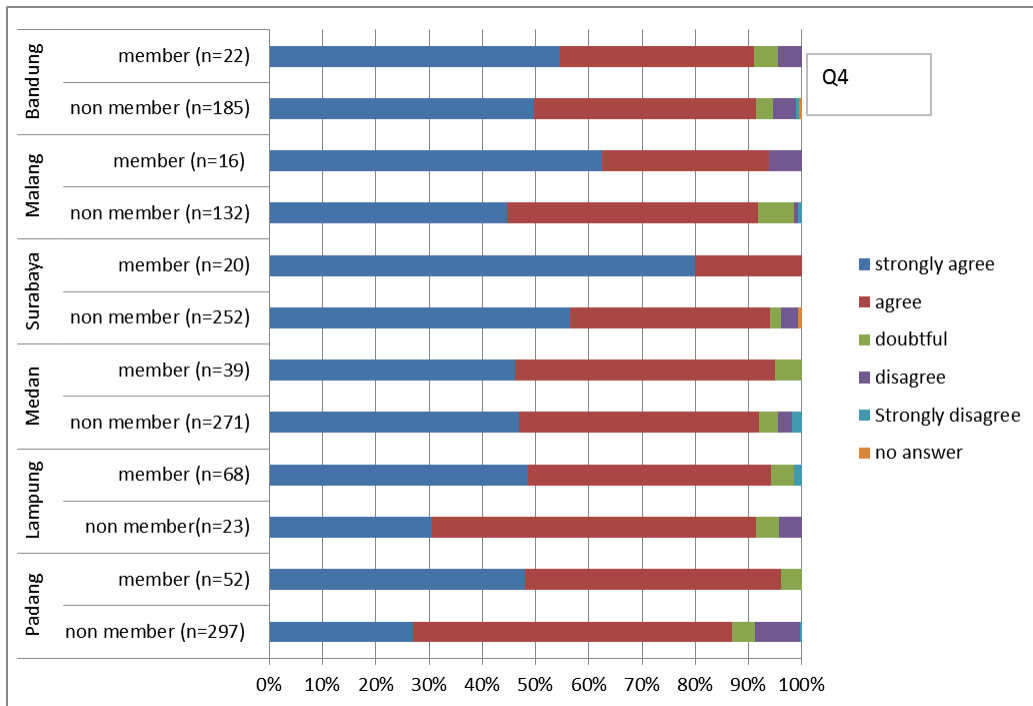


Fig. 3.3 “I am also responsible in solving waste issues” (Q4)

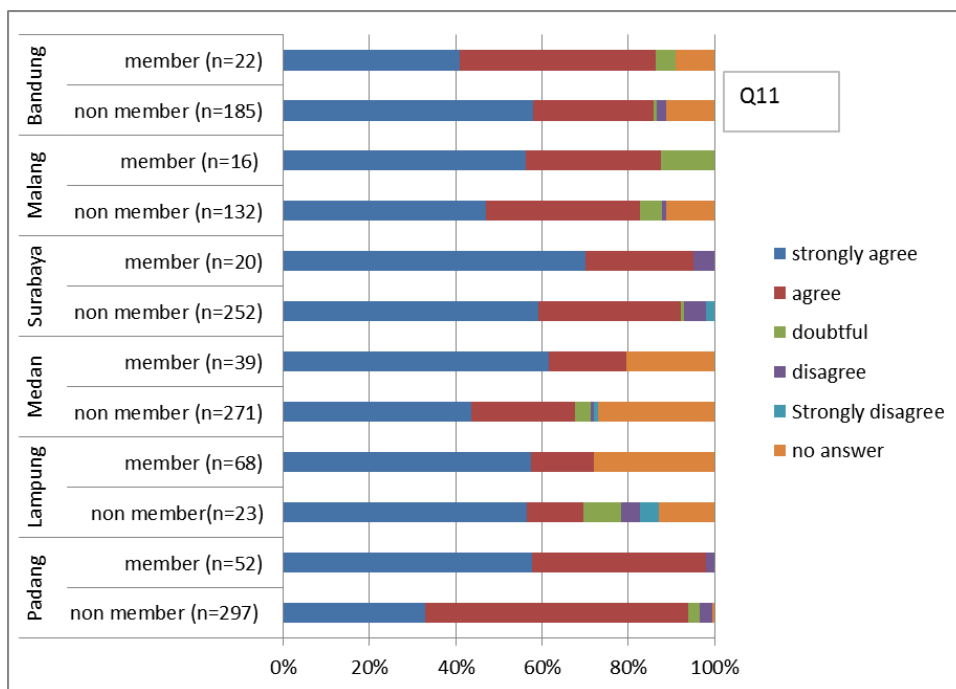


Fig. 3.4 “In my opinion, although managing waste issues is not easy, solving the issues will make the city cleaner” (Q11)

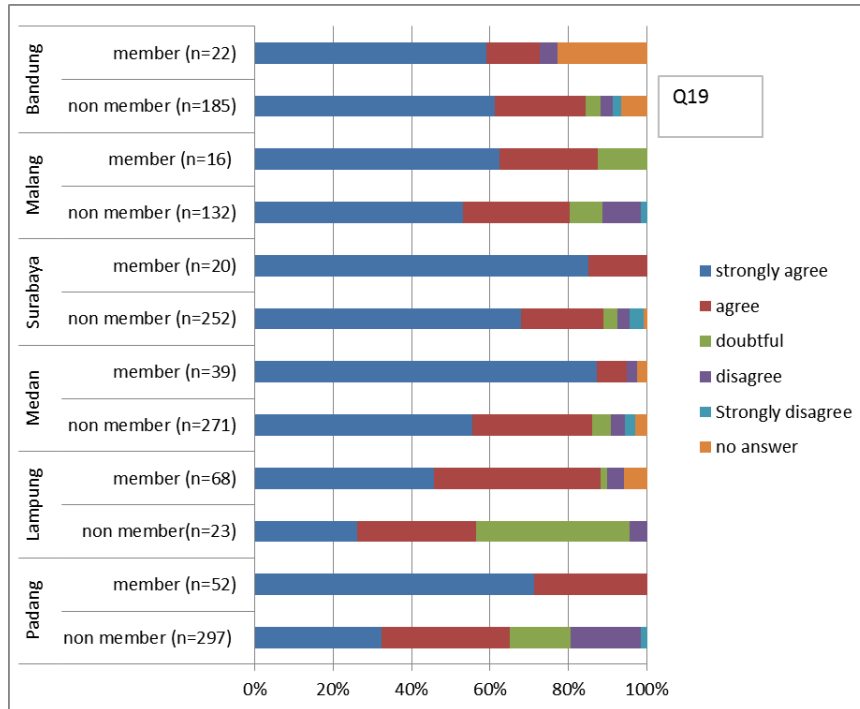


Fig. 3.5 “I participate in waste bank” (Q19)

Based on the cross tabulation on members/non-members, evaluation result and discussion result, it is concluded that there is differences on environmental awareness and waste bank effectiveness between members and non-members.

The result of the cross tabulation applying Wilcoxon rank-sum test methods is shown on Table 6. The result reveals that difference in awareness is below the significance level of 0.01. This issue has to be solved for the city where they live (Q2). Other conditions, at more than one city, the level is lower than 0.01. In other words, for Q2 there is no significant difference in awareness between members and non-members. It reveals that regardless members or non-members, the issue is something that has to be solved (Q2). The result shows a significant difference. In regard to Q19 (Fig. 3.5), it is shown in all cities, that due to awareness difference between members and non-members on recycle, those who own understanding on environment exist in some cities. Unlike non-members, “members tend to solve waste issues”. This condition is understandable as the majority thinks that they are

responsible on waste issues. Q19 (Fig. 3.5) also reveals that in all cities, due to a awareness difference between members and non-members, members tend to own more understanding on environment and recycle compared to non-members. Furthermore, in Surabaya, where membership system is expected to be effective among three cities in Bandar Lampung, Padang and other cities. Consider if there is difference in awareness between members and non-members.

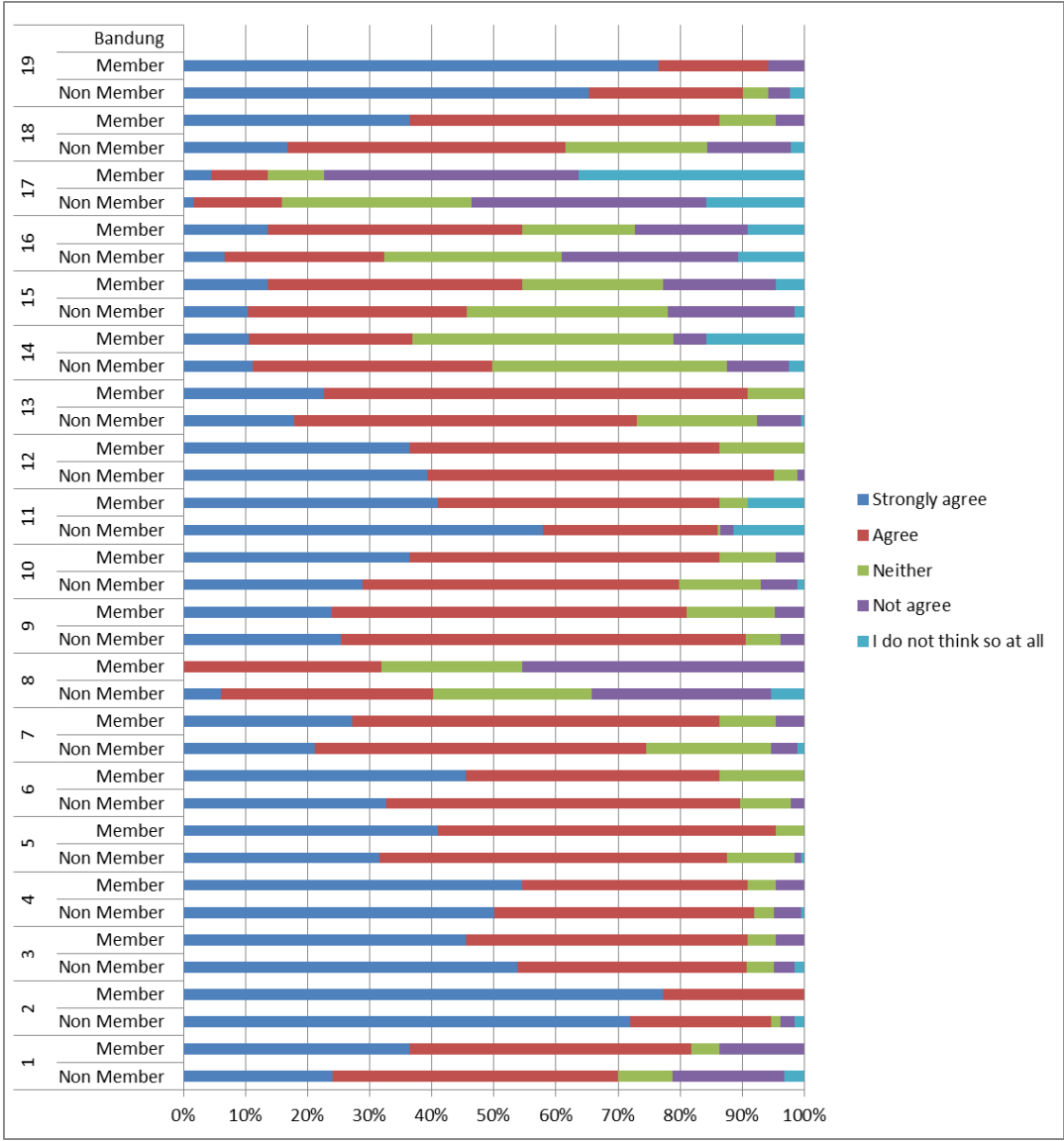


Fig. 3.7 Answers from all questions in Bandung city

Fig. 3.4 shows that 40% of members of waste bank in Malang think that they are responsible in solving waste issues in Malang. Members of waste bank in Malang have strong interest and high engagement in environmental issues. However, in Surabaya, as shown on Figure 3.5 there is no significant difference in awareness between members and non-members. This means that both parties have high expectation on the existence of waste banks. On another case, it was found that members of waste banks in Malang and Padang own awareness on the existence of waste banks as a solution to environmental issues, as indicated by a high score related to this matter. Figure 16 shows that members of waste banks in Padang and Surabaya have high engagement on the program, compared to questionnaire result for Malang, where members and non-members succeed in their engagement and support to waste banks, as well as encouraging the community to be involved in the program. In order to observe difference on participation awareness, cross tabulation on each city questionnaire was performed separately for members and non-members, Fig. 3.7-3.12 shows the result summary the 19 of questions spread in the city of Bandung, analyzed questions that have strongly agree answers mostly more than 60%. that is in question no 2 that is about The problem of garbage in the city where I live, is to be completed question no 3 The government is responsible to solve the garbage problem, question no 4 There is a responsibility to solve the garbage problem in their own, Question no 11 Activities that are difficult, but to clear the city of garbage bank, and the last of question no 19 that It was participated.

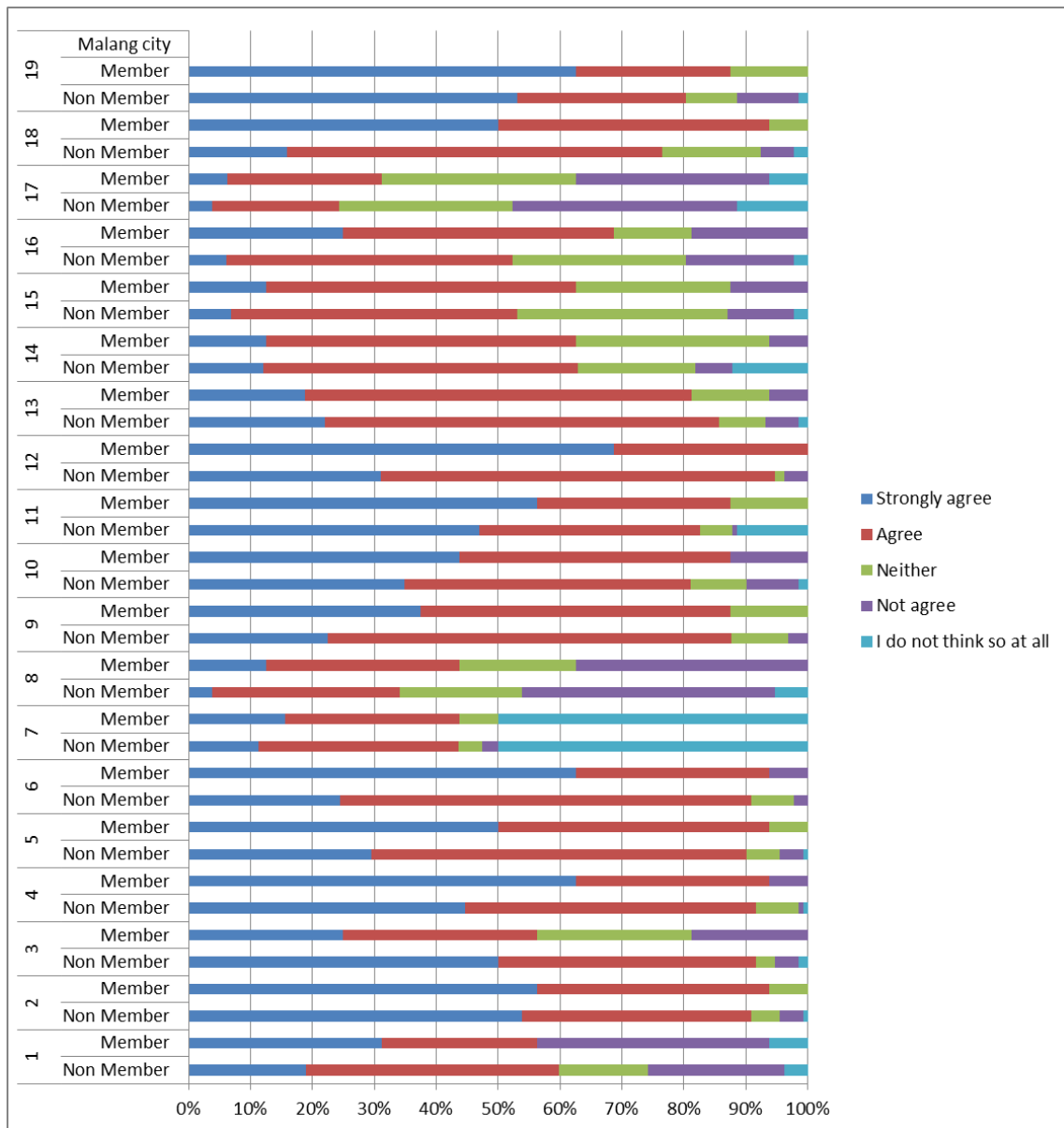


Fig. 3.8 Answers from all questions in Malang city

The 19 of questions distributed in the city of Malang, analyzed questions that have strongly agree answers mostly more than 60%. That is in question no 2 that is about The problem of garbage in the city where I live, is to be completed. question no 4 ie. There is a responsibility to solve the garbage problem in their own, question no.19 It is participated.

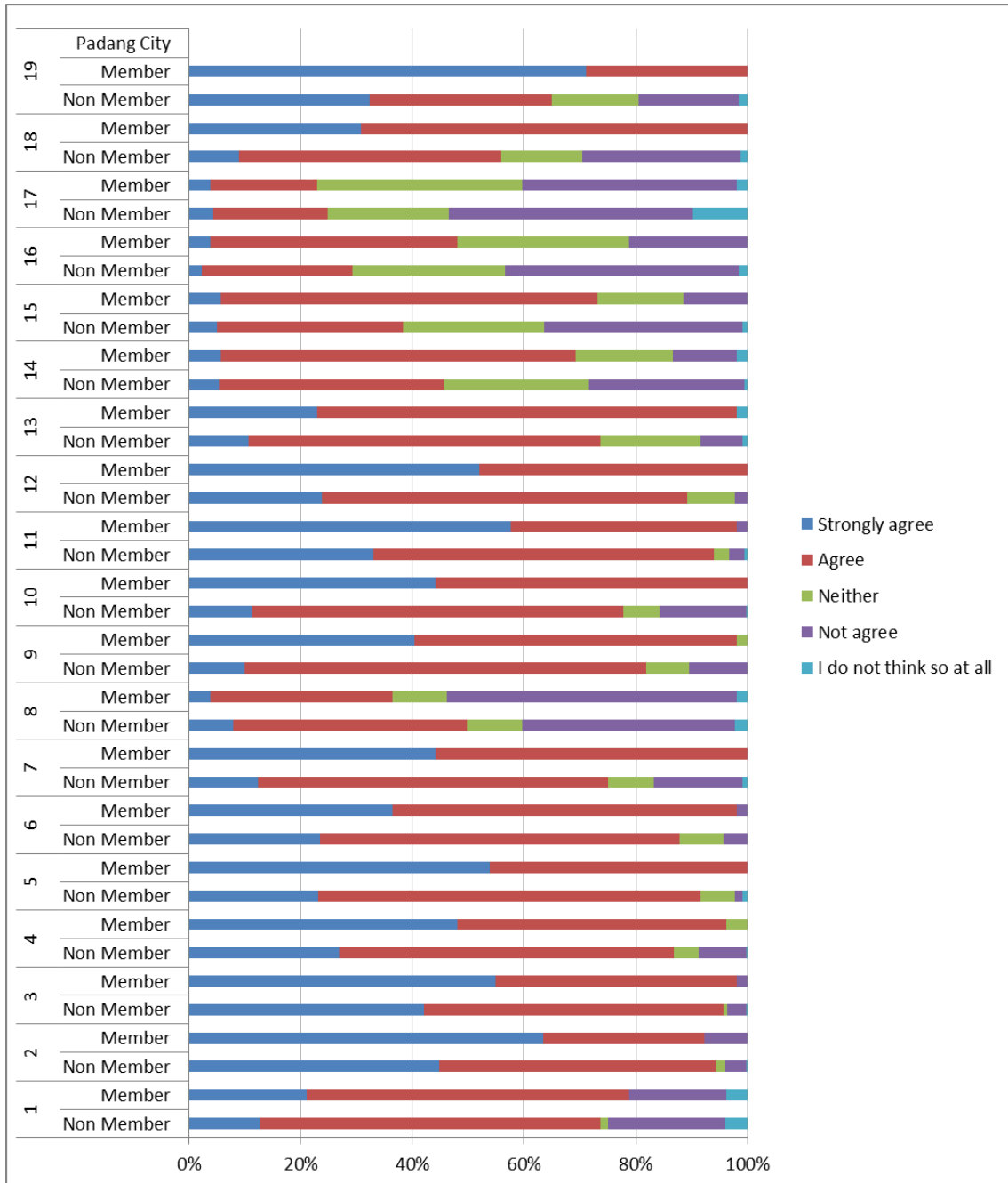


Fig. 3.9 Answers from all questions in Padang City

The 19 of questions distributed in the city of Padang, analyzed questions that have strongly agree answers to more than 60%. That is in question 19 that It was - participated.

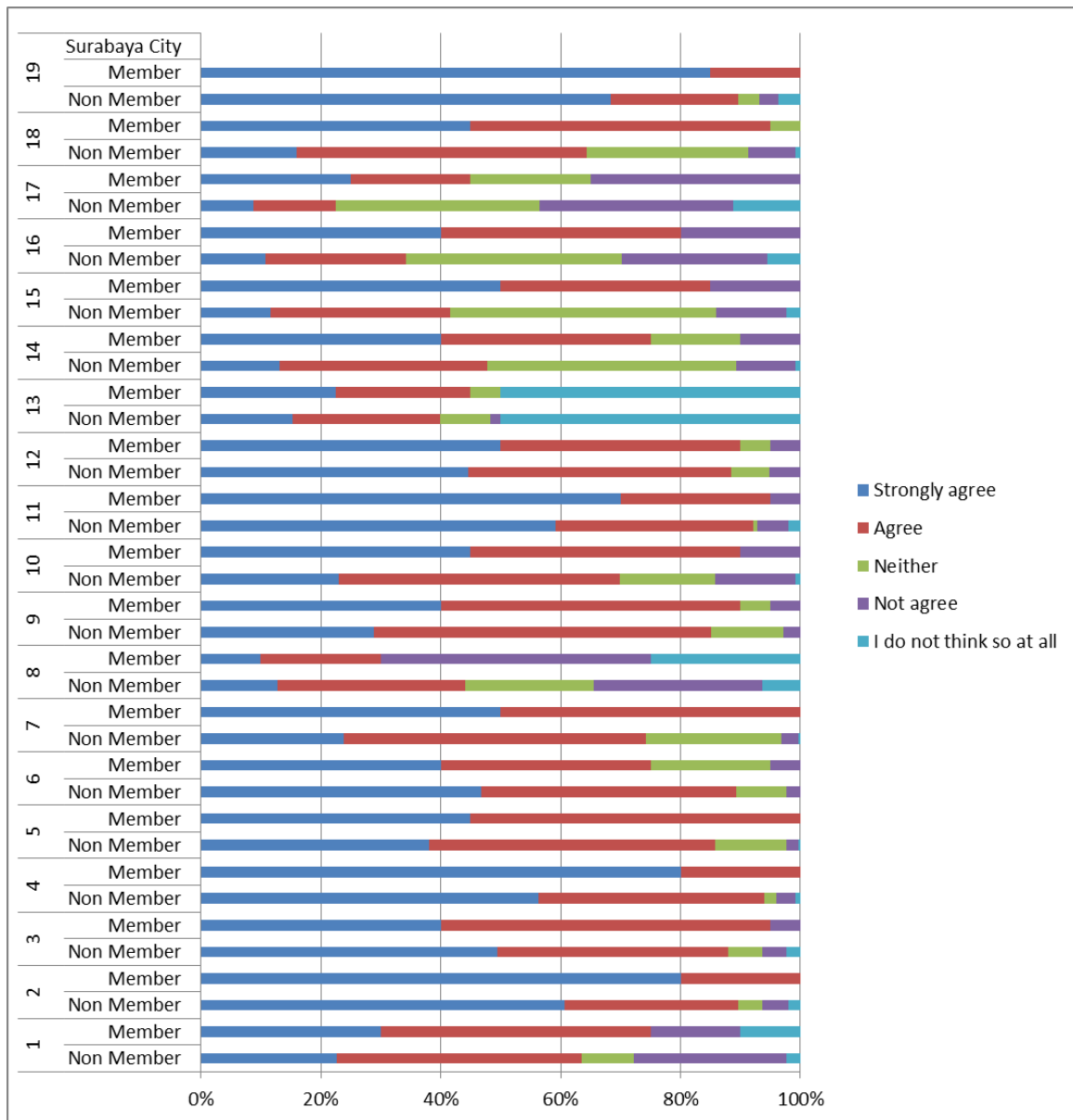


Fig. 3.10 Answers from all questions in Surabaya City

The 19 of questions distributed in the city of Surabaya, analyzed questions that have strongly agree answers mostly more than 60%. ie on question no 2 that is about The problem of garbage in the city where I live, is to be completed. question no 4 There is a responsibility to solve the garbage problem in their own, question no 11 that is difficult, but to clear the city of garbage bank, and last question is no 19 that It was – participated.

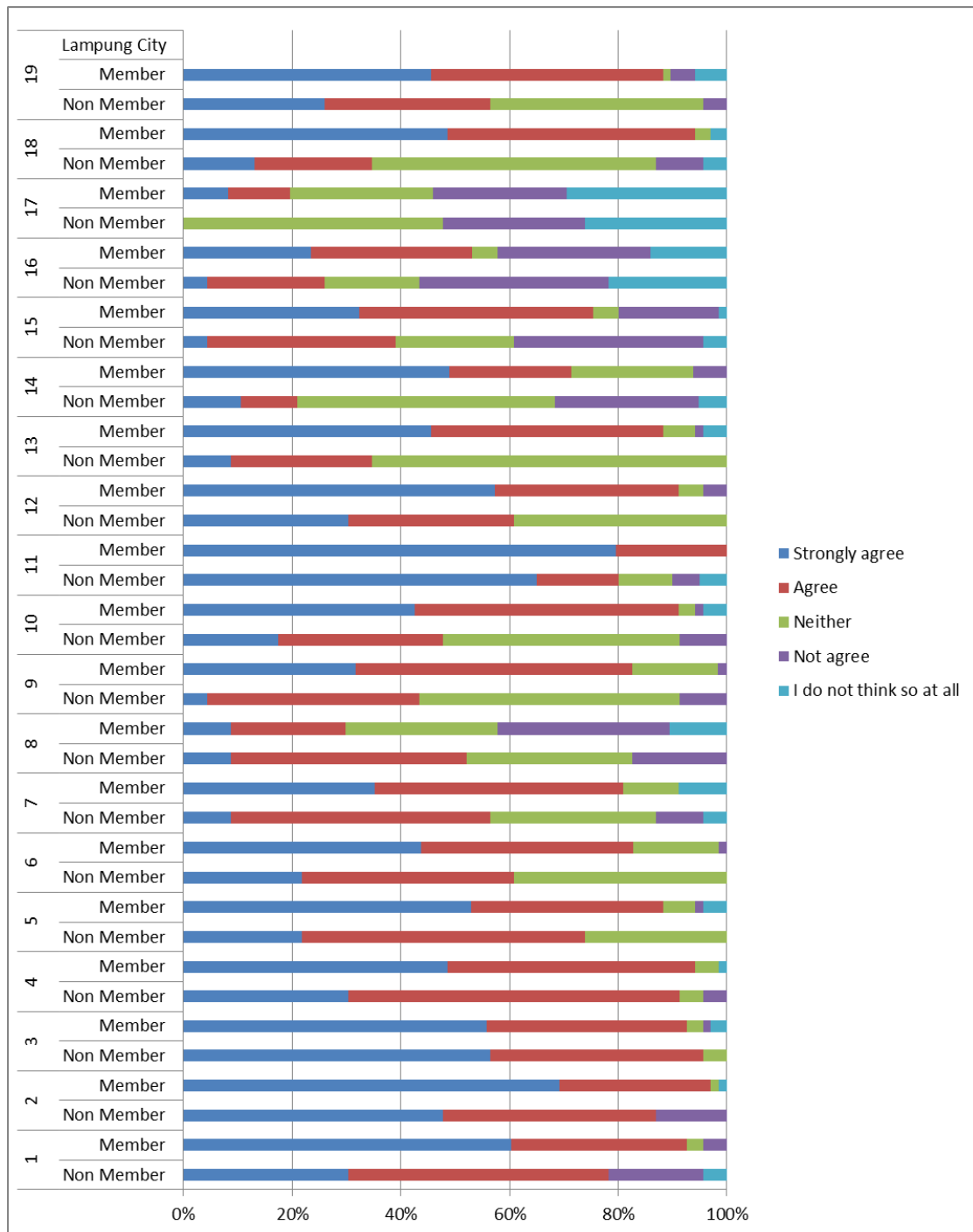


Fig. 3.11 Answers from all questions in Lampung City

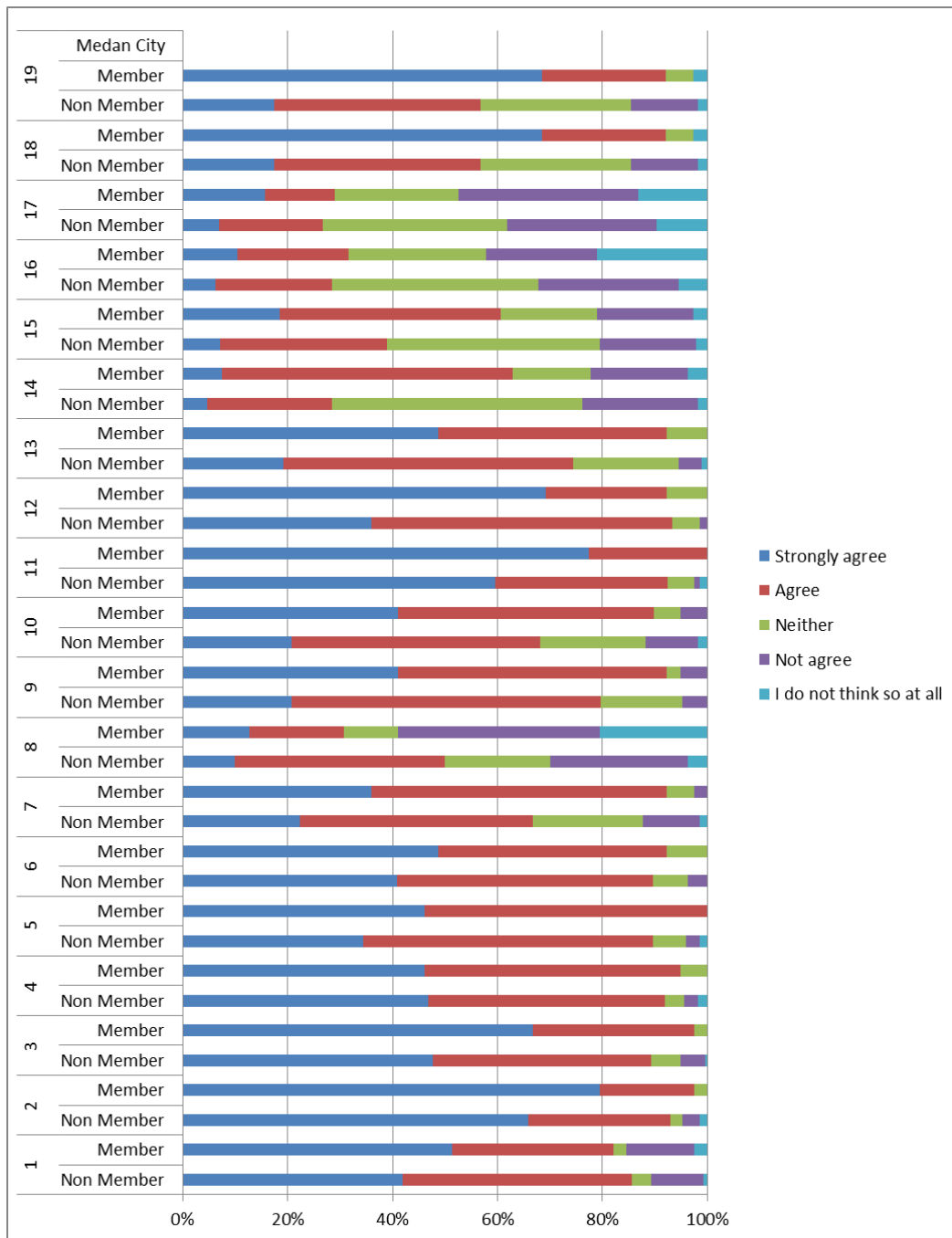


Fig. 3.12 Answers from all questions in Medan

The question spread in surabaya city shows that question no. 2.3.11.12.18.19 has strongly agree answer, question no 2. The problem of garbage in the city where I live, is to be completed. Question no 3. The government is sole responsible for garbage problem. Question no 11. Activities that are difficult, but to clear the city of garbage bank, question no 12.

Activity was very, but led to the resolution of the city garbage problem. Question no 18. The eyes of the regions are concerned and do not participate and question no 19. It was – participated.

3.4.3 Characteristic of waste banks at each city

Table 3.6 Summarizes characteristic of waste banks involved in the research and questionnaire.

Latent variable	Observation variable
Countermeasure Effectiveness perception	Q5 Garbage bank can solve waste problem
	Q6 Garbage Bank is also effective for solving regional problems
Social norm evaluation	Q15 People around are participating in garbage bank activities
	Q16 People in the area can recommend participation
	Q17 If you do not participate you will be concerned about the eyes of local people
Environmental risk perception	Q1 Garbage is scattered in the city
	Q2 The garbage problem of the city where you live is to be solved
My benefit cost effect	Q12 Activity is serious but it will lead to the solution of city garbage problem
	Q13 Activities are not serious and you can save your income in your account
Evaluation of feasibility	Q9 I will join if I have time
Responsibility attribution recognition	Q3 The administration is responsible for solving the garbage problem
	Q4 I am also responsible for solving the garbage problem

(1) Compared Cities

Compared to other cities, Surabaya, Malang and Padang have membership system which functions effectively. This can be seen from the social activities that have been performed. Some amount of the money received by members is saved in their accounts and other is arranged for religious, educational and social activities of the cities. In addition, handicraft sale and workshop on how to manage a waste bank are other forms of the social activities which are actively conducted. In Padang and Surabaya, some waste banks also provide loan system for their members.. Furthermore, Table 3.7 shows other social activities being conducted, such as regular saving where members can withdraw their money anytime,

Ramadhan saving where members can only withdraw their money at the end of Ramadhan Month. Ramadhan saving is arranged for the reason that for Moslems the end of Ramadhan Month is an important event and it tends to require extra expenses. Therefore they get prepared by saving their money in a year. Besides, they also obtain big incentive from it. This kind of program is provided by waste banks in Surabaya. Based on comprehensive analysis on Table 3.5 and Table 3.7 in regard to member participation, it can be seen that waste banks with high participation of their members tend to have interesting activities.

(2) Awareness difference due to participation frequency

Table 3.7 shows result of cross tabulation between members and non-members. Based on the result of Wilcoxon rank-sum test, it is concluded that with exception on questions no. 2, 3 and 4, there are difference in participation awareness between participants and non-participants. The result of cross tabulation, with exception on question no. 8, reveals that members are more ambitious to participate in activities facilitated by waste banks, compared to non-members.

Table 3.7 Test results on members' non-member crosstabs

No.	question	Padang	Lampung	Medan	Surabaya	Malang	Bandung
Q1	Garbage is scattered in the city.		**				
Q2	The garbage problem of the city in which I live should be solved	*	*				
Q3	The administration is responsible for solving garbage problems			*		**	
Q4	I am also responsible for solving the garbage problem	**			*		
Q5	Garbage Bank can solve garbage problem	**	**	*			
Q6	Garbage Bank is also effective for solving regional problems	**	*			**	
Q8	I do not have time to participate in work etc.		*	**	*		
Q9	I will join if I have time	**	*			**	
Q10	I know the method of sorting garbage to bring to garbage banks	**	**	**	*		
Q11	Garbage bank activities are tough, but the city becomes clean	**		*			
Q12	The activities of garbage banks are serious but I think they will lead to the solution of the garbage problem in the town	**	**	**		**	
Q13	Activities are not serious and you can save money in your account	**	**	**			
Q14	People around me are participating in garbage bank activities.	**	**	*	**		
Q15	People around are participating in garbage bank activities	**	**	*	**		
Q16	People in the area can recommend participation	**	*		**	**	*
Q17	If you do not participate you will be concerned about the eyes of local people				*		
Q19	I know the word "reuse" and "reduce" other than recycling	**	**	**	**	**	**

Table 3.8 Characteristics of waste banks are subject to questionnaire surveys

Name of city	Padang			Lampung
Name of Waste Bank	Universitas Andalas	Semen Padang	Hidayah	Bandar Lampung
Operating Entity	University	Regional	Personal	NGO
Leader	University teacher	Chairman	An individual	NGO
Staff	Teachers and students of Andalas University	Citizen Padang company residents	An individual	NGO
participant	Teachers and students of Andalas University	Citizen Padang company residents	Surrounding resident / junior high school	Lamp citizen
Number of units	0 places	2 places	0 places	-
Number of garbage separators	Five types	4 kinds	9 types	8 unit
Established year	2014	2012	2011	-
Foundation fund	University	Cement Padang	An individual	Local
Economic support	University	-	Local Government (Providing Compsols / Plastic Crushing Machine)	Local governments · NGOs
technical support	University teacher	NGO	Local government	Local governments ·
Compost Activity	○	○	△	○
Social activities	· Legral savings	· Legral savings · Electricity charge of mosques 25% of income · I can borrow	· Legral savings · Handmade recycling products study group · sales	· Legral savings · Handmade recycling products study
Definition of members and non-members	University teachers and students are automatically registered as members	Only members can participate	Only members can participate	Only members can participate
Winning at environmental contest		○	○	×

Table 3.8 Characteristics of waste banks are subject to questionnaire surveys(cont.)

Name of city	Surabaya		Malang	Medan
Name of Waste Bank	Mandiri	Rewin	Kota Malang	Induk Sicanang
Operating Entity	Universty Teacher	Rewin Community	Local Government	Environment
Leader	University teacher	Chairman	-	Director of environmental
Staff	Group members	People in the Lewinwar region	Residents of the Cotamاران area · Teachers of the schools · Employees of the	Group members
participant	Surabaya citizen	Residents of the war area	Residents of the Cotamاران area · Teachers of the schools · Employees of the	Residents of Brawan area
Number of units	212 places	50 places	469 places	5 places
Number of garbage separators	13 kinds	6 kinds	8 kinds	14 kinds
Established year	2006	2014	2011	2016
Foundation fund	University teacher	Town fee dues	Local government	JICA
Economic support	Environment group	Town fee dues	Local government	Local
technical support	University teacher	Teacher of Unile University	Local government	JICA
Compost Activity	×	○	△	○
Social activities	· Legral savings · Ramadan savings · Educational saving · I can borrow · Support for the poor town free	· Legral savings · Ramadan savings · Environmental workshop	· Legral savings · Garbage Bank workshop · Handmade recycling products study group · sales	· Legral savings · English education for
Definition of members and non-members	Non-members can participate, but savings and debts can not be done	Only members can participate	Non-members can participate, but savings and debts can not be done	Only members can participate
Winning at environmental contest	○	○	×	×

Table 3.8 Characteristics of waste banks are subject to questionnaire surveys(cont.)

Name of city	Bandung		
Name of Waste Bank	Sabilulungan	Daun Kipas	Tamansari
Operating Entity	Batununggal	UNPAS	Tamansari Region
Leader	Chairman	University teacher	University teacher
Staff	Residents of the Batura area	Downpast University students	Residents of the area
participant	Residents of Batunungaru area	Dr. Downpast University's teachers and	Residents of the area · teachers of universities ·
Number of units	1 place	1 place	3 places
Number of garbage separators	Five types	Five types	Five types
Established year	-	2013	2011
Foundation fund	Town fee dues	University	University
Economic support	Local government	University	Town fee dues
technical support	Teacher of Unisba University	University of UPP	Teacher of Unisba University
Compost Activity	△	△	○
Social activities	· Legral savings · Environmental workshop	· Legral savings	· Legral savings
Definition of members and non-members	Only members can participate	Non-members can participate, but savings and debts can not be done	Only members can participate
Winning at environmental contest	×	×	×

Table 3.11 Test results on members' non-members crosstab

No.	Question	Result
Q1	Garbage is scattered in the city.	**
Q2	The garbage problem of the city in which I live should be solved	
Q3	The administration is responsible for solving garbage problems	
Q4	I am also responsible for solving the garbage problem	
Q5	Garbage Bank can solve garbage problem	**
Q6	Garbage Bank is also effective for solving regional problems	**
Q8	I do not have time to participate in work etc.	**
Q9	I will join if I have time	**
Q10	I know the method of sorting garbage to bring to garbage banks	**
Q11	Garbage bank activities are tough, but the city becomes clean	**
Q12	The activities of garbage banks are serious but I think they will lead to the solution of the garbage problem in the town	**
		**
Q13	Activities are not serious and you can save money in your account	**
Q14	People around me are participating in garbage bank activities.	**
Q15	People around are participating in garbage bank activities	**
Q16	People in the area can recommend participation	**
Q17	If you do not participate you will be concerned about the eyes of local people	**
Q19	I know the word "reuse" and "reduce" other than recycling	*

Table3.12 Factor extraction result after rotation

Latent variable	Observation variable	因子					
		1	2	3	4	5	6
Countermeasure Effectiveness perception	Q5 Garbage bank can solve waste problem	0.924	0.059	0.035	-0.014	-0.028	-0.026
	Q6 Garbage Bank is also effective for solving regional problems	0.654	-0.027	-0.091	0.074	-0.01	0.177
Social norm evaluation	Q15 People around are participating in garbage bank activities	-0.053	0.604	-0.027	0.235	-0.058	0.096
	Q16 People in the area can recommend participation	0.021	0.916	-0.04	-0.054	-0.002	0.038
	Q17 If you do not participate you will be concerned about the eyes of local people	0.03	0.616	0.094	-0.112	0.07	-0.16
Environmental risk perception	Q1 Garbage is scattered in the city	-0.056	0.041	0.661	0.032	0.018	-0.168
	Q2 The garbage problem of the city where you live is to be solved	0.016	0.006	0.597	-0.006	-0.05	0.31
My benefit cost effect	Q12 Activity is serious but it will lead to the solution of city garbage problem	0.188	-0.057	0.068	0.592	0.037	-0.039
	Q13 Activities are not serious and you can save your income in your account	-0.031	0.013	-0.016	0.768	0.015	-0.075
Evaluation of feasibility	Q9 I will join if I have time	-0.003	0.026	-0.007	0.042	0.858	0.069
Responsibility attribution recognition	Q3 The administration is responsible for solving the garbage problem	0.185	-0.042	0.21	-0.013	0.031	0.251
	Q4 I am also responsible for solving the garbage problem	0.273	-0.037	0.027	-0.098	0.078	0.481

3.5. Structural analysis on awareness by participation frequency

3.5.1 Factor analysis

To obtain latent variable required for the covariance structure analysis, the result of 12 questions (Table 3.9) distributed on the questionnaire survey was applied. Factor analysis was performed using of maximum likelihood method with pro-max rotation. The result of factor extraction after rotation is shown on Table 3.9. The analysis results in six factors being extracted. The names of the six factors are determined as follow: The first factor is

recognizing effectiveness of waste bank activities considering many influencing factors. This factor is named as “Solution in overcoming challenges”. The second factor is response of people in the surrounding areas towards the existence of a waste bank, considering also, many influencing factors. This factor is named as “Social norms evaluation”.

Table 3.13 coefficient and significance probability for all samples

Standardization factor: (participant - model number 1)

Relationship between latent variables, observation variables, latent variables	Estimate	Significance probability
I think I will attend	-0.03	0.683
I think I will attend	0.119	0.318
I think I will attend	0.168	0.183
I think I will attend	0.459	***
The garbage problem of the city in which I live should be solved	0.617	
Garbage is scattered in the city	0.496	***
I am also responsible for solving the garbage problem	0.696	
The administration is responsible for solving garbage problems	0.349	***
Garbage Bank is also effective for solving regional problems	0.703	
Garbage Bank can solve garbage problem	0.782	***
I will join if I have time	0.8	
Activities are not serious and you can save your income in your account	0.647	
If you do not participate you will be concerned about the eyes of local people	0.513	
People in the area can recommend participation	0.932	***
People are participating in garbage bank activities around	0.562	***
I was participating -	0.407	***
I was participating -	0.167	***
I was participating -	0.218	***
Activities are serious but will lead to the solution of the garbage problem in the city	0.733	***
I was participating -	-0.05	0.594
People around are participating in garbage bank activities	0.245	***
Garbage Bank is also effective for solving regional problems	0.007	0.925
The garbage problem of the city in which I live should be solved	0.238	*
The administration is responsible for solving garbage problems	0.211	**
Environmental risk perception	0.316	*
Responsibility attribution recognition	0.729	***
Countermeasure Effectiveness perception	0.499	***
Cost vs. Profit Evaluation	0.291	***
Environmental risk perception	0.177	0.155
Environmental risk perception	0.251	*
Responsibility attribution recognition	0.453	***
Environmental risk perception	0.392	***
Environmental risk perception	0.049	0.469
Responsibility attribution recognition	0.467	***
Responsibility attribution recognition	-0.025	0.705
Countermeasure Effectiveness perception	0.588	***
Countermeasure Effectiveness perception	0.149	*
Evaluation of feasibility	0.171	**
Evaluation of feasibility	0.669	***

* : p<0.05 **: p<0.01 ***p<0.001

The third factor is towards environmental issues, considering many factors related to risk perceptions. This factor is named as “Recognizing risks”. The fourth factor is time to participate. This is an element related to personal benefit and costs, such as labour cost. This

factor is named as “Cost versus personal benefit evaluation”. The fifth factor is waste, considering this is an opportunity element to participate by bank. This factor is named as “Performance evaluation”. The sixth factor is responsibility on waste issues, considering many factors influencing awareness to take actions. This factor is named as “Recognition of responsibility.” Furthermore, factors obtained from the factor analysis are considered as the latent variables. Questions included in variable factors are determined as the observation variable. Description on latent variables and observation variables are shown on Figure 10. Description on latent variables is as follow:

Effectivity management: Participating in waste bank broaden knowledge on waste issues and the effects. Evaluation on social norms: Actions are consistent with norms and expectation of the local and surrounding communities. Perception on environmental risks: such as how serious waste issues are, how high the risk of on environmental damage and also cost of education and profit evaluation adjusted to the budget. Recognition of responsibility: I am the cause of waste issues with myself. The cognition and responsibility should go along with dynamic changes.

To facilitate the reading, then on the graph of this model, made two types that is with all the results of calculations and graphics that only have results above the value of 0.5 only.

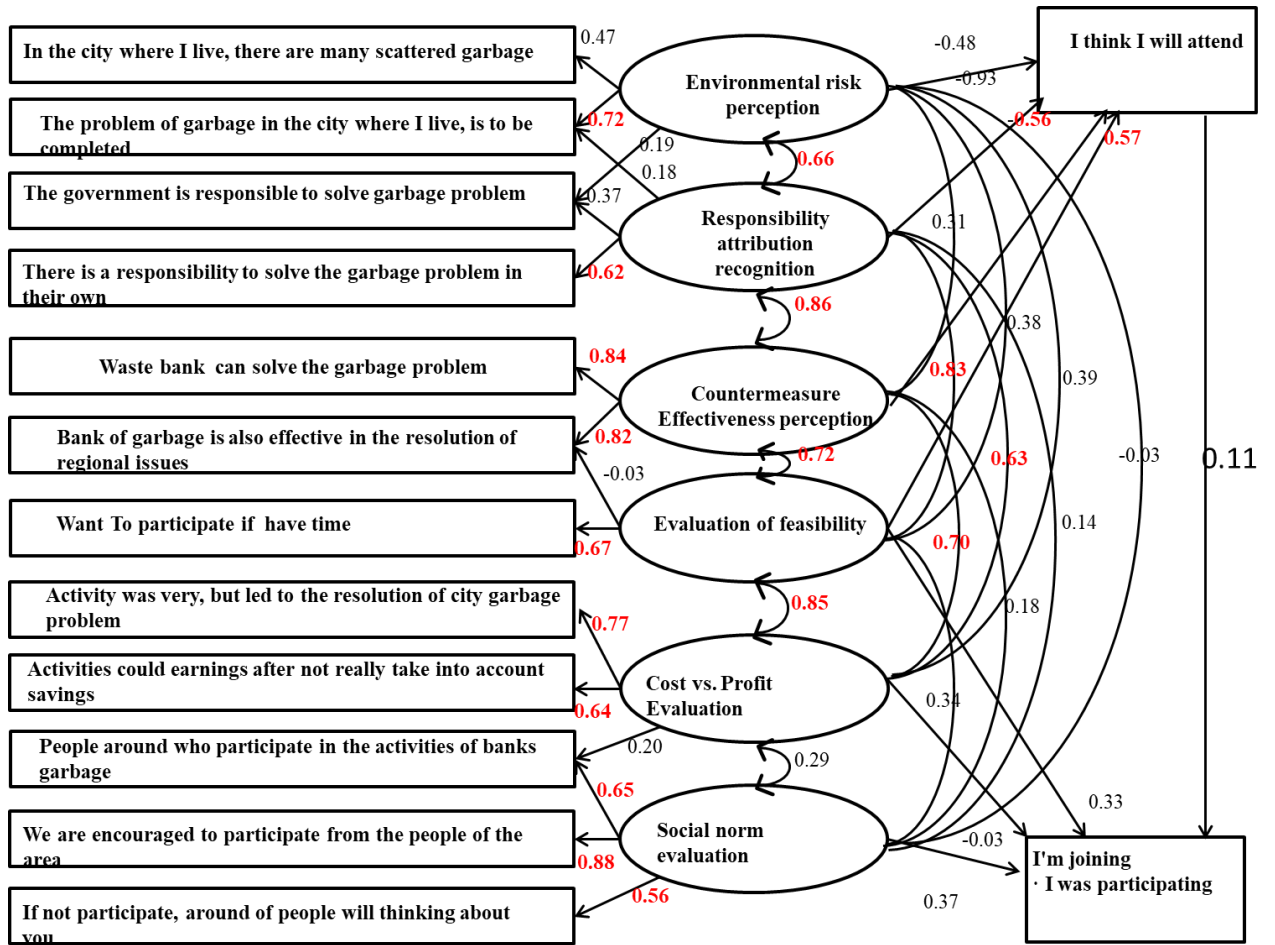
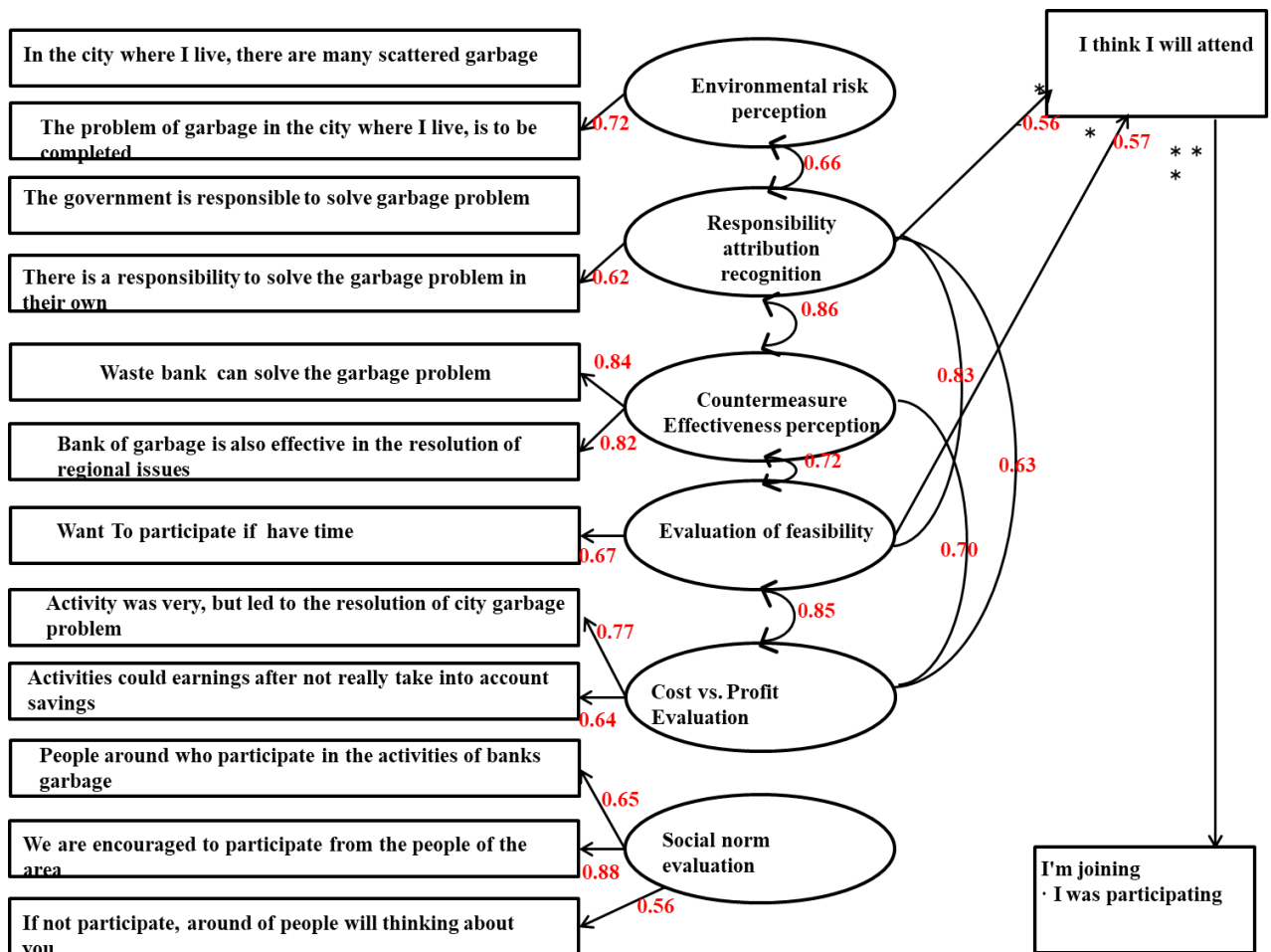


Fig.3.19 Participant Factor Model in All Samples



Note: GFI: 0.985, AGFI: 0.969, CFI: 0.983, RMSEA: 0.038

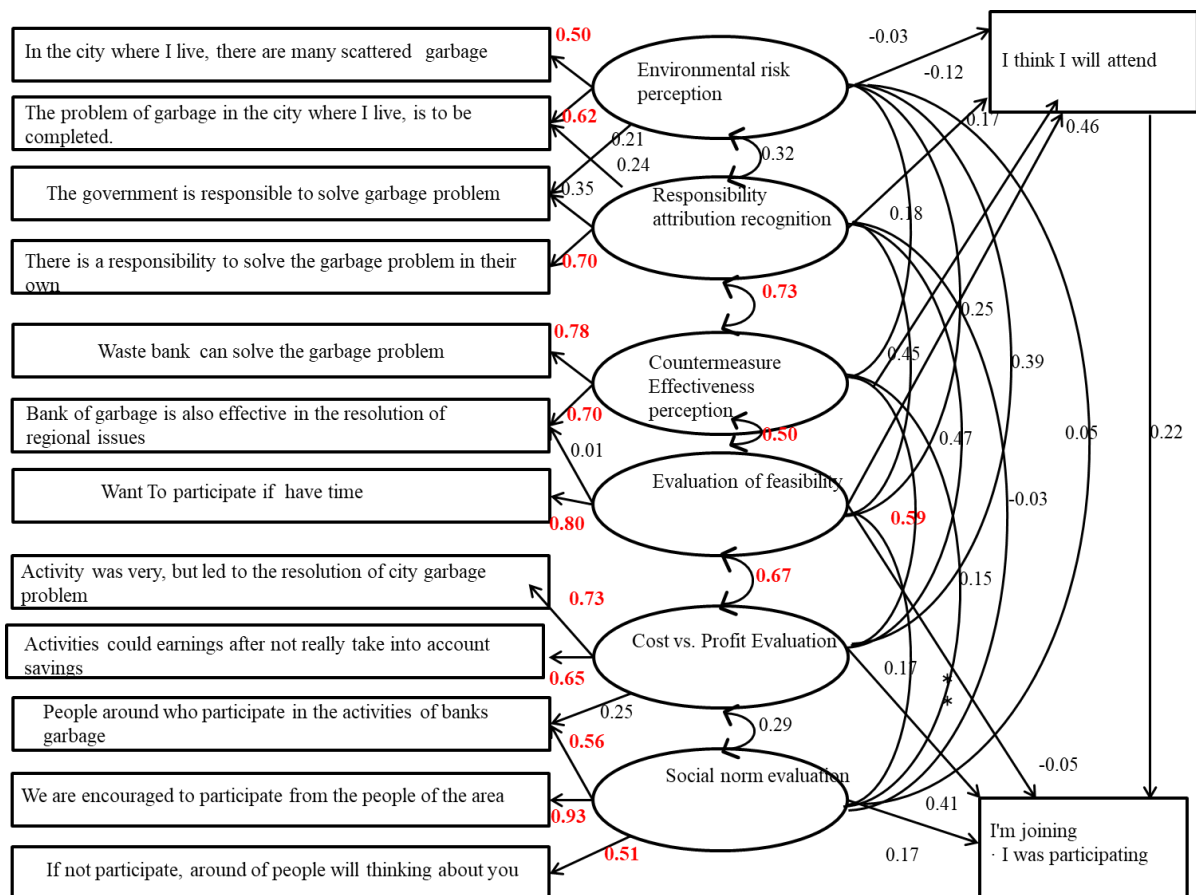
* p <.10 ** p <.05, *** p <.01

Fig.3.20 Participant Factor Model in All Samples more than p<0.5

Table 3.14 Standardization factor and significance probability of participants

Standardization factor: (non-participant - model number 1)					
Relationship between latent variables, observation variables, latent variables			Estimate	Significance probability	
I think I will attend	<--	Environmental risk perception	-0.444	**	
I think I will attend	<--	Responsibility attribution recognition	0.858	**	
I think I will attend	<--	Countermeasure Effectiveness perception	-0.398	*	
I think I will attend	<--	Evaluation of feasibility	0.425	**	
The garbage problem of the city in which I live should be solved	<--	Environmental risk perception	0.794		
Garbage is scattered in the city	<--	Environmental risk perception	0.479	***	
I am also responsible for solving the garbage problem	<--	Responsibility attribution recognition	0.643		
The administration is responsible for solving garbage problems	<--	Responsibility attribution recognition	0.374	***	
Garbage Bank is also effective for solving regional problems	<--	Countermeasure Effectiveness perception	0.865		
Garbage Bank can solve garbage problem	<--	Countermeasure Effectiveness perception	0.855	***	
I will join if I have time	<--	Evaluation of feasibility	0.651		
Activities are not serious and you can save your income in your account	<--	Cost vs. Profit Evaluation	0.586		
If you do not participate you will be concerned about the eyes of local people	<--	Social norm evaluation	0.548		
People in the area can recommend participation	<--	Social norm evaluation	0.894	***	
People are participating in garbage bank activities around	<--	Social norm evaluation	0.67	***	
I was participating ·	<--	Cost vs. Profit Evaluation	-0.01	0.934	
I was participating ·	<--	Social norm evaluation	0.423	***	
I was participating ·	<--	I think I will attend	0.098	0.289	
Activities are serious but will lead to the solution of the garbage problem in the city	<--	Cost versus benefits	0.768	***	
I was participating ·	<--	Evaluation of feasibility	0.27	0.143	
People around are participating in garbage bank activities	<--	Cost vs. Profit Evaluation	0.161	***	
Garbage Bank is also effective for solving regional problems	<--	Evaluation of feasibility	-0.053	0.545	
The garbage problem of the city in which I live should be solved	<--	Responsibility attribution recognition	0.128	0.149	
The administration is responsible for solving garbage problems	<--	Environmental risk perception	0.212	***	
Environmental risk perception	<-->	Responsibility attribution recognition	0.683	***	
Responsibility attribution recognition	<-->	Countermeasure Effectiveness perception	0.829	***	
Countermeasure Effectiveness perception	<-->	Evaluation of feasibility	0.717	***	
Cost vs. Profit Evaluation	<-->	Social norm evaluation	0.181	***	
Environmental risk perception	<-->	Countermeasure Effectiveness perception	0.343	**	
Environmental risk perception	<-->	Evaluation of feasibility	0.325	**	
Responsibility attribution recognition	<-->	Evaluation of feasibility	0.876	***	
Environmental risk perception	<-->	Cost vs. Profit Evaluation	0.402	***	
Environmental risk perception	<-->	Social norm evaluation	-0.095	*	
Responsibility attribution recognition	<-->	Cost vs. Profit Evaluation	0.621	***	
Responsibility attribution recognition	<-->	Social norm evaluation	0.145	**	
Countermeasure Effectiveness perception	<-->	Cost vs. Profit Evaluation	0.738	***	
Countermeasure Effectiveness perception	<-->	Social norm evaluation	0.105	*	
Evaluation of feasibility	<-->	Social norm evaluation	0.305	***	
Evaluation of feasibility	<-->	Cost vs. Profit Evaluation	0.822	***	

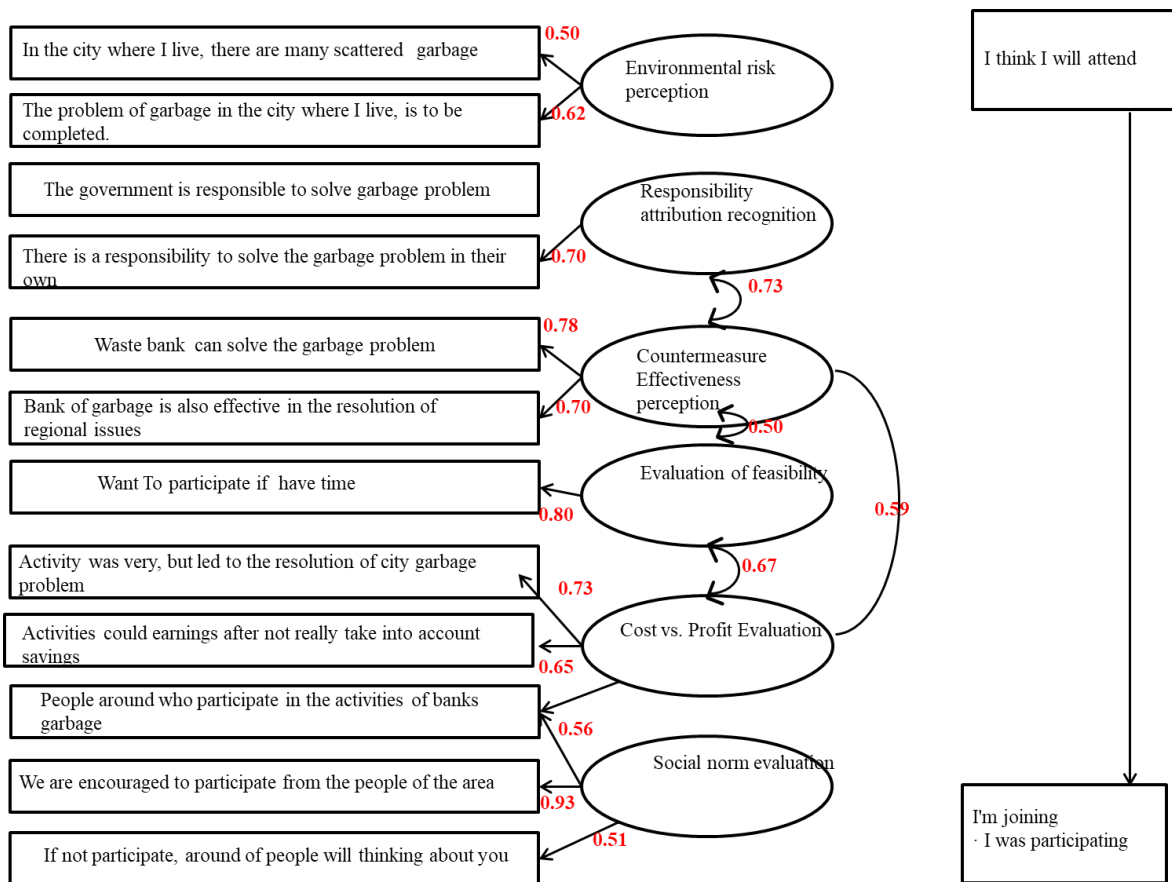
* : p<0.05 ** : p<0.01 ***p<0.001



Note: GFI: 0.985, AGFI: 0.969, CFI: 0.983, RMSEA: 0.038

* p < .10 ** p < .05, *** p < .01

Fig. 3.21 Participant factor model in participants



Note: GFI: 0.985, AGFI: 0.969, CFI: 0.983, RMSEA: 0.038

* p <.10 ** p <.05, *** p <.01

Fig. 3.22 Participant factor model in participants more than p<0.5

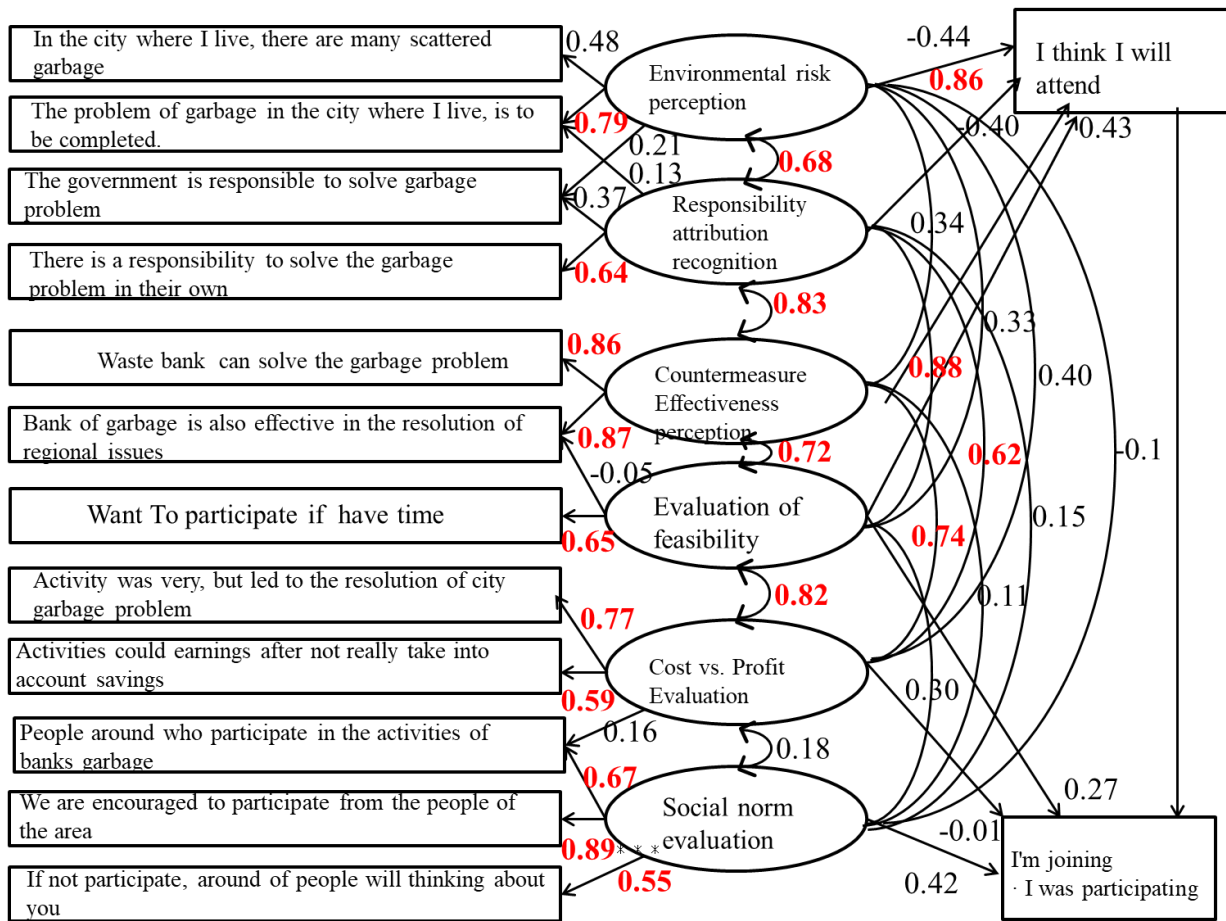
Table 3.15 Standardization coefficient and significance probability for non-participants

Standardization factor: (Overall - model number 1)				
Relationship between latent variables, observation variables, latent variables		Estimate	Significance probability	
I think I will attend	<--	Environmental risk perception	-0.483	**
I think I will attend	<--	Responsibility attribution recognition	0.926	*
I think I will attend	<--	Countermeasure Effectiveness perception	-0.563	*
I think I will attend	<--	Evaluation of feasibility	0.573	***
The garbage problem of the city in which I live should be solved	<--	Environmental risk perception	0.716	
Garbage is scattered in the city	<--	Environmental risk perception	0.471	***
I am also responsible for solving the garbage problem	<--	Responsibility attribution recognition	0.622	
The administration is responsible for solving garbage problems	<--	Responsibility attribution recognition	0.374	***
Garbage Bank is also effective for solving regional problems	<--	Countermeasure Effectiveness perception	0.818	
Garbage Bank can solve garbage problem	<--	Countermeasure Effectiveness perception	0.842	***
I will join if I have time	<--	Evaluation of feasibility	0.669	
Activity is not hard and you can save money in your account	<--	Cost vs. Profit Evaluation	0.643	
If you do not participate you will be concerned about the local eyes	<--	Social norm evaluation	0.563	
People in the area can recommend participation	<--	Social norm evaluation	0.882	***
People around are participating in garbage bank activities	<--	Social norm evaluation	0.646	***
I am participating - I was participating	<--	Cost vs. Profit Evaluation	-0.027	0.818
I am participating - I was participating	<--	Social norm evaluation	0.373	***
I am participating - I was participating	<--	I think I will attend	0.109	0.158
Activity is serious, but it leads to the solution of garbage problem in town	<--	Cost vs. Profit Evaluation	0.77	***
People around are participating in garbage bank activities	<--	Cost vs. Profit Evaluation	0.201	***
Garbage Bank is also effective for solving regional problems	<--	Evaluation of feasibility	-0.029	0.686
The administration is responsible for solving garbage problems	<--	Environmental risk perception	0.187	***
The garbage problem of the city in which I live should be solved	<--	Responsibility attribution recognition	0.175	**
I am participating - I was participating	<--	Evaluation of feasibility	0.332	0.052
Environmental risk perception	<-->	Responsibility attribution recognition	0.661	***
Responsibility attribution recognition	<-->	Countermeasure Effectiveness perception	0.862	***
Countermeasure Effectiveness perception	<-->	Evaluation of feasibility	0.722	***
Cost vs. Profit Evaluation	<-->	Social norm evaluation	0.29	***
Environmental risk perception	<-->	Countermeasure Effectiveness perception	0.305	***
Environmental risk perception	<-->	Evaluation of feasibility	0.377	***
Responsibility attribution recognition	<-->	Evaluation of feasibility	0.829	***
Environmental risk perception	<-->	Cost vs. Profit Evaluation	0.394	***
Environmental risk perception	<-->	Social norm evaluation	-0.027	0.453
Responsibility attribution recognition	<-->	Cost vs. Profit Evaluation	0.629	***
Responsibility attribution recognition	<-->	Social norm evaluation	0.143	***
Countermeasure Effectiveness perception	<-->	Cost vs. Profit Evaluation	0.702	***
Countermeasure Effectiveness perception	<-->	Social norm evaluation	0.176	***
Evaluation of feasibility	<-->	Social norm evaluation	0.341	***
Evaluation of feasibility	<-->	Cost vs. Profit Evaluation	0.849	***

* : p<0.05

** : p<0.01

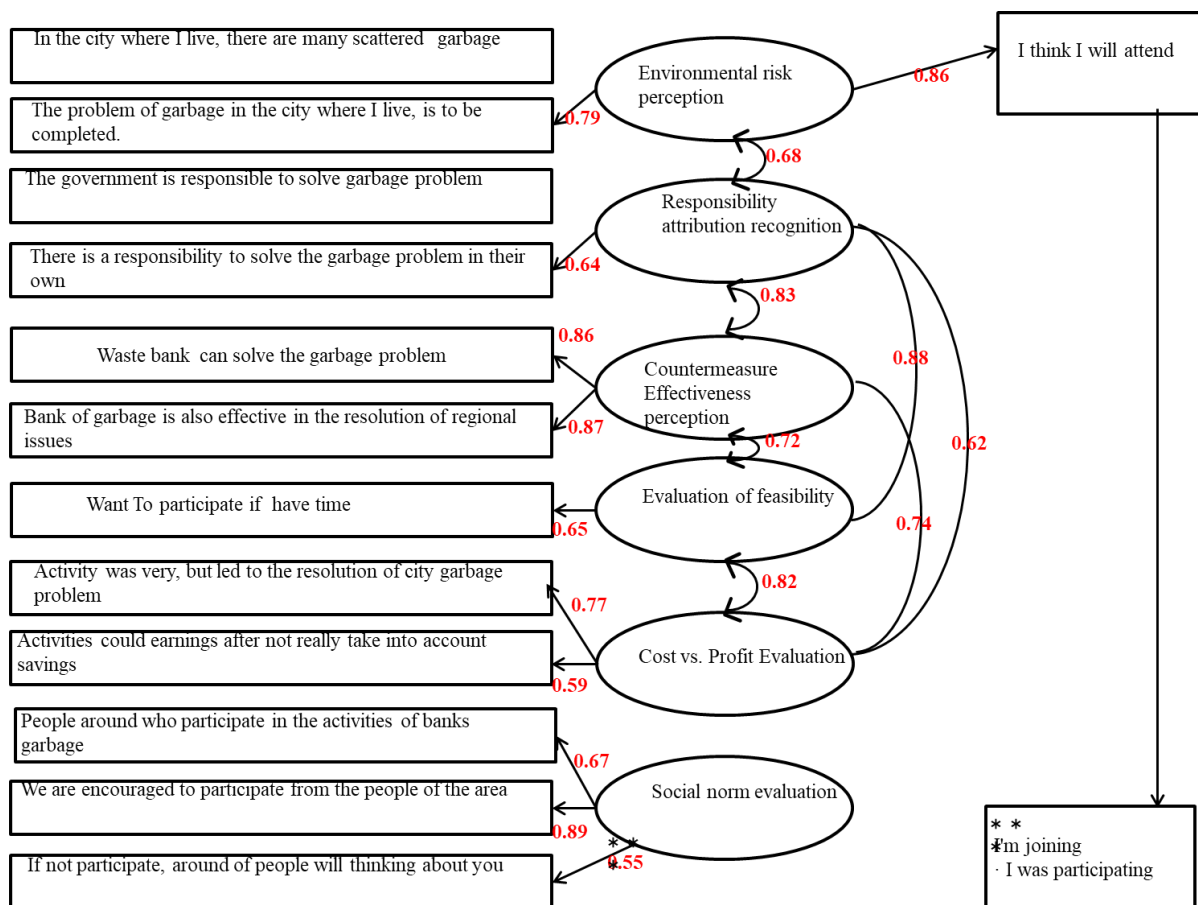
***p<0.001



Note: GFI: 0.985, AGFI: 0.969, CFI: 0.983, RMSEA: 0.038

* p <.10 ** p <.05, *** p <.01

Fig. 3.22 Participation factor model in non-participants



Note: GFI: 0.985, AGFI: 0.969, CFI: 0.983, RMSEA: 0.038

* p <.10 ** p <.05, *** p <.01

Fig. 3.23 Participation factor model in non-participants more than p<0.5

3.5.2 Covariance structure analysis

a. Develop model

Based on the result of the factor analysis, “intension to join waste bank” and considering formation structure, participation factor model is successfully developed for all samples (n = 1,495). Additional factor model is shown on the diagram. A line and an arrow at the model diagram represent relation between the cause and the effect. Curve arrow indicates occurrence of the relation. The model is quite clear, with statement “I will participate”, (furthermore called “this is perception on environmental risks” that creates “dynamic

intention”, ”Recognition of responsibility”, “effectiveness on solution”, “participation”. “Participate” (furthermore called “action”) form. What we perform is “action intention” and “feasibility evaluation”. “Cost evaluation versus personal benefit evaluation”, “Social norms evaluation”. There are four types for adaptation model, ie. GFI, AGFI, CFI, RMSEA

In general, considered indicators for GFI, AGFI, CFI is 0.9 or more and RMSEA is 0.05 or less. These indicators are considered good ⁷⁾. Indicators of this model as shown on the diagram are GFI 0.985, AGFI 0.969, CFI 0.983. RMSEA achieves an optimum value of 0.038. Therefore, adaptation level of the model is considered as good. In participation factor model, high significance of causal relation is statistically indicated by a bold line while low significance of causal relation is indicated by a dashed line. Here, focus is given on causal relation with high significance.

b. Analysis result for all samples

Table 3.14 shows normalization coefficient and significance probability. Figure 3.19 shows participation factor model in all samples and Fig. 3.20 shows participation factor model in all samples more than $p < 0.5$. Standardization factor for “action intention” is the highest. This is overall “Execution evaluation”. “I would like to participate if I have time”

Standardization factor for “behaviour” is the highest. “Social norms evaluation”, participation is the highest. Factors to feel response to norms and expectation of the surrounding community. In addition, from “action intention” to become “action” I would like to participate, as standardization factor. Only based on feeling that you cannot be related to the actual behaviour. And it becomes clear.

c. Analysis result of participants/non-participants

Table 3.12 shows standardization coefficient and significance probability of the participants.

In addition, Fig. 3.21 shows participation factor model of the participants. Standardization factor for "action intention" is very high due to "executable performance evaluation". Participants will participate if they have time, "I would like to participate if I have time". For "action", the reason of high standardization factor is "cost versus benefit evaluation". Participants, if personal interest results in big profit. I know how it feels to take action. Besides, from "action intention" to become "action". For the reason that standardization factor for "we would like to participate" is quite significant, it becomes clear that the feeling leads to the actual behaviour. Table 3.13 shows normalization coefficient and significance probability for non-participants. Fig. 3.21 shows participation factor model for non-participants. The fact shows that the high standardization factor for "action intention" belongs to "recognition of responsibility attribution". Non-participants understand the existence of waste issues. It was also found that they actually would like to participate in waste bank activities. If you commit to your promise, you know that you will participate. The reason for high standardization factor for "dynamic" is "Social norms evaluation". The most influencing participation factor of non-participants is such as effort to meet norms and expectation of the surrounding community. I understand that this has to be done. As well as "action intention". Because normalization (factor) for "behaviour" is not significant, non-participants feel that they would like to participate in real actions. It is clear that it will not happen.

3.6 Conclusion

This study examines how the communities play a role in managing their waste. There were many studies that stated the role of society in managing waste through waste banks is one of activities that can solve the waste problem. This study examines about what kind of society will be able to take part in the activities of waste banks and what kind of community consciousness that plays a role in the activities of waste bank. Areas where most people are

members of waste banks, will influence strongly to the other people in the same area to participate in waste banks. This enables a better membership system and improved awareness to make waste banks function better. In other words, the success of waste bank is closely related to participation of people in the community. The communities with high environmental knowledge, awareness and behavior are the ones who will participate in the environmental-related activities, especially in waste management and becoming members of waste banks.

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Chapter 4

Chapter 4. Analysis on the Appropriate Model of A Community-Based Waste Management: Case of Rural Area in Karang Joang Village, Balikpapan, Indonesia

4.1. Introduction

Karang Joang is one of an attractive village in the Balikpapan City, East Kalimantan. The village has some leisure areas for domestic tourists. Manggar Dam, which is located in the village, also attracts people with its natural environment. The dam was constructed by the Indonesian Government Public Works in 2004 to store raw water for drinking water of Balikpapan City citizens. Nowadays, many communities visit the place to have leisure activities, such as fishing, off-road cycling, camping, etc (www.balikpapanguide.com, access Jun 9, 2016). As a tourist destination, the Karang Joang village needs to preserve the environment, including in managing the generated solid waste.

Until today, the Karang Joang's community behavior of handling the solid waste is still using the old paradigm. To make it worse, the habit of burning the garbage is still conducted by the community. It was stimulate by the pilling up waste which was uncollected and not transported to the final disposal. The solid waste handling is understood as an inconvenience burden for the people. Therefore it is needed to formulate an attractive program of solid waste handling for the community. This study was conducted to obtain the most appropriate model of a community-based waste management of Karang Joang Village. Community-based participatory research (CBPR) engages the multiple stakeholders, including the public and community providers, who affect and are affected by a problem of concern (Horowitz, et al, 2009).

Several methods have been applied in other cities in Indonesia to overcome the domestic solid waste problem. One of popular method is *biopori* holes. In addressing the problem of

household organic waste, biopori holes can be one solution processing of organic waste that is effective and efficient and provide a better return for the hosts, and the environment (<http://digilib.polban.ac.id>). Other methods that have been applied in domestic solid waste management are Takakura and Waste Bank Methods. This study is aimed to find out the most appropriate model in order to solve problem concerning the domestic solid waste management in the Karang Joang Village considering the community power and effort.

4.2. Profile Karang Joang Village

The Karang Joang Village is located in the east part of Kalimantan Island. Fig. 1 shows a map of Indonesia and the arrow is pointing the location of Karang Joang Village. The village is situated close to Balikpapan City. Fig. 4.1 shows the map of the surrounding of Balikpapan City, whereas the shaded area shows the Karang Joang Village administration border.

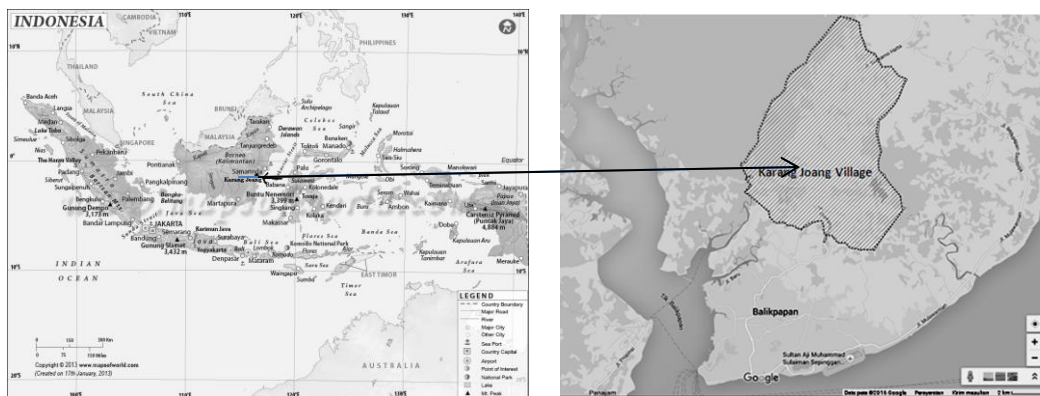


Fig. 4.1 Map of Indonesia and the Karang Joang Village (<http://www.mapsofworld.com>)

4.2.1 Community-Based Waste Management

In the data retrieval conducted in this Karang joang village, conducted activity was carried out to find out the people lifestyle living near the dam. Questionnaires were distributed to 500 respondents living in 12 sub-villages near the river. The questionnaire consists of material flow analysis (MFA), asking on the resident environmental awareness for their current

behavior and their future potential behavior towards the waste handling. The specific waste for this research was solid waste generated by kitchen activities. This activity was performed to 5 housewives to have description of the usual daily shopping items of the community. Beside, the interview was conducted to explore the garbage generated daily from the households. Direct interview was also performed to an owner of a small grocery store who sells his products for the community. A workshop was carried out to respond the results of the questionnaire. This workshop provide knowledge to the community concerning waste handling and recycling, including the government policies on the waste management. The community was introduced by several potential method of waste processing such as composting methods (*Takakura* and *Biopori*), waste bank, etc. The results of questionnaire, interview and workshop activities were then being analyzed using SWOT method. This type of analysis attempts to figure out all possibilities that exist in that village involving the strength, the weakness, the opportunity and the threat. All those factors will be summarized and analyzed in order to find out the solution for this case. Formulation of the most potential and suitable waste management was then being performed based on the SWOT analysis results.

From the distributed questionnaires, it was found that almost 50% people of Karang Joang have income between IDR 1,000,000 to IDR 2,000,000. According to the Balikpapan Government, the minimum wage is approximately IDR 2,100,000. The average of family income can be categorized as middle to lower income. The questionnaire also shows that 90% of respondent were housewives with the average education level is elementary school.

Total amount of garbage generated by the community of Karang Joang was 250-300 gram/day/ family, with a composition of 60% of organic and 40% non-organic. Figure 3 shows the result of questionnaire on the behavior of the community in handling the kitchen waste. It indicates that approximately 48% of the Karang Joang people do the waste separation

processes to sort organic and non-organic domestic waste.

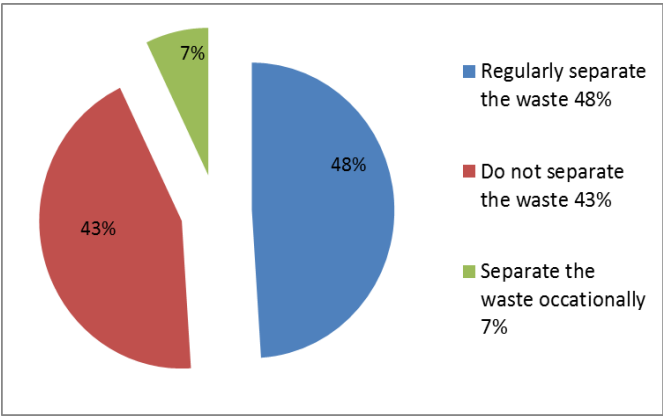


Fig. 4.2 The percentage of kitchen waste treatment by the Karang Joang community.

The proper treatment of the kitchen waste was not conducted by the Karang Joang Village community. The 3R concept application was quite low where only 48% of the communities do the separation waste. Fig. 4 shows the further handling of the kitchen waste by the community. It indicates that most of the people of Karang Joang burn the waste. This method was their habit that passing down from generation to generation.

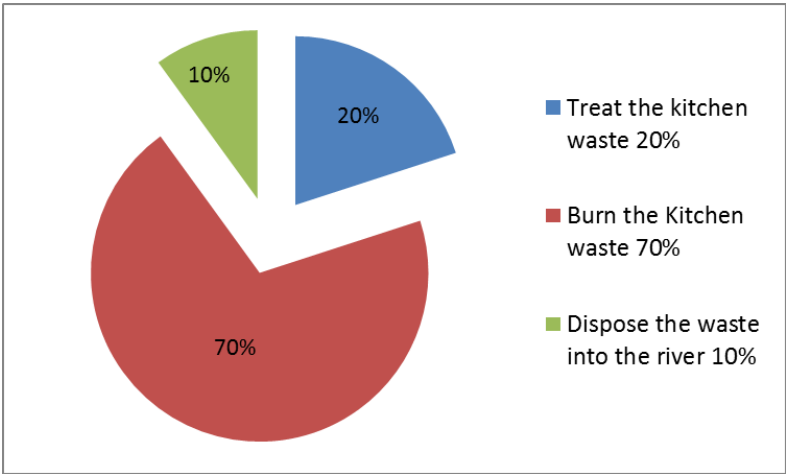


Fig. 4.3 Percentage of Karang Joang community in handling the kitchen waste.

Composting treatment of the kitchen waste was performed by only 24% of the community. It can be seen from the Fig. 4.4 The community did not have habit on composting their organic waste.

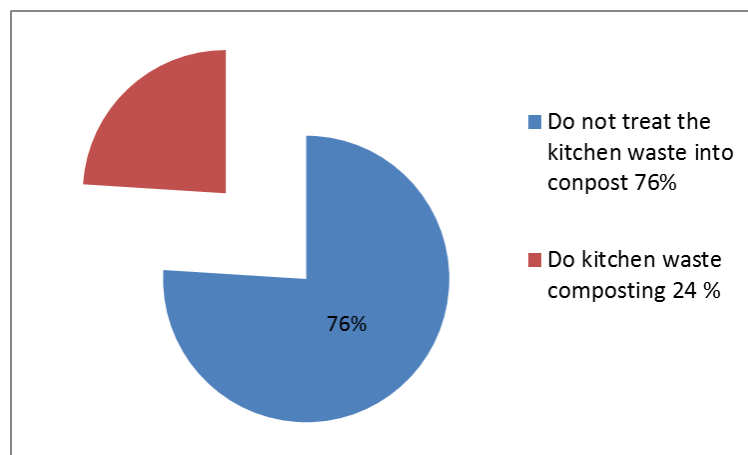


Fig.4.4 Percentage of composting process by Karang Joang community for their kitchen waste.

a. Workshop Environmental Education for Community

Several findings from workshop activity are: The community has the will to separate the waste into organic waste and inorganic, which will be further managed. The organic waste will be treated into compost and the inorganic waste will be traded in a Waste Bank. The waste bank is mainly addressed to motivate the community to separate the waste, give the reward for efforts in separating, and collecting waste in form of monetary instrument (Purba, et. al., 2014). There is a plastic waste treatment process by one of the Karang Joang Village community being operated since 2011. The process includes collection and pressing. The pressed plastics were then being transported and traded to the next treatment agency. This plastic waste business was relatively undeveloped due to lack of management and raw material. Government support for the community was apparently quite low. Several findings from workshop activity are: The community has the will to separate the waste into organic

waste and inorganic, which will be further managed the Fig. 4.5 workshop environmental education for community.



Fig. 4.5 workshop environmental education for community.

b. SWOT Analysis community.

SWOT analysis has its origins in the 1960 which is a simple yet useful planning tool to understand the 'Strengths', 'Weaknesses', 'Opportunities', and 'Threats' as part of a strategic planning process (Hong, et.al, 2010). When applied to ecosystem services and its associated research fields, Strengths can be considered to be those features of the ecosystem services concept that underpin the ability of the concept and the field to achieve the implicit goals of (Bull, et. al. 2016):

- a) increasing awareness of the extent to which human societies interact with and are dependent upon the environment.

- b) better integrating the natural and social sciences and engaging and acknowledging stakeholder knowledge.
- c) greater understanding of the impacts of environmental change and environmental policy on human wellbeing.
- d) contributing towards achievement of sustainable relationships between human society and ecosystems.

The Figure 4.6 shows each component of the SWOT diagram concerning the domestic waste management in Karang Joang Village. This diagram will be used to formulate strategies connected between Strength and Opportunity (S-O), Weakness and Opportunity (W-O), Strength and Thread (S-T), Weakness and Thread (W-T).

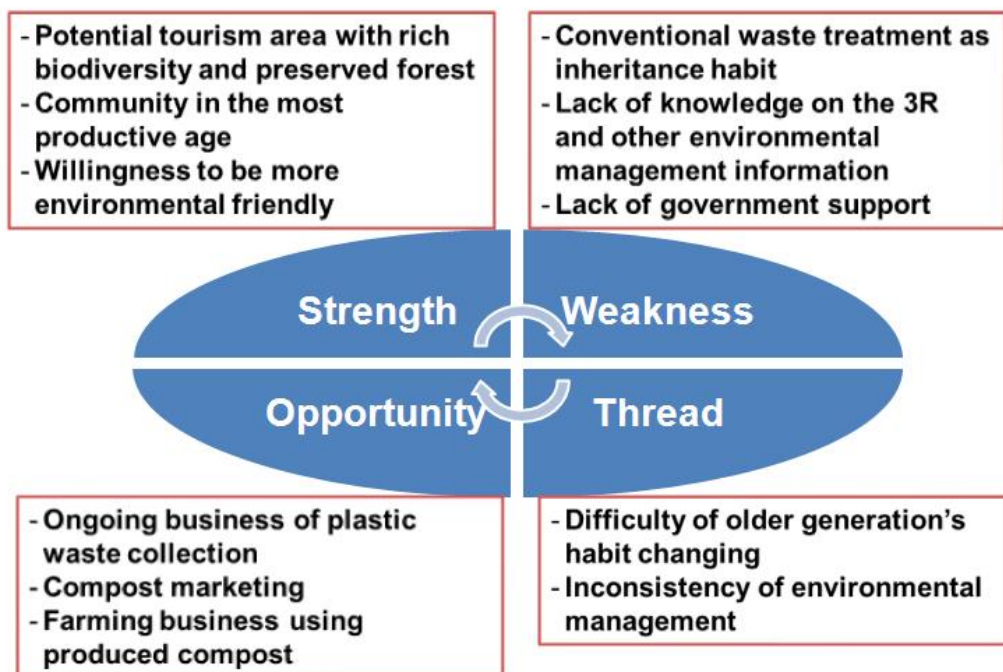


Fig. 4.6 SWOT Analysis of Karang Joang Village

Table 4.1 Strategic plan of S-O, W-O, S-T, and W-T

Components	Strategy
S-O	Improvement of the tourism area quality
	Enrich the business type to support tourism activity
	Starting the profit oriented waste management activities (waste bank, compost production, plant and nursery business)
W-O	Workshops to upgrade business and technical skill (<i>biopori</i> method, <i>Takakura</i> method, etc.)
	Business matching to open product market
S-T	Involvement of key persons in environmental events and programs
	Assistantship by the experts or volunteers
W-T	Continuous environmental education
	Periodic events of environmental program

c. The Appropriate Model of A Community-Based Waste Management

Based on the previous stages of the research, it can be formulate that some potential methods may be applied in the Karang Joang Village as the domestic solid waste management.

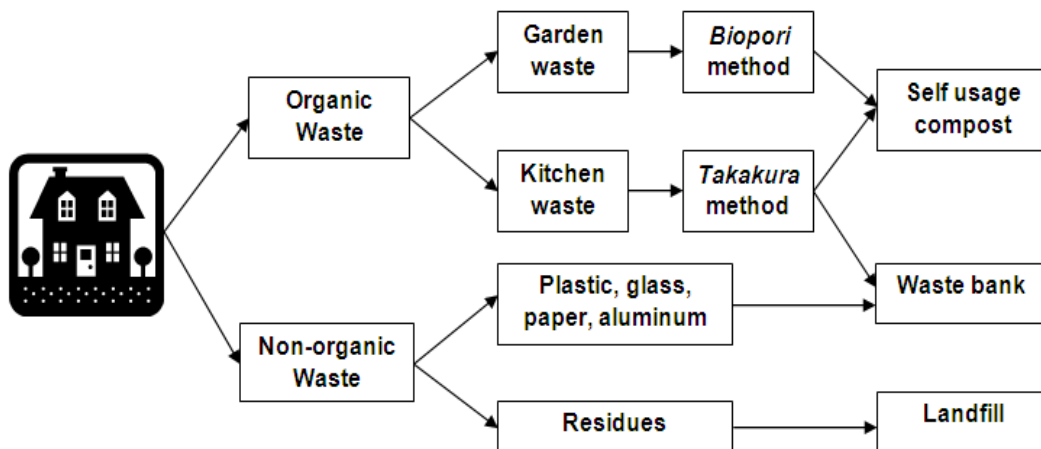


Fig. 4.7 The proposed flow of the Karang Joang Village solid waste treatment and handling.

By analyzing all aspects, the most appropriate activities to be applied in the Karang Joang Village are as follow: Operating a village-scale waste bank, treating the organic waste using the Takakura and Biopori methods to produce compost, recycling plastic waste into plastic pellets using shredder.

The Karang Joang Village community is still applying conventional method in handling the domestic waste. As low as 48% separate the waste into organic and non-organic waste and most of them burn the waste or dispose into the river without any prior treatment. Questionnaire result shows that although the 3R practice was quite low, the will of the community to be more environmental friendly was increasing. Total amount of waste generated by each household was as much as 250-300 gram/day which indicate a good opportunity and potency to have further treatment. The most appropriate model is 3R concept with composting process for the organic waste and professional waste bank operation for the non-organic waste, all conducted and organized by the community of Karang Joang Village.

4.3 Conclusion

The Karang Joang Village community is still applying conventional method in handling the domestic waste. As low as 48% separate the waste into organic and non-organic waste and most of them burn the waste or dispose into the river without any prior treatment. Questionnaire result shows that although the 3R practice was quite low, the will of the community to be more environmental friendly was increasing. Total amount of waste generated by each household was as much as 250-300 gram/day which indicate a good opportunity and potency to have further treatment. The most appropriate model is 3R concept with composting process for the organic waste and professional waste bank operation for the non-organic waste, all conducted and organized by the community of Karang Joang Village.

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Chapter 5

Chapter 5. PBL Method Under the Environmental Education in Indonesia Analysing the Influence of PBL Method into the Knowledge Attitude and Behavior Aspects

5.1. Introduction

The purpose of this chapter is to clarify the effectiveness of trial of environmental education program based on PBL to teachers and children of elementary schools in multiple cities in Indonesia and to compare before and after program implementation for a certain period of time. From the results of the questionnaire survey conducted for elementary school students, we analyze the relationships among the three items of environmental knowledge, consciousness, and behavior. This will clarify the effectiveness and limit of the environmental education program used this time, and can extract its universal value and improvement point.

One of the keys to success is by implementation of environmental education in all elementary schools in the city. In implementation of the environmental education, the Ministry of Education provides worksheet called “Midori no Noto”, which is distributed to students to be filled during their summer vacations. Accordingly, the next study applied Environmental Education Worksheet “Midori no Noto” used in Kitakyushu, with Problem-Based Learning (PBL) Method.

The success of Kitakyushu in educating the people through formal education becomes inspiration for educational environment in Indonesia and the method is then applied in Indonesia. In order to find out whether application of “Midori no Noto” worksheet with PBL method can improve students’ knowledge, awareness and behaviour in environment, a test was performed in 18 elementary schools in 6 big cities in Indonesia.

5.2. Research Method

5.2.1 Procedure of PBL Trial

In conducting actual classes, it is important to consider activities and flows in each process. The flow of PBL lessons is divided into 5 stages ①-⑤ and shown in Figure 1. The problem presentation in ① is cast to the whole class, but after that ② and ③ are carried out by individuals and groups on a student basis. Therefore, the role of the teacher after ② will teach each student and group as progressors so that these activities can be carried out smoothly. In the ④ announcement and the ⑤ review, management of the entire class will be conducted again. In this trial use "Catatan Lingkunganku" as worksheets and handbooks for teachers. This book adapts from the system "Midori no noto" in kitakyushu, but tailored with the conditions in Indonesia.

5.2.2 Trial and Verification Method of Environmental Education Program

Survey Summary

The surveyed cities are three cities; Bandung, Malang and Batu. At the elementary schools in each city, we implemented the environmental education program prepared by us, in one semester (about 6 months), excluding day off, from November 2015 to June 2016. The effect was verified by conducting questionnaire survey before and after the trial. The questionnaire before the trial was done in October 2015, and the questionnaire after the enforcement was done in August 2016. The outline of the survey target cities is shown in Table 2 ^{7), 8), 9)}.

Classification Method of Comparison Target Group

Before implementing the environmental education program, WS (workshop) was held for teachers and children. We held WS of teaching method for teachers and WS of environmental

education for children, respectively, for 3-4 hours in October 2015, by using these supplementary readers Fig. 5.1 created by us.

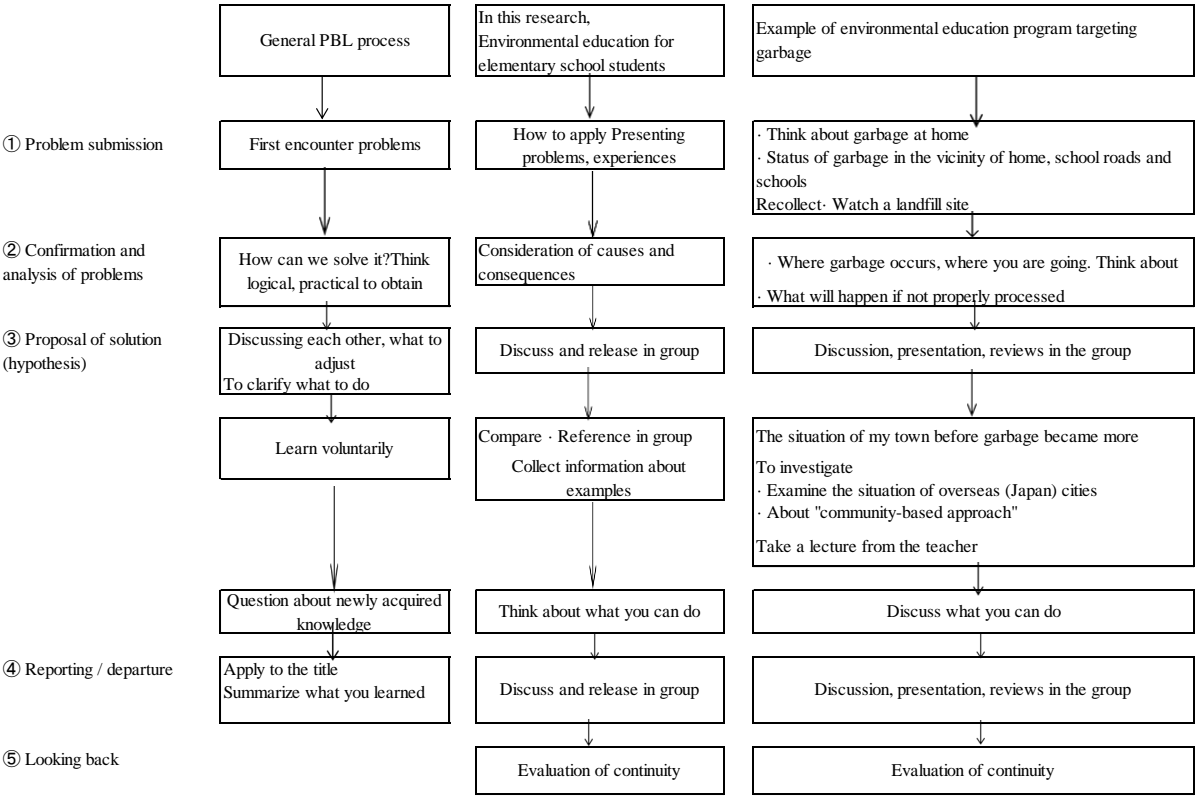


Fig. 5.1 Class flow in PBL

Table 5.1 Outline of Survey Target City

	Bandung City	Malang City	Batu City
Area	167,3 Km ²	252,1Km ²	202,3Km ²
Total Popilation	2,490,622	850,000	258,000

Table 5.2 Schedule of PBL method for elementary school

No	Activity	Month 1	Month 2	Month 3	Month 4	Month 5
1	Explanation of teacher's environmental education PBL program					
	1. Group A	■				
	2. Group B	■				
	3. Group C	■				
2	Environmental education PBL workshop					
	A. Pretest questionnaire	■				
	Teacher and Student Workshop		■			
	B. Pretest questionnaire	■				
	Teacher's workshop		■			
	C. Pretest questionnaire	■				
3	D. Explain information dissemination and test activities		■			
	Monitoring program					
	Greeting		■			
	Find garbage			■		
	Preparation			■		
	Picture-story show				■	
	Preparation				■	
	Announcement					■
	Preparation					■
	Recycling					■
	Preparation					■
	Bingo game					■
	Preparation					■
	compost					■
	Preparation					■
4	Living and using water					■
	Posttest Questionnaire Group A.B.C					■
	Interview for teachers					■

Table 5.3 Schedule of PBL one day workshop for elementary school

Time	Contents	Activity	Place
07:00-08:00	Pretest Questionner	Survey response	Classroom
08:00-08:15	Preparation and explanation	Explanation of the program	Classroom
08:15-09:00	Find garbage	Mapping garbage around the school	Outside
09:00-09:15	Preparation and explanation		Classroom
09:15-10:00	Kamishibai	Create a story using picture-story	Classroom
10:00-10:15	Preparation and explanation		Classroom
10:15-11:00	Announcement	Presentation	Classroom
11:00-11:15	Preparation and explanation		Classroom
11:15-12:00	Recycling	Recycling problem	Classroom
12:00-13:00	Break		Classroom
13:00-13:15	Preparation and explanation		Classroom
13:15-14:00	Bingo game	Using games, creatures that are rivers	Classroom
14:00-14:15	Preparation and explanation		Classroom
14:15-15:00	Compost	How to make and use	Classroom
15:00-15:15	Preparation and explanation		Classroom
15:15-16:00	Living and using water	use water in one day. Calculate used water	Classroom

In order to clarify whether WS is effective for teachers and children, we implemented the environmental education program and categorized the schools of each city into three groups A, B and C. Table 5.4 shows the classification of surveyed elementary school in each city.

Table 5.4 Classification of surveyed elementary school

City	Name of Elementary School	Student	Teacher	EE	Group	Implementation of WS	
				Study time / week		Student	Teacher
Bandung	Dayeuh Kolot 7 Elementary School	55	3	2	A	○	○
	Dayeuh Kolot 2 Elementary School	54	3	2	A	○	○
	Dayeuh Kolot 5 Elementary School	57	3	2	B	X	○
	Dayeuh Kolot 14 Elementary School	48	3	2	C	X	X
Malang	Polean 5 Elementary school	28	2	2	A	○	○
	Purwanto 7 Elementary school	31	2	2	B	X	○
	Purwanto 5 Elementary school	20	1	2	C	X	X
Batu	Pendem 1 Elementary school	26	1	2	A	○	○
	Telekung Elementary school	23	1	2	B	X	○
	Tolongrejo elementary school	14	1	2	C	X	X

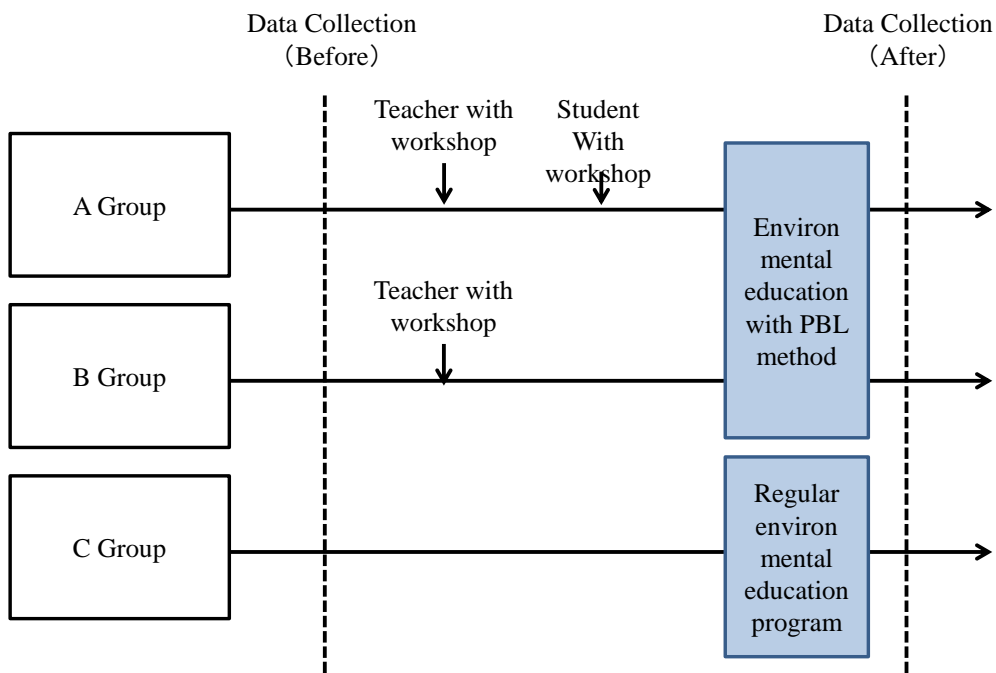


Fig. 5.2 Flow of survey method in A, B, C

Next, the flow of the investigation method in A, B, C is shown in Fig. 5.2 A conducted WS for teaching methods targeting teachers and environmental education workshop for students, and then implemented a program for six months. B held only the workshop targeted to teachers and implemented the program for six months thereafter. C did not hold workshop for both the teachers and students, only the program was carried out.





Fig. 5.3 PBL Workshop Activity in Bandung city

Table 5.5 Question contents in the item of knowledge

No	Question
1	Currently we are facing serious environmental damage issues
2	Ecosystem damages occur in many forests in Indonesia
3	Many of natural disasters happen as results of environmental damages
4	Waste consists of organic and inorganic waste
5	It takes a long time for inorganic waste to decompose
6	Plastic, metal and paper waste can be used as industrial raw materials
7	Food, vegetable, fruit scraps are organic waste that can produce unpleasant smell
8	Composting requires 1-2 weeks of process and it also requires covered baskets
9	Inorganic waste can be used for handicrafts, such as bags, pencil cases and tablecloths
10	Reduce means cut back on the amount of waste we produce
11	Reuse means find a new way to use waste
12	Recycle means use trash to remake new goods that can be used or sold again
13	Water is the primary needs of all living organisms
14	Water pollution is contamination of water by substances, energy or other components which causes declining water quality
15	Wastewater is disposed waste from toilets, clothes dishwater and dishwasher
16	Wastewater shall not be disposed directly to rivers
17	Domestic wastewater can be disposed to backyards
18	Domestic wastewater shall be processed prior to disposal to rivers
19	Water pollution causes unbalanced ecosystem of rivers or lakes
20	One of the causes of floods is high volume of waste in rivers
21	Organic and inorganic solid waste is one of the causes of river pollution
22	Water quality can be monitored by observing physical, chemical and biological condition of the water
23	Water can be used for irrigation and Hydroelectric Power Plant (HEPP)
24	Benthic macroinvertebrate is one of the organisms that is often used for monitoring water quality
25	Declining water quality is indicated by changes in the odor and colour

Question Summary

Questionnaires were prepared with three items: environmental knowledge, consciousness, and behavior. The numbers of questionnaire are 25 questions, 17 questions, and 15 questions in knowledge, awareness, and behavior respectively. The contents of question in the item of knowledge are shown in Table 4. The choices are three stages: (1) correct, (2) wrong, and (3) do not know. Next, the contents of question in the item of awareness are shown in Table 5. The choices are 5 stages: (1) I think so, (2) I agree a little, (3) neither, (4) I do not think so, and (5) I do not think so at all. And next, the contents of question in the item of behavior/action are shown in Table 5.5. The choices are three stages: (1) Yes, (2) No, and (3) Sometimes.

Table 5.6 Question contents in the item of awareness

No	Question
1	I deeply concern about our damaged environment
2	I feel reluctant to do sorting of organic and inorganic waste
3	I will feel offended if someone litters at my yard and in my neighbourhood
4	I get used to dispose organic waste everywhere
5	I am interested in learning how to make compost
6	I do not have any interest in learning how to plant flowers using compost
7	I am willing to start waste sorting
8	I prefer to buy my daily needs in refill packages
9	I feel reluctant to spend my time making bags out of rags or unused fabric
10	I am not willing to ask my parents and friends to become waste bank members
11	I like to use water wisely
12	It is not my responsibility to save rivers
13	I am really interested in learning how to treat wastewater so that it will not pollute rivers
14	I feel comfortable disposing wastewater to my backyard
15	It is my responsibility to save rivers
16	I would feel guilty for disposing waste to rivers and the surroundings
17	I do not feel the necessity for me to monitor rivers in my neighbourhood

Table 5.7 Question contents in the item of behavior

No	Question
1	I always keep my neighbourhood clean
2	I use paper wisely as my contribution to forest preservation
3	I always do waste sorting of organic and inorganic waste
4	I get used to cleaning my yards
5	I can make compost from organic waste
6	I plant flowers using compost and used bottles as the media
7	I am willing to be a member of a waste bank in my neighbourhood
8	I always bring my own shopping bag to stores or supermarkets
9	I use recycled products
10	I always take part in environment-related activities if I have time
11	I never use water unwisely
12	I always save rivers from pollution
13	To keep my neighbourhood clean, I never dispose wastewater to my backyard
14	I never dispose waste to rivers so that I will not cause damage to the river ecosystem balance
15	I often observe rivers to see the impact of wastewater disposal to our lives

5.3. Analysis method and verification result

5.3.1 Crosstabulation

In order to make a comparison before and after the effect of trying the environmental education program, cross-tabulation was carried out by groups A, B, C using the results of the questionnaire survey. As an example, Fig. 5.2 shows the result of cross tabulation on No.13 of (cies) arranged in the column. Normally, the χ^2 test is onsciousness item, "I am interested in learning how to filter wastewater so as not to contaminate river."

Both A and B show that the proportion of respondents who answered "I think so" after the implementation increases as compared with before the implementation. Furthermore, if the answer of "I agree a little" is included, the change before and after implementation can be saw more conspicuously. However, C shows that there is not much change before and after implementation. We conduct such cross tabulation at all questions and examine whether there is a significant difference between A, B and C using Wilcoxon's rank sum test.

Water is the primary needs of all living organisms

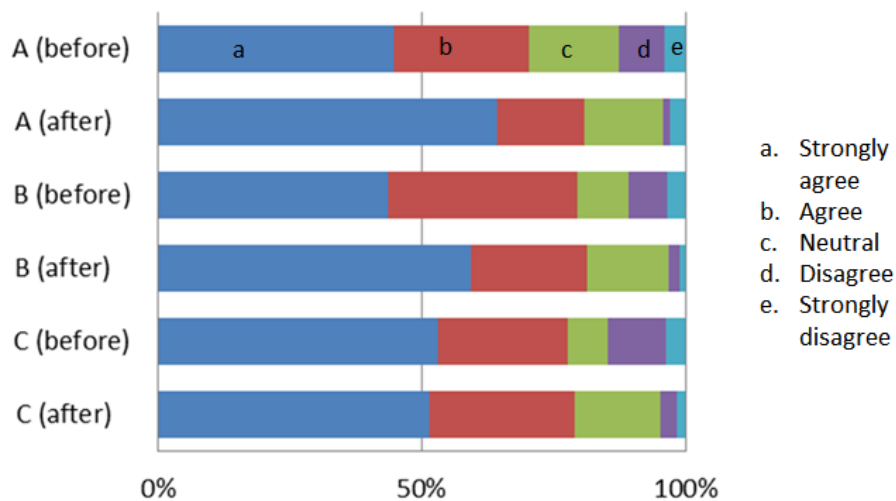


Fig. 5.2 Cross-tabulation result of Q no.13 of awareness item

5.3.2 Wilcoxon rank sum test

First, division table are prepared in which there is an order that the satisfaction level is higher for the right column between the options (categorapplied to the test of the contingency table. However, in the case of partitioned tables with ordered categories, the χ^2 test that ignores the order information is not valid. In such a case, Wilcoxon rank sum test is effective.

Wilcoxon rank sum test in group comparison

Group comparison between A, B and C was conducted using Wilcoxon's rank sum test. The greater number of (*), it is result with more significant difference. Colors were given to the question with a significant difference.

First, the results of inter-group comparison in the item of knowledge are shown in Table-7. In the item of knowledge, there were significant differences in questions in related to garbage reduction, drainage methods, and the nature of water. Next, table 5.8 shows the results of inter-group comparison in the item of awareness. In the item of awareness, there were

significant differences in questions such as separation of garbage, water conservation, and drainage method and so on. Finally, Table 5.8 shows the results of inter-group comparison in behavior items. In the items of behavior, significant differences were found in questions such as separation of garbage, use of garbage and drainage methods.

5.4. Relevance of question

Fig. 5.3 shows the relevance of the questionnaire. Coloring was given to questions that showed significant differences, and bold lines showed relevant questions. As a result, the following questions were related to knowledge, awareness and behavior.

*. Separation of waste/garbage

Knowledge 5 - Awareness 2 - Behavior 3

Knowledge 5 "Inorganic waste is not rapidly decomposed".

Awareness 2 "I neglect to separate organic waste and inorganic waste".

Action 3 "I will separate organic waste and inorganic waste".

Awareness 3 - Behavior 4

Awareness 3 "I will angry if there are people who throw away garbage around the garden and the house".

Behavior 4 "I have a habit of cleaning my garden".

*. Reduction of Waste

Knowledge 10 - Awareness 8

Knowledge 10 "Reduce means to reduction of waste".

Awareness 8 "I am buying refillable packaging for daily necessities".

Knowledge 11 - Awareness 8

Knowledge 11 "Reuse means reusing used products".

Awareness 8 "I am buying refillable packaging for daily necessities".

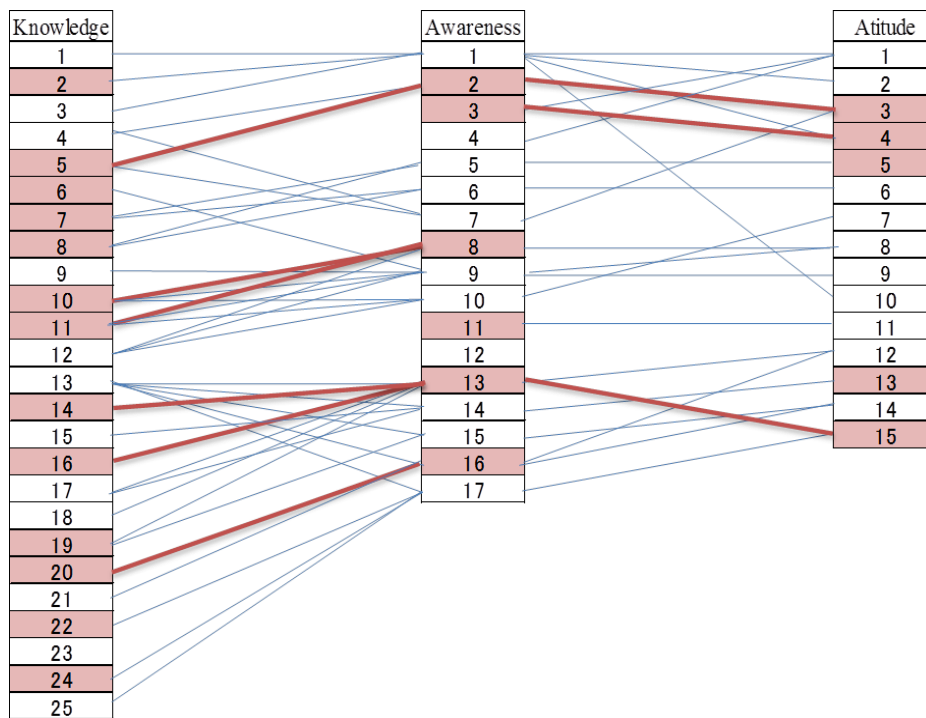


Fig. 5.3 Relevance of question

***. Pollution of wastewater**

Knowledge 14 - Awareness 13 - Behavior 15

Knowledge 14 "Water pollution is the contamination of substances, energy, and other components that cause a decline in water quality".

Awareness 13 "I am interested in learning how to filter wastewater so as not to contaminate the river".

Behavior 15 "I often observe the river to see the impact of wastewater management on life".

Knowledge 16 - Awareness 13 - Behavior 15

Knowledge 16 "Wastewater should not be discharged directly to the river".

Awareness 13 "I am interested in learning how to filter wastewater so as not to contaminate the river".

Behavior 15 "I often observe the river to see the impact of wastewater management on life".

*. Dumping waste to the river

Knowledge 20 - Consciousness 16.

Knowledge 20 "One of the causes of the flood is many garbage in the river".

Consciousness 16 "I feel that throwing away garbage in the river and its surroundings is incorrect".

Table 5.8 Result of inter group comparison in the item of knowledge

No.	Group A	Group B	Group C
1	***	**	*
2	****	***	***
3	****	****	**
4	****	****	****
5	**	*	*
6	***	**	**
7	****	****	****
8	**	*	*
9	***	***	**
10	****	*	*
11	***	*	*
12	***	**	*
13	****	****	***
14	**	**	*
15	***	***	**
16	****	***	***
17	**	*	*
18	**	*	*
19	***	***	**
20	****	****	***
21	**	***	**
22	**	*	*
23	****	****	***
24	**	**	*
25	****	****	***

Q1: 1.6463E-21, Q2: 9.6877E-13, Q3: 8.7362E-08

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.9 Result of inter group comparison in the item of awareness

No.	Group A	Group B	Group C
	1	***	***
	2	*	*
A	3	**	*
w	4	*	*
a	5	***	**
r	6	*	*
e	7	***	**
n	8	**	*
e	9	*	*
s	10	*	*
s	11	***	***
	12	*	*
	13	***	**
	14	*	*
	15	***	*
	16	***	**
	17	*	*

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= ****

Table 5.10 Result of Inter group comparison in the item of behavior

No.	Group A	Group B	Group C
B e h a v i o r	1	***	**
	2	*	*
	3	*	*
	4	***	**
	5	**	***
	6	*	*
	7	**	*
	8	*	*
	9	*	*
	10	**	*
	11	***	***
	12	**	**
	13	**	*
	14	***	**
	15	*	*

Q1: 1.564E-10, Q2: 8.401E-06, Q3: 6.253E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

5.4.1. Wilcoxon Rank Sum Test in Inter-city Comparison

Although WS being implemented for both the teacher and the students in group A, there was no notable significant difference in terms of awareness and behavior compared to group B and group C. Therefore, we conducted inter-city comparisons on Bandung City, Malang City and Batu City by using the survey results only for Group A. Similarly, Wilcoxon's rank sum test was used for the analysis method. The greater number of (*), it is result with more significant difference. Coloring is given to questions with significant difference. First, the results of inter-city comparison in the item of knowledge are shown in Table-10. In the item of knowledge, Bandung City and Malang City have significant differences, but Batu City has a significant difference in almost all questions. Next, the results of inter-city comparison in the item of awareness are shown in Table 5.12. In the item of awareness, Bandung City was significant difference in garbage related question, and Malang city was significant difference in water related questions. Finally, Table 5.13 shows the results of inter-city comparison in behavior items. In the item of behavior, Bandung City was significant difference in garbage related question, and Malang City was significant difference in water related questions, as well as items of awareness.

Table 5.11 Result of Bandung City group comparison in the item of knowledge

Bandung					
No.	Group A-1	Group A-2	Group B	Group C	
K n o w l e d g e	A1	***	***	**	**
	A2	***	***	**	**
	A3	****	***	***	**
	A4	****	****	***	***
	A5	**	*	#	#
	A6	**	***	*	*
	A7	****	****	***	***
	A8	**	*	*	#
	A9	**	**	*	*
	A10	***	****	**	*
	A11	**	**	*	*
	A12	**	**	*	*
	A13	****	****	****	**
	A14	**	*	**	*
	A15	**	***	*	*
	A16	***	***	***	**
	A17	*	*	*	*
	A18	**	**	*	#
	A19	**	**	**	*
	A20	****	****	****	***
	A21	*	*	**	*
	A22	*	**	**	*
	A23	***	***	****	**
	A24	*	*	*	#
	A25	**	**	***	***

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Group A1 and A2 in Bandung have the significant difference value. Group B and C tend to be small difference. Bandung is a city that requires environmental education lessons from departement of education. From the interview result, group A1 is a school whose position is near to the river. Therefore in the environmental education lessons, many are taught about river, garbage and river function. In the awareness and behavior section there seems to be no change.

Table 5.12 Result of Bandung City group comparison in the item of awareness

Bandung

No.	Group A-1	Group A-2	Group B	Group C	
A w a r e n s s	B1	***	***	**	***
	B2	*	*	#	#
	B3	**	**	**	*
	B4	*	*	#	#
	B5	***	**	**	*
	B6	*	#	#	#
	B7	**	**	**	*
	B8	*	*	*	#
	B9	#	*	#	#
	B10	#	*	#	#
	B11	***	***	**	**
	B12	*	*	#	#
	B13	**	**	**	*
	B14	#	#	#	#
	B15	**	**	**	*
	B16	***	**	**	*
	B17	****	*	*	#

Q1: 4.2306E-08, Q2: 1.4793E-05, Q3: 4.8625E-04

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.13 Result of Bandung City group comparison in the item of behavior

Bandung

No.	Group A-1	Group A-2	Group B	Group C	
B e h a v i o r	C1	***	**	**	*
	C2	**	*	*	#
	C3	**	*	*	#
	C4	***	**	**	*
	C5	*	*	**	*
	C6	*	*	#	#
	C7	**	**	*	#
	C8	*	*	#	#
	C9	*	*	*	#
	C10	**	*	*	#
	C11	**	**	**	**
	C12	**	**	*	*
	C13	*	**	*	*
	C14	***	**	**	*
	C15	*	*	****	****

Q1: 1.3492E-07, Q2: 1.1021E-05 Q3: 1.2290E-03

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.14 Result of Malang City-group comparison in the tem of knowledge

Malang				
	No.	Group A	Group B	Group C
K n o w l e d g e	A1	b	d	**
	A2	***	****	**
	A3	**	****	**
	A4	***	****	****
	A5	*	**	***
	A6	***	****	****
	A7	****	****	****
	A8	*	*	**
	A9	***	****	***
	A10	***	****	*
	A11	***	*	*
	A12	****	***	*
	A13	****	****	****
	A14	*	***	***
	A15	**	****	**
	A16	**	****	****
	A17	*	***	*
	A18	*	****	**
	A19	**	****	***
	A20	***	****	***
	A21	*	****	**
	A22	*	*	**
	A23	****	****	****
	A24	**	**	*
	A25	**	****	****

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

In Malang City, the comparison between group A, B and group C is comparable. Does not show much difference. The city of Malang has a program of all schools to be Adiwiyata school. Therefore, the government participates in managing activities related to adiwiyata. All teachers are equipped with the ability to teach environmental education. In the awareness and behavior section, group A has a not difference, but group B and C are visible changes.

Table 5.15 Result of Malang City -group comparison in the item of awareness

Malang				
No.		Group A	Group B	Group C
A w a r e n s e s s	B1	**	***	***
	B2	*	*	*
	B3	*	***	**
	B4	*	*	*
	B5	*	****	***
	B6	*	**	*
	B7	*	***	**
	B8	*	**	**
	B9	#	**	*
	B10	*	*	*
	B11	**	****	***
	B12	*	**	*
	B13	**	***	***
	B14	*	*	*
	B15	*	**	*
	B16	**	**	**
	B17	*	*	*

Q1: 1.3492E-07, Q2: 1.1021E-05, Q3: 1.2290E-03

#<* < Q1 <= ** < Q2 <= *** < Q3 <= ****

Table 5.16 Result of Malang City group comparison in the item of behavior

Malang				
No.		Group A	Group B	Group C
B e h a v i o r	C1	*	***	****
	C2	#	*	**
	C3	#	*	**
	C4	*	**	**
	C5	**	**	**
	C6	*	***	*
	C7	*	***	**
	C8	*	*	*
	C9	#	*	*
	C10	#	***	****
	C11	#	***	**
	C12	#	***	***
	C13	*	**	**
	C14	*	**	**
	C15	#	*	**

Q1: 1.3492E-07, Q2: 1.1021E-05, Q3: 1.2290E-03

#<* < Q1 <= ** < Q2 <= *** < Q3 <= ****

Table 5.17 Result of Batu City group comparison in the item of knowledge

Batu				
No.	Group A	Group B	Group C	
	A1	***	#	****
	A2	****	**	****
	A3	****	***	****
	A4	****	****	#
	A5	**	*	*
	A6	***	*	**
K	A7	****	****	***
n	A8	***	*	*
o	A9	***	**	***
w	A10	***	**	**
l	A11	***	**	**
e	A12	***	**	*
d	A13	****	#	****
g	A14	***	**	*
e	A15	****	***	****
	A16	****	**	***
	A17	**	*	#
	A18	***	*	*
	A19	****	****	**
	A20	****	#	#
	A21	***	*	*
	A22	***	*	*
	A23	****	****	***
	A24	***	***	*
	A25	****	***	***

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

The results of the calculation of trials in the Batu city, shows that group A has a significant, seen from the results. Groups B and C have the little change. Group A has a value of $Q3 \leq ****$ 10 people and group B and C looks balanced shown on table 5.17. While in group awareness and behavior. Group A has a high value, when compared with other groups. Interviews found that teachers in group A had an interest in EE learning. Teachers team consisting of 4 people, create their own worksheet that is tailored to their school condition. Teacher team can motivate students to learn EE more interesting .

Table5.18 Result of Batu City group comparison in the item of awareness

Batu

		No.	Group A	Group B	Group C
A w a r e n s e s		B1	***	**	*
		B2	*	*	#
		B3	***	*	**
		B4	**	*	#
		B5	***	*	*
		B6	**	*	*
		B7	***	*	*
		B8	**	*	#
		B9	*	#	#
		B10	**	*	#
		B11	****	**	*
		B12	**	#	#
		B13	***	**	*
		B14	**	#	#
		B15	**	*	*
		B16	***	**	*
		B17	**	*	#

Q1: 1.3492E-07, Q2: 1.1021E-05 Q3: 1.2290E-03

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.19 Result of Batu City group comparison in the item of behavior

Batu

		No.	Group A	Group B	Group C
B e h a v i o r		C1	***	**	**
		C2	**	*	#
		C3	**	*	#
		C4	***	**	#
		C5	**	**	*
		C6	**	#	#
		C7	**	*	*
		C8	**	*	#
		C9	**	#	#
		C10	**	*	#
		C11	***	**	#
		C12	**	*	#
		C13	**	#	#
		C14	**	**	#
		C15	**	*	*

Q1: 1.3492E-07, Q2: 1.1021E-05, Q3: 1.2290E-03

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

in this section groups A1 and A 2 have different results from before and after learning by using PBL, teacher field in group A1 and A2 have high awareness on environmental lesson. This is evident when interviewed. During one semester the teacher uses the midori no noto book. In the awareness and behavior groups A1 and A2 show differences after learning, but group B is only slightly different. Group C shows almost no change. Group C is a group that does not get an environmental education workshop, either teachers or students. Table 5.12 result of Bandng city-group comparison in the item of awareness, Table 5.13 Result of Bandu ng city group comparison in the item of behavior.

The results of groups A, B and C almost all groups have the same result. Among those who received environmental education workshops and who did not get the workshop. Unfortunate city is a city that targets all schools to become adiwiyata school. Therefore, the education department and municipal government in cooperation with Universitas Brawijaya held a "Green School" program, in which all schools must become adiwiyata school. Policy and passion into a city that has a 100% school Adiwiyata this provides learning to teachers to increase the capacity of teachers to teach environmental education.

Therefore, in table no 5.14 show the result of Malang city-group Comparison in the Item of Knowledge, but in Table 5.15 Result of Malang city -group Comparison in the Item of Awareness and Table 5.16 Result of Malang city group Comparison in the Item of Behavior, showed a slight difference in group A. group B and C in the awareness and behavior section showed a difference. Table 5.28 Result of inter-city group C comparison in the item of behavior. Batu city is a city located in the west of Malang city, with a position on the hill of the mountains. The city is famous for its agriculture and flower farming. Batu city is a tourist destination for the people of East Java. The government of Batu city hopes that the whole community becomes the environment city from waste and water pollution. Therefore, the environmental love movement has been done since 20 years ago. Batu city makes

environmental education subjects as local subjects curriculum. Teachers who active in the environmental field learning, will get a point and intensive from department of education.

Table 5.20 Result of inter city group A comparison in the item of knowledge

No.	Bandung	Bandung	Malang	Batu
	Group A-1	Group A-2	Group A	Group A
A1	***	***	b	***
A2	***	***	***	****
A3	****	***	**	****
A4	****	****	***	****
A5	**	*	*	**
A6	**	***	***	***
K	A7	****	****	****
n	A8	**	*	***
o	A9	**	**	***
w	A10	***	****	***
l	A11	**	**	***
e	A12	**	**	****
d	A13	****	****	****
g	A14	**	*	***
e	A15	**	***	**
	A16	***	***	**
	A17	*	*	*
	A18	**	**	*
	A19	**	**	**
	A20	****	****	***
	A21	*	*	*
	A22	*	**	*
	A23	***	***	****
	A24	*	*	**
	A25	**	**	**

Q1: 1.6463E-21, Q2: 9.6877E-13, Q3: 8.7362E-08

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Teachers in the city of Batu citu have an appreciation for the subject of life education, so that students understand about the environment and can maintain the sustainability of the city of tourism. Therefore, the spirit to learn new things related to environmental learning.

From the results found, it can be seen in Table 5.17 result of Batu city-group comparison in the Item of knowledge, Table 5.19 result of Batu city group comparison in the item of

behavior. In the table 5.20 shows the result of inter-city group A comparison in the item of knowledge, Table 5.20 Result of inter-city group A comparison in the item of knowledge, Table 5.21 Result of inter-city group A comparison in the item of awerenes and table 5.22 result of inter-city group A comparison in the item of behavior. It can be seen that the Bandung city and Batu city has a change, almost all the results show the difference between the before and after, but for the city of Malang some shows the change is not too much. In the table awareness and behavior are shown in table 5.21 show the result of inter-city group A comparison in the item of awerenes. Table 5.23 show result of inter-city group B comparison in the item of knowledge, Table 5.24 result of inter-city group B comparison in the item of awareness, table 5.25 result of inter-city group B comparison in the item of behavior and Table 5.26 result of inter-city group C comparison in the item of knowledge. Table 5.27 result of inter-city group C comparison in the item of awareness,

Table 5.21 Result of inter city group A comparison in the item of awerenes

No.	Bandung	Bandung	Malang	Batu
	Group A-1	Group A-2	Group A	Group A
B1	***	***	**	***
B2	*	*	*	*
B3	**	**	*	***
A	B4	*	*	**
w	B5	***	**	***
a	B6	*	#	**
r	B7	**	**	***
e	B8	*	*	**
n	B9	#	*	#
e	B10	#	*	**
s	B11	***	***	****
s	B12	*	*	**
	B13	**	**	***
	B14	#	#	**
	B15	**	**	**
	B16	***	**	***
	B17	****	*	**

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.22 Result of inter city group A comparison in the item of behavior

No.	Bandung	Bandung	Malang	Batu
	Group A-1	Group A-2	Group A	Group A
C1	***	**	*	***
C2	**	*	#	**
B C3	**	*	#	**
e C4	***	**	*	***
h C5	*	*	**	**
a C6	*	*	*	**
v C7	**	**	*	**
i C8	*	*	*	**
o C9	*	*	#	**
r C10	**	*	#	**
C11	**	**	#	***
C12	**	**	#	**
C13	*	**	*	**
C14	***	**	*	**
C15	*	*	#	**

Q1: 1.564E-10, Q2: 8.401E-06, Q3: 6.253E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.23 Result of inter city group B comparison in the item of knowledge

No.	Bandung	Malang	Batu
	Group B	Group B	Group B
A1	**	d	#
A2	**	****	**
A3	***	****	***
A4	***	****	****
A5	#	**	*
A6	*	****	*
K A7	***	****	****
n A8	*	*	*
o A9	*	****	**
w A10	**	****	**
l A11	*	*	**
e A12	*	***	**
d A13	****	****	#
g A14	**	***	**
e A15	*	****	***
A16	***	****	**
A17	*	***	*
A18	*	****	*
A19	**	****	****
A20	****	****	#
A21	**	****	*
A22	**	*	*
A23	****	****	****
A24	*	**	***
A25	***	****	***

Q1: 1.6463E-21, Q2: 9.6877E-13, Q3: 8.7362E-08

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.24 Result of inter city group B comparison in the item of awareness

No.		Bandung	Malang	Batu
		Group B	Group B	Group B
	B1	**	***	**
	B2	#	*	*
	B3	**	***	*
A	B4	#	*	*
w	B5	**	****	*
a	B6	#	**	*
r	B7	**	***	*
e	B8	*	**	*
n	B9	#	**	#
e	B10	#	*	*
s	B11	**	****	**
s	B12	#	**	#
	B13	**	***	**
	B14	#	*	#
	B15	**	**	*
	B16	**	**	**
	B17	*	*	*

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.25 Result of inter city group B comparison in the item of behavior

No.		Bandung	Malang	Batu
		Group B	Group B	Group B
	C1	**	***	**
	C2	*	*	*
B	C3	*	*	*
e	C4	**	**	**
h	C5	**	**	**
a	C6	#	***	#
v	C7	*	***	*
i	C8	#	*	*
o	C9	*	*	#
r	C10	*	***	*
	C11	**	***	**
	C12	*	***	*
	C13	*	**	#
	C14	**	**	**
	C15	****	*	*

Q1: 1.564E-10, Q2: 8.401E-06, Q3: 6.253E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.26 Result of inter city group C comparison in the item of knowledge

No.	Bandung	Malang	Batu	
	Group C	Group C	Group C	
A1	**	**	****	
A2	**	**	****	
A3	**	**	****	
A4	***	****	#	
A5	#	***	*	
A6	*	****	**	
K	A7	***	****	***
n	A8	#	**	*
o	A9	*	***	***
w	A10	*	*	**
l	A11	*	*	**
e	A12	*	*	*
d	A13	**	****	****
g	A14	*	***	*
e	A15	*	**	****
	A16	**	****	***
	A17	*	*	#
	A18	#	**	*
	A19	*	***	**
	A20	***	***	#
	A21	*	**	*
	A22	*	**	*
	A23	**	****	***
	A24	#	*	*
	A25	***	****	***

Q1: 1.6463E-21, Q2: 9.6877E-13, Q3: 8.7362E-08

#<* < Q1 <= ** < Q2 <= *** < Q3 <= **** *

Table 5.27 Result of inter city group C comparison in the item of awareness

No.	Bandung	Malang	Batu	
	Group C	Group C	Group C	
B1	***	***	*	
B2	#	*	#	
B3	*	**	**	
A	B4	#	*	#
w	B5	*	***	*
a	B6	#	*	*
r	B7	*	**	*
e	B8	#	**	#
n	B9	#	*	#
e	B10	#	*	#
s	B11	**	***	*
s	B12	#	*	#
	B13	*	***	*
	B14	#	*	#
	B15	*	*	*
	B16	*	**	*
	B17	#	*	#

Q1: 2.2695E-16, Q2: 2.2954E-09, Q3: 2.6195E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= ****

Table 5.28 Result of inter city group C comparison in the item of behavior

No.		Bandung	Malang	Batu
		Group C	Group C	Group C
	C1	*	****	**
	C2	#	**	#
B	C3	#	**	#
e	C4	*	**	#
h	C5	*	**	*
a	C6	#	*	#
v	C7	#	**	*
i	C8	#	*	#
o	C9	#	*	#
r	C10	#	****	#
	C11	**	**	#
	C12	*	***	#
	C13	*	**	#
	C14	*	**	#
	C15	****	**	*

Q1: 1.564E-10, Q2: 8.401E-06, Q3: 6.253E-05

#<* < Q1 <= ** < Q2 <= *** < Q3 <= ****

Knowledge group A Bandung city, Malang city and Batu city looks no change marked by the number of **** value. on the knowledge group B Malang city has a change when compared with group B city of Bandung and group B Batu city. Part awareness of bandung city and Batu city A group showed significant changes. while Malang city in group B and group C there is significant change also, but group A little there is change and group C rock city almost no change. Viewed from group A.B. and C Malang city, the most visible changes. from the results of interview analysis, in Malang city there is very strong support from government in environmental education program. also the program adiwiyata and green school that declared a green education city. Malang city government together with local companies and brawijaya University make project with thema 100% adiwiyata school for all schools in Malang.

Table 5.29 Result of teacher interview about use of worksheet "Catatan LINGKUNGAN" in Bandung

Name of City	Bandung		
	Group	A	B
Name of School	SD Dayeuh Kolot 7 SD Dayeuh Kolot 2	SD Dayeuh Kolot 05	SD Dayeuh Kolot 14
Date of interview	17-18 march 2017		
From "Catatan LINGKUNGAN" book, which materials that you performed again in the class within this semester?	All materials tested again, Bingo Game method tested also for other lessons. Students are enthusiastic in study/learning.	All the material in "Catatan LINGKUNGAN" book, especially Bingo games, is also used in other subjects.	Learning environmental education with use the handbook
What teaching method do you use to teach environmental education after 6 months of attending PBL workshops using the worksheet of "Catatan LINGKUNGAN"?	Using PBL as instructed in the workshop	method as in workshop	according to the environmental education text book distributed by the department of education and learning PLH is also done when learning scout.
Do you use the usual method used so far, or try to use the PBL method with the book "Catatan LINGKUNGAN"?	Using PBL as instructed in the workshop	sometime use as according to workshop instruction.	No
Within these 6 months, how many times use the book "Catatan LINGKUNGAN"?	Once a week when PLH lessons	Once a week when PLH lessons	using environmental education text book
How to use it? Whether it is arranged again or in accordance with instructions taught?	Using "Catatan LINGKUNGAN" PBL method as instructed in the workshop	sometime use as according to workshop instruction.	learning is adjusted to the package book and the use of media around the school.
Do you have any new ideas to develop from the book "Catatan LINGKUNGAN"?	There is a little progress, for example when visiting out of school.	any, refer/view from internet	no answers
Do you understand how to use the Worksheet Notes on the book "Catatan LINGKUNGAN"	Not all. The theme of visiting and looking for trees is difficult to understand.	understand, but it is hard to implement	Understand how to use the environmental handbook
Do you think the worksheet "Catatan LINGKUNGAN" with the PBL method is useful in helping PLH teaching in the school / classroom?	Very useful and makes students more understandable	useful to add new perception and innovative	No answers
Do you use it periodically?	Each PLH subject, 2 hours for a week.	sometimes when remember, but there is environmental education text book	No answers
Do you see any effect of using the book "Catatan LINGKUNGAN" of the PBL method?	There are many changes to the students, the students to remember what ever learned.	there are some that students like, like bingo games	No answers
Is the use of the book, did you combine with other books?	Combined with a package book from the education dept	with a environmental education text book from the education dept	just text book from school
If you do not understand the learning materials, what do you do?	Search for answers on the internet and discuss with fellow teachers and ask lecturers at the university.	Search for answers via google and ask friends	search on the internet, ask to fellow teacher or give assignments to students
Do you think worksheet at "Catatan LINGKUNGAN" should be improved?	No improvement, it is perfect, just how to teach it should be told again	nothing	do not know
Do you think the worksheet of "Catatan LINGKUNGAN" can be a medium in improving the process of environmental education?	It is very possible that many teachers also learn about PBL by using the worksheet "Catatan LINGKUNGAN"	it is possible, but the teachers must really understand the instruction and the stages of learning.	do not know
Is there need to be training like learning using worksheet of "Catatan LINGKUNGAN" with PBL method?	it is expected that there will be workshops with other materials, and other methods.	there is another worksheet again to be innovative.	want to follow the workshop to get new knowledge and understand PLH learning is fun

Environmental Education (EE.) Is a local content curriculum in Bandung. The Departement of education is suggests to be held in every schools, but it is depends of on each school. The principal has the authority to decide whether to hold an EE. Almost the teachers in Bandung teach EE for their students in classroom , through science lessons. sport and religion.

Table 5.29 Result of teacher interview about use of worksheet "Catatan Lingkunganku" (Cont.)

Name of City	Malang		
Group	A	B	C
Name of School	Polean 5	Polean 1	SDN 7 Malang Purwanto
Date of interview	21-22 March 2017		
From "Catatan Lingkunganku" book, which materials that you performed again in the class within this semester?	All materials tested again, Bingo Game method tested also for other lessons. Students are enthusiastic in study/learning.	not all of them, adapted with the material at the time	using the environmental education text book provided by the education office and from the nestle project
What teaching method do you use to teach environmental education after 6 months of attending PBL workshops using the worksheet of "Catatan Lingkunganku"?	With PBL and worksheet, but still confused how to teach it	PBL and conventional	using the environmental education text book provided by the education office and from the nestle project
Do you use the usual method used so far, or try to use the PBL method with the book "Catatan Lingkunganku"?	Both are used, because there is an environmental education text book from the education department should be used.	used as a book companion	according to the environmental education text book and training had received from nestle about green school.
Within these 6 months, how many times use the book "Catatan Lingkunganku"?	The package book is accompanied by the book "Catatan Lingkunganku"	Selected which I think is interesting, just like bingo games	environmental education text book and study module EE
How to use it? Whether it is arranged again or in accordance with instructions taught?	Arranged with traditional learning, but the method is taken from "Catatan Lingkunganku"	always try with PBL metode	according to the environmental education text book and training had received from nestle about green school.
Do you have any new ideas to develop from the book "Catatan Lingkunganku"?	There are ideas, but have no time to make it. It will be tried to develop later.	there are already many Text books and modules, so just do it	No answers
Do you understand how to use the Worksheet Notes on the book "Catatan Lingkunganku"	There are some materials that do not understand, about the river and field visits, and what purpose	The only understandable content is done	No answers
Do you think the worksheet "Catatan Lingkunganku" with the PBL method is useful in helping PLH teaching in the school / classroom?	no, according to the needs.	Yes, usefull but must more learning about how to use	No answers
Do you use it periodically?	no, according to the needs.	if there is time, because sometimes filled with other lessons.	No answers
Do you see any effect of using the book "Catatan Lingkunganku" of the PBL method?	Very effect, students really study EE. They became able to argue.	There are effects, new methods are always interesting	No answers
Is the use of the book, did you combine with other books?	Yes, with a environmental education text book from the education dept	Combined with a package book and module from the education dept.	No answers
If you do not understand the learning materials, what do you do?	Search on the internet, and ask to fellow teacher	Search on the internet, and discuss with teacher group	Discuss with other teachers, searching on the internet, and assigning children to find out
Do you think worksheet at "Catatan Lingkunganku" should be improved?	It is no need to revise and improve, but the teacher must develop according to local wisdom.	already perfect, many caricatures and stories make children a passion for learning	No answers
Do you think the worksheet of "Catatan Lingkunganku" can be a medium in improving the process of environmental education?	possible	yes, of course	No answers
Is there need to be training like learning using worksheet of "Catatan Lingkunganku" with PBL method?	It is necessary to hold a workshop for teachers. If only given a book without knowing how to use it, it will not work.	the workshop should continue to be done for the teacher's knowledge	if possible, want to participation in training and workshop environmental education

Malang departement of education is make some Instruction that EE is a local content lesson but is required. Therefore, all schools in Malang must have subject study about EE learning. EE activities are conducted with all school staff, teachers, students and parents. Parents have an activity in maintaining the school park and make organic compos.

Table 5.29 Result of teacher interview about use of worksheet "Catatan Lingsunganku" (Cont.)

Name of City	Batu		
	Group	A	B
Name of School	Pendem 1	Telekung	Torongrejo
Date of interview	23-24 March october 2017		
From "Catatan Lingsunganku" book, which materials that you performed again in the class within this semester?	All material is tested again for one semester	All material	Modules from the education department
What teaching method do you use to teach environmental education after 6 months of attending PBL workshops using the worksheet of "Catatan Lingsunganku"?	Creating own "Catatan Lingsunganku" book with adjusting to the conditions around their school, but the method adopted from my "Catatan Lingsunganku" introduced at the workshop.	Using the environmental education from departement education text book and "catatan Lingsunganku"	Rely on module only
Do you use the usual method used so far, or try to use the PBL method with the book "Catatan Lingsunganku"?	Used in all package books and accompanied by "Catatan Lingsunganku"	Environmental education text book and "Catatan lingsunganku"	Use module
Within these 6 months, how many times use the book "Catatan Lingsunganku"?	The environmental education text book is accompanied by the book "Catatan Lingsunganku"	one week 2 hours	No answers
How to use it? Whether it is arranged again or in accordance with instructions taught?	trying out all the methods and materials that are in "Catatan Lingsunganku"	use the text book and PBL methode in "Catatan Lingsunganku"	The method is in the module and corresponds to the instructions inside the module
Do you have any new ideas to develop from the book "Catatan Lingsunganku"?	We have created our school version and we have introduced it to other teachers.	Want to make another thema,	There is no time to create own modules
Do you understand how to use the Worksheet Notes on the book "Catatan Lingsunganku"	all can be understood, guidance have received also from school supervisor and team adiwiyata		Understand the instructions in the module
Do you think the worksheet "Catatan Lingsunganku" with the PBL method is useful in helping PLH teaching in the school / classroom?	Very useful, and there are new innovations	Very useful, and there are new innovations	No answers
Do you use it periodically?	Yes, in one semester use the PBL metode	yes	No answers
Do you see any effect of using the book "Catatan Lingsunganku" of the PBL method?	Students studying outside the classroom become easy to understand	Students studying outside the classroom become easy to understand	
Is the use of the book, did you combine with other books?	Yes, with text book from depart education and looking for internet	Combined with a package book and module from the education dept.	Use module
If you do not understand the learning materials, what do you do?	Discuss with other teachers, searching on the internet, and assigning children to find out	Discuss with other teachers, searching on the internet, and assigning children to find out	Discuss with other teachers, searching on the internet, and assigning children to find out
Do you think worksheet at "Catatan Lingsunganku" should be improved?	want to get other material, new material development and method	good worksheet, students become eager to learn and discuss	No answers
Do you think the worksheet of "Catatan Lingsunganku" can be a medium in improving the process of environmental education?	very possible	Possible and inovation	No answers
Is there need to be training like learning using worksheet of "Catatan Lingsunganku" with PBL method?	If possible the workshop can be done periodically, to raise the ability of teaching teachers, and to know how to learn in Japan.	Another thema	Need more information and training about how to teach environmental education

Batu city is a tourism city. Batu city has the EE learning subject in every school. The local government strongly recommends that all schools become eco friendly schools. The teachers in the Batu city joint the training and workshop about how to teach EE for students. The Batu city target is every school becomes the Adiwiyata school and green school.

5.5. Consideration

5.5.1 Consideration of comparison between groups

From table 5.6 it can be seen that the significant difference before and after the program of group A and B increased in the item of knowledge. This is thought that the memorized knowledge is more firmly established by utilizing auxiliary teaching materials in the environmental education program. In particular, significant differences were increased in the question related to waste and drainage, and it seems that these questions closely related to daily life among supplementary teaching materials were effective.

From table 5.7 and table 5.8, it can be seen that in the items of awareness and behavior, there were not significant differences in all groups A, B and C. However, significant differences in awareness and behavior were relatively large, such as waste sorting method, water saving, learning method of drainage filtration, not draining into the house area. From fig. 5.3 these are related in terms of knowledge, awareness, and behavior items. As same as knowledge items, these questions closely related to the items of awareness and behaviors are considered to be effective.

5.5.2 Consideration of comparison between cities

From table 5.26 show that the significance difference of Batu City has increased in the item of knowledge. Tourism is also a major industry in Batu City. In order to maintain an environment suitable for sightseeing, it is conceivable that the mayor obliges schools to take classes on environment and measures such as raising salaries of teachers by clearing items approved by the country are implemented.

From tables 5.27 to 5.28 we can see that there was a relatively significant difference in waste related questions in Bandung City and water related questions in Malang City. Since

Bandung City is an industrial city and Malang City is an agricultural city, it is thought that the understanding degree was deepened by learning the characteristics of each city by class, reflected in awareness and behavior.

In order to make a comparison effect of before and after trial of the environmental education program, cross-tabulation was carried out by grouping A, B, C using the results of the questionnaire survey. Comparing before and after the program was implemented for both group A and B, the change could be seen more conspicuously, especially in A, positive answers increased. However, there was not much change before and after program implementation in group C. Group comparison between A, B and C was conducted using Wilcoxon's rank sum test. In the item of knowledge, there were significant differences in questions related to garbage reduction, drainage methods, and the nature of water. In the item of awareness, there were significant differences in questions such as separation of garbage, water saving, drainage methods. In the item of behavior, significant differences were found in questions such as garbage separation and drainage methods.

By summarizing the questions that showed significant differences, relevance was found in knowledge, awareness, and behavior on questioning about waste separation and reduction, pollution of waste water, and waste.

Although WS being implemented for both the teacher and the students in group A, there was no notable significant difference in terms of awareness and behavior compared to group B and group C. Therefore, we conducted inter-city comparisons on Bandung City, Malang City and Batu City by using the survey results only for Group A. Similarly, Wilcoxon's rank sum test was used for the analysis method. In the item of knowledge, Bandung City and Malang City have significant differences, but Batu City has significant difference in almost all questions. In the item of awareness, Bandung City was significant difference in garbage related questions, and Malang City was significant difference in water related questions. In

the item of behavior, Bandung City was significant difference in garbage related questions, and Malang City was significant difference in water related questions, as well as items of awareness. In the field of garbage and water which was relatively focused in this PBL, not only knowledge but also the influence on awareness and behavior could be extracted.

A side from the field of garbage and water, the items of knowledge were able to extract influence change, but influence on awareness and behavior could not be explicitly extracted. Therefore, it is necessary to improve on the program that induces children to think about themselves in the future.

5.6 Conclusion

In this chapter, various statistical analysis methods including covariance structure analysis were applied to clarify factors participating in activities of residents' waste banks in Bandung City, Indonesia. As a result, the effectiveness of the waste banks, the responsibility for the garbage problem, and the evaluation of surroundings have influenced the participation.

It also revealed that there are differences in participation factors of members and non-members of waste banks. In other words, the members influence "countermeasure effectiveness recognition" on the "target intention" of waste bank. And the non-members influence the "social norm evaluation" on the "action intention". In addition, it is thought that experiencing the activity of waste banks will lead to recognition of the effectiveness of waste banks, due to "countermeasure effectiveness recognition" and "social norm evaluation" are strongly related. For continuous activities of garbage banks, it is desirable to non-members should become members. Therefore, the people who are participating on the waste banks must actively invite people who are not participating in waste banks. It is necessary to tell them about the effectiveness of waste banks and procedure separation of garbage, and convey the importance of environmental consideration It can be said that it is necessary.

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Chapter 6

Chapter 6. Summary of Findings, Discussion, Conclusion and Suggestion for Future Research

6.1 Summary of findings

In Indonesia, the problem of waste has become serious in recent years due to rapid economic growth, progress of urbanization, and delay in infrastructure development. Illegal dumping to rivers and others, and social problems such as picking up garbage by the poor, and community-based resource garbage collection systems are drawing attention as well as public waste management. Regarding environmental education, we have independently built an evaluation and certification system for schools, but it is difficult to say that the effect is sufficiently high. Against this backdrop, this research focused on the community-based waste management system and clarified the consciousness structure of staff and residents involved in the activities. We also analyzed the trial of PBL (problem-based learning) type environmental education and its effect on education to improve participation awareness and behavior. This paper is a summary of the above research results and consists of 6 chapters.

In Chapter 1, we discuss the background of the research and described the purpose and composition of this research.

In Chapter 2 and Chapter 3, in order to clarify the factors that local residents participate in garbage banks, paying attention to "garbage bank" which is community-based waste management, Chapter 2 covers Bandung city We conducted a questionnaire survey. As a result of covariance structure analysis based on the obtained data, it became clear that there are differences between members and non-members of the factors that residents participate in garbage banks. In Chapter 3, we will further

increase the number of surveyed cities, participate from the side of benefits of being able to save money by improving garbage problem and resource recycling, ie public benefit side, and participating in garbage bank activities. We clarified the consciousness structure concerning cooperation. Participants revealed that "Cost vs. Profit Evaluation" has a strong influence on "Action intention", non participants have a strong influence on "Social norm evaluation" "Action intention".

In Chapter 4, SWOT analysis was used to discuss future improvement measures based on the analysis of the current situation surrounding village waste management, for Karan Joang village in Balikpapan. Specifically, it includes introduction of private-initiative waste management activities, business matching to develop market for resource garbage, environmental program incorporating key persons, support by experts and volunteers, on going efforts of environmental education etc. .

In Chapter 5, we analyzed the trial of PBL type environmental education program and its effect, which is thought to be effective for residents' inclusion in environmental conservation activities including garbage banks. We conducted a questionnaire survey for trial and subsequent effect analysis in three cities. We set up a group that teaches the PBL type method and a group that does not do it, and analyzed knowledge, consciousness, and actions after six months, respectively. As a result, we confirmed the effectiveness of PBL type method.

In chapter 6, we discussed the conclusion of this research and future subjects. The findings demonstrate that community is willing to be involved in the waste management as long as they are educated or informed on how to effectively manage their waste starting from their house. To educate them in the environment subject, there is a need to teach them by using an active learning method. A Problem-Based Learning or PBL is

one of the effective learning method.

6.2. Conclusion

Participation of member is observed to be owned by waste banks with effective membership system. With regard to the participation awareness, where members tend to have higher environmental awareness . Using the various statistical analysis methods including covariance structure analysis, the study also resulted that the effectiveness of the waste banks, the responsibility for the garbage problem, and the evaluation of surroundings have influenced the participating factors in the activities of residents waste banks in Bandung city.

The communities play a role in managing their waste. This study examines about what kind of society will be able to take part in the activities of waste banks and what kind of community consciousness that plays a role in the activities of waste bank. Areas where most people are members of waste banks, will influence strongly to the other people in the same area to participate in waste banks. This enables a better membership system and improved awareness to make waste banks function better.

The Karang Joang Village community is still applying conventional method in handling the domestic waste without any prior treatment. Questionnaire result shows that although the 3R practice was quite low, the will of the community to be more environmental friendly was increasing. Total amount of waste generated by each household was a good opportunity and potency to have further treatment. Through the SWOT analysis, a possibility of a region to become a role model as a community that can perform independent waste management will be able to be determined.

The increase of community awareness is strongly supported by environmental

education. Using the PBL (Problem-Based Learning) method is effective for environmental education to improve the public awareness. It is necessary to test the application of PBL method and learning as the effective environmental education.

6.3. Discussion

Solution the problem solving in this study, it is necessary for government action to take decisions relating to policy, education and real activity. For example the Government, in cooperation with local community organizations, will be able to develop better infrastructures, facilitate waste management to final landfill and find solutions to waste issues. One of the solutions is by raising tax for waste handling, which is expected to motivate people in conducting 3R toward their domestic waste, at their own houses.

There are two methods which are considered suitable and powerful in solving issues related to paradigm, Eco literacy and eco-design concepts. Eco literacy emphasizes more in building people awareness on the importance of sustainable environment through education, starting from elementary level to higher education. Building ecological awareness should be initiated from the early age. The education includes introducing a simple way in waste handling, teaching on how to sort domestic waste into organic and non-organic waste, introducing waste handling model to the community and educating people who live in the surrounding areas of final landfills.

Government owns the authority to establish policies enacting all industries to produce more environment-friendly products from year to year, and applying a high tax on non-recyclable waste. These policies are expected to force people to give more thoughts on choosing products they will consume. Government may also establish eco-design

policies, such as policies on producing minimum waste products. Following the policies, people are then directed to choose the product,. products in refill packages. All their lives, people will always produce waste. The issue is how government, along with community organizations, figure out a way to involve people to actively participate in waste management. This kind of involvement is expected to change people's paradigm to a better way.

6.4. Suggestion for Future Research

People have different levels of environmental awareness, therefore evaluation was performed in purpose to create a community where people, having environment-friendly paradigm, manage their domestic waste and participate in waste management activities in their neighborhood. It is considered important to figure out a way in maximizing people's participation on waste management.

The existence of waste has a close relation with the products consumed by people. The further issue is how the government establish policies that require producers to consider environmental issues in their productions and how to educate people in becoming environment-friendly consumers. It is obvious that government, producers and consumers play an unseparated role in generating waste. Creating a supportive relation between these parties is an important issue to consider in order to maintain sustainability of the nature.

To refine this research, a further research is planned to determine the role of government policies in engaging producers to support government program in preserving nature and environment-friendly related issues. Other aspects will also be considered in the further research, including people's role as consumers, in choosing

products which also determine their pattern in managing the waste, looking for patterns of education that can develop ecological intelligence in urban communities, then needed also how people's role in considering sustainability of our nature and environment and the role of the stakeholders in optimizing the waste management.

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