



Construction Waste Management from a Gender Perspective

Ektewan Manowong and Ranjith Perera

Abstract— Construction industry generates high volume of waste. The availability of dump sites for construction waste is decreasing and becoming a serious problem. Common waste management strategies such as Reduce, Reuse, Recycle (3Rs) can be provided for construction waste management (CWM). However, in order to be extensively implemented in construction industry, such practices need to be recognized by construction operatives and the general public whose behavior may be influenced by their attitudes and perception. A survey was carried out to investigate current situation of CWM in various regions of Thailand. Attitudes, perceptions, and roles of men and women in the construction-related sectors were analyzed. Recommendations are planners and decision-makers to improve the relevant parties' perception and attitudes towards CWM policy planning and implementation in the GMS countries.

Keywords— Attitudes, Construction, Gender, Waste management.

1. INTRODUCTION

The rapid urbanization in many developing countries over the past decades seems to have been resulted from their soaring economy. To maintain the economic boom, development of relevant facilities is essential. As such, number of construction projects including infrastructures, commercial offices and residential buildings continues to increase. However, such construction boom proceeds in an unprecedented way, resulting in higher level of construction waste generation.

Among sources of waste generated in urbanized areas, construction industry has been found to be a major generator of waste that pollutes the environment as well as a main consumer of resources and energy. It has been reported that the construction sector generated unacceptable levels of material waste [1]. Being in the period of transition economy, the countries in the Greater Mekong Subregion (GMS) experience particular problems of construction waste. Construction boom in China, Vietnam and Thailand considerably causes environmental problems. Among sources of waste generated in urbanized areas, construction industry has been found to be a major generator of waste that pollutes the environment. Construction activities and manufacturing of construction materials have created

adverse environmental effects including solid and liquid wastes, dust, harmful gases, noises, blazing lights, ground movements, fallen items, and so forth.

As the environmental impacts from construction may be significant and irreversible, the interrelated problems of water, air, and land pollution must be appropriately and adequately dealt right from the sources of construction waste. Resources can then be effectively consumed. Sustainable construction can then be achievable through effective participation from construction operatives, both at management offices and construction sites, as well as the general public. In the field of solid waste management, consideration of gender differences has emerged as essential issues. As such, it is expected to apply gender initiatives into the construction waste management scheme. This paper examines the significance of roles and attitude of men and women with an objective to integrate the issue of gender into the construction waste management program. The paper reports findings of a survey carried out in the capital and regional cities of Thailand to evaluate respondents' attitudes and perceptions towards the construction waste management.

2. LITERATURE REVIEW

Gender, Environment, and Sustainable Development

Gender refers to the culturally and socially determined differences between men and women, the relationships between them, and their roles in the community at large [6]. Such relationships determine decisions and activities affected in both the management and utilization of the environment for sustainable development [7]. Rapid urbanization is inevitably associated with increased construction projects and higher generation of waste. Such development activities also cause severe pollution, depletion of natural resources, degradation of ecosystems, and loss of biodiversity.

Gender is becoming the key issue for environmental management because men and women could have

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contributed essentially to the conservation, use and management of natural resources [8]. Importance of gender issue has already been emphasized by the international organization as a cross-cutting priority [9]. As such, gender is incorporated in the environmental management in order to enable women and men perform their roles in the best cost effective methods, which facilitate conservation of the environment, accelerate sustainable development, and consequently improve the people's quality of life [7].

It is also revealed that [10], regarding the ordinary urban waste, the gender may have influence upon the person's judgment about the definitions of "waste". Men and women may see the value of discarded materials differently. Further, men and women differently participate in managing waste depending on their roles in the waste-related activities. The subordinate status of women frequently affects their control of resources, including re-using and recycling waste materials. Besides, different attitudes of men and women may also carry through preferences for policies or approaches which affect decisions made by women and men managers or public authorities. Moreover, as in [10], the commitment to empowerment of women is considered critical in the support of new initiatives in urban environmental protection.

In many societies such as construction industry, which is characteristically a male-dominated sector in terms of employment at all level, women are traditionally afforded a lower status than men. As the construction industry is a labour-intensive, construction operatives should have more responsible attitude towards the environment. Behavior of construction operatives may be influenced by their awareness, attitudes and perceptions towards CWM, as pointed out by [5], [11], [12], and [13]. Hence, their decision-making regarding waste handling is directly affected. As such, these attributes, as well as their CWM efforts, should be investigated and organized to maximize the probability of achieving practical and effective CWM. Altogether, diversities among men and women need to be studied to explore whether such differences have any effects on the CWM efforts.

Managing Construction Waste

Construction waste (CW) is normally disposed by land filling in private areas or municipal landfill sites. However, construction industry is facing a serious problem as the dumping sites become inadequate and unavailable to accommodate higher volume of construction waste. As such, the heavy and bulky CW is undesirable for disposal in landfills [2]. In some cases, therefore, construction waste is illegally dumped to public areas causing environmental problems to local communities. The strategies of Reduce, Reuse, Recycle (3Rs) have been recently promoted for the solid waste management practices. As the construction projects are major sources of waste generation, CW can be targets for potential 3Rs opportunities. However, the 3Rs attempts for CW are not yet widely practiced in the construction industry. Some reasons for the 3Rs not being popular

options for CW include that the recycling markets are not available for some types of CW such as concrete and bricks [3] or that the use of recycled building materials is not widely practiced because it is not cost-effective [4].

It is also argued that previous research on CW in the construction industry traditionally focused only on the work practices, processes and technologies that contribute to the generation of waste while ignoring importance of people's willingness to change their attitudes and behavior [5]. As such, exploring the current situation of construction waste management (CWM) in Thailand would enable policy/decision-makers to perceive possibilities as well as the problems of CWM when preparing plans for construction.

As a good and proactive way to manage construction waste is prevent or reduce the generation of waste. Then, people working or living in or near the environment exposed to construction waste are regarded as key participants in the urban waste management activities, including collection, separation, transportation, treatment, processing, recycling, composting, and disposal of waste. Therefore, the construction operatives particularly play important role in managing waste by foreseeing possible reuse of construction materials such as woods, steel bars, and broken bricks in some types of construction works. At this point, since the construction is labour-intensive industry, the gender perspectives should enter the area of waste management. It is expected that a gender-integrated CWM plan can then have an important role in improving performance of the overall environmental management.

3. OBJECTIVES AND METHODOLOGY

This study is part of the authors' research on CWM practices in Thailand. One of the major objectives is to investigate the current attitudes, perception and expectation of the people, directly or indirectly involved with construction activities, towards the management of construction waste. Attitudinal differences among men and women towards the management of waste generated by construction activities are also examined. The study was carried out by conducting structured questionnaire surveys and interviews. Target groups of respondents include construction operatives, local government officials, and the local residents. All respondents were personally approached at the workplaces or residences. Locations of this study are limited to the Bangkok downtown, Bangkok's suburban area of Rangsit in Pathumthani province, and three regional cities of Thailand, including Chiang Mai, Udon Thani, and Hat Yai. The survey was carried out during August to October 2007.

4. FINDINGS

Survey Respondents

The total of 226 sets of returned questionnaires comprises responses from Pathumthani (44 sets: 19.5%); Chiang Mai (54 sets: 23.9%); Udon Thani (31 sets: 13.7%); Bangkok (50 sets: 22.1%); and Hat Yai (47 sets: 20.8%). It was found that there were total male

respondents approximately twice the number of female respondents. This reflects that, in general, there are more men involved in the construction in all locations under study. Figure 1 shows groupings of the respondents according to their involvement with the construction projects under study.

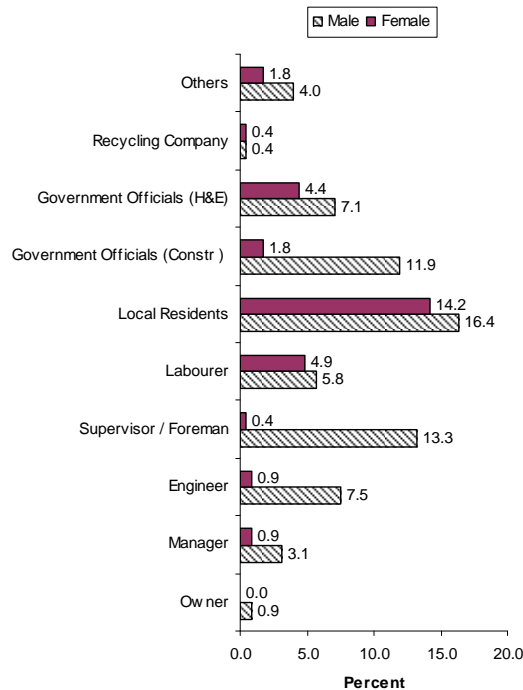


Fig.1. Respondent Involvement with Construction Projects

The survey did not find any female project owner. It can be seen that, responses from male and female in the group of local residents were slightly different. At construction sites, there were almost equal number of men and women working as labourers while the number of women who are supervisor/foremen, engineer, or manager is much less than men. In government sector, there were more female respondents from the department of health and environment (H&E) than the construction department.

Important Concerns in Construction Project

The respondents were asked to rank the factors that should be concerned as most important when executing a construction project. Results are presented in Table 1. In the group that is directly involved with the construction project, it is found that the groups who had more decision-making power (i.e. owner, manager, engineer, and supervisor/foremen) considered waste management is less important. Only the group of female engineers perceived waste management more important than profits. On the contrary, male and female labourer considered that the issue of health and safety is most important. In addition, male labourer viewed that waste management is the second most important while female labourer did not think that profits is in the top five important concerns. The group of government officials expressed that the construction quality should be most

concerned while considering that the issue of health & safety is more important than waste management.

Table 1. Ranking of Important Concerns in Construction

| | Respondents' ranking categorized by gender | |
|------------------------------|--|--|
| | Male | Female |
| Owner | 1. Profit 2. Expenses & Quality 3. Time management 4. Health & Safety 5. Waste management | N/A |
| Manager | 1. Expenses 2. Profits 3. Time management 4. Health & Safety 5. Quality | 1. Expenses 2. Profits 3. Quality, Time management and Health & Safety 4. Waste management |
| Engineer | 1. Quality 2. Health & Safety 3. Time management 4. Profits 5. Expenses | 1. Quality 2. Time management 3. Health & Safety 4. Expenses & Waste management 5. Profits |
| Supervisor / Foreman | 1. Quality 2. Expenses 3. Profits & Time management 4. Health and Safety 5. Waste management | 1. Profits 2. Expenses 3. Quality & Time management 4. Health & Safety 5. Waste management |
| Labourer | 1. Health & Safety 2. Waste management 3. Time management 4. Quality 5. Profits | 1. Health & Safety 2. Expenses 3. Time management 4. Quality 5. Waste management |
| Government Officers (Constr) | 1. Quality 2. Expenses 3. Health & Safety 4. Time management 5. Waste management | 1. Quality 2. Health & Safety 3. Expenses 4. Waste management 5. Profits |
| Government Officers (H&E) | 1. Quality 2. Health & Safety 3. Expenses 4. Waste management 5. Time management | 1. Quality 2. Health & Safety 3. Expenses 4. Waste management 5. Time management |

When the respondents were further asked to specifically indicate level of importance of the construction waste management (CWM) in construction project and how important CWM is when comparing with other works in the project, using the seven-point Likert scale ranging from "1=Not Important at all" to "7=Very Highly Important", the result is shown in Figure 2.

Considering the mean value of the question on the importance of CWM in construction project and comparing responses from men and women, the result reveals that women generally give more importance to CWM.

Table 2. Perceived Responsibility for CWM Process

| Groups of Respondents | Party that should be responsible for CWM process | Percent | |
|--|--|---------|-------|
| | | M | F |
| Owner | Project Owner | 50.0 | N/A |
| | Contractor | 50.0 | N/A |
| Manager | Project Owner | 14.3 | 0.0 |
| | Contractor | 71.4 | 50.0 |
| | Recycling Company | 0.0 | 50.0 |
| | All party | 14.3 | 0.0 |
| Engineer | Government | 0.0 | 50.0 |
| | Project Owner | 17.6 | 0.0 |
| | Contractor | 47.1 | 0.0 |
| | Sub-Contractor | 11.8 | 0.0 |
| | Recycling Company | 17.6 | 0.0 |
| | All party | 5.9 | 50.0 |
| Supervisor / Foreman | Government | 3.3 | 100.0 |
| | Project Owner | 23.3 | 0.0 |
| | Contractor | 50.0 | 0.0 |
| | Sub-Contractor | 10.0 | 0.0 |
| | Recycling Company | 13.3 | 0.0 |
| Labourer | Government | 7.7 | 0.0 |
| | Project Owner | 23.1 | 27.3 |
| | Contractor | 53.8 | 45.5 |
| | Sub-Contractor | 15.4 | 0.0 |
| | Recycling Company | 0.0 | 9.1 |
| | All party | 0.0 | 18.2 |
| Local Residents | Government | 13.5 | 6.3 |
| | Project Owner | 40.5 | 37.5 |
| | Contractor | 37.8 | 40.6 |
| | Sub-Contractor | 5.4 | 3.1 |
| | Recycling Company | 2.7 | 12.5 |
| Government (Construction) | Government | 11.1 | 0.0 |
| | Project Owner | 37.0 | 50.0 |
| | Contractor | 40.7 | 25.0 |
| | Recycling Company | 11.1 | 25.0 |
| Government (Health & Environment) | Government | 6.3 | 20.1 |
| | Project Owner | 43.8 | 20.0 |
| | Contractor | 43.8 | 50.0 |
| | Recycling Company | 0.0 | 9.9 |
| | All party | 6.3 | 0.0 |
| Recycling Company | Project Owner | 100.0 | 0.0 |
| | Contractor | 0.0 | 100.0 |
| Others (e.g. safety & procurement officers, architect) | Project Owner | 33.3 | 75.0 |
| | Contractor | 44.4 | 25.0 |
| | Recycling Company | 22.2 | 0.0 |

Responsibility, Roles, and Options for the Management of Construction Waste

The respondents were also asked to indicate which party should be most responsible for arrangement of

CWM process. It can be seen from Table 2 that most of the male respondents indicated that "Contractor" and "Project Owner" should be responsible for this task.

In contrast, female engineers and supervisors perceived that the government should take more responsibility for CWM process arrangement. However, most of the government officials seem to disagree although about 20% of female officers working in health and environment department pointed out that the arrangement of CWM process should be responsible by the government agencies. Female managers and labourer perceived similarly that CWM process should also be arranged by the recycling companies.

Table 3 contains the results of the question asking the respondents to indicate the party that should be most active in handling waste in construction project. It can be clearly seen that male respondents indicated that the project management/decision-making level (owner and manager) should have most active role for CWM followed by the supervisor/foremen who lead and control the construction works at operational level. Meanwhile, the female managers and engineers indicated that the project owner and supervisor/foremen should be most active in CWM. It can also be noticed that the group of labourers, both male and female, who are most directly exposed to construction waste, indicated that their supervisors/foremen should be most active role in managing waste generated in construction project. However, the supervisor/foremen disagreed as they think that the project owner should be most active party to deal with construction waste. This corresponds to opinion from the project's outsiders such as local residents and government officers.

The respondents were further asked to indicate their favorite options to manage the waste from construction. It was found that (result not shown here) most of the managers (55%), supervisor/foremen (48.4%) and labourers (62.5%) still prefer the landfill method while most engineers (57.9%) prefer the options of recycle and reuse. Meanwhile, the project outsiders (both male and female) such as local residents (53.6%) and government officials from health and environment department (57.7%) prefer the recycle method. Government officials from the department of construction almost similarly prefer the recycle option (42%) and the landfill (41.9%).

Awareness of Gender Issues in Construction

Figure 3 presents the result of the question regarding the issue of gender in construction industry. It was found that the recognition on differences among men and women among construction operatives (Manager, Engineer, Supervisor/Foremen, and Labourer) was averagely low (Mean=3.45/7) while the government sector seem to be slightly more recognized on the importance of gender differences (Mean=4.34/7). The result also indicates that the respondents considered that the importance of gender issue and the existing of respect to women's ability are at average level (Means are 4.11 and 4.00 respectively).

Table 3. Parties with Most Active Role for CWM

| Groups of Respondents | Party that should have most active role for CWM | Percent | |
|--|---|---------|-------|
| | | M | F |
| Owner | Project Owner | 50.0 | N/A |
| | Supervisor/Foreman | 50.0 | N/A |
| Manager | Project Owner | 14.3 | 0.0 |
| | Project Manager | 28.6 | 0.0 |
| | Supervisor/Foreman | 28.6 | 50.0 |
| | Labourers | 14.3 | 50.0 |
| | All party | 14.3 | 0.0 |
| Engineer | Project Owner | 0.0 | 50.0 |
| | Project Manager | 35.3 | 0.0 |
| | Supervisor/Foreman | 29.4 | 50.0 |
| | Labourers | 23.5 | 0.0 |
| | All party | 11.8 | 0.0 |
| Supervisor / Foreman | Project Owner | 33.3 | 100.0 |
| | Project Manager | 16.7 | 0.0 |
| | Supervisor/Foreman | 23.3 | 0.0 |
| | Engineer | 10.0 | 0.0 |
| | Labourers | 3.3 | 0.0 |
| Labourer | Project Owner | 7.7 | 0.0 |
| | Project Manager | 15.4 | 0.0 |
| | Supervisor/Foreman | 61.5 | 63.6 |
| | Engineer | 7.7 | 0.0 |
| | Labourers | 7.7 | 36.4 |
| Local Residents | Project Owner | 35.1 | 50.0 |
| | Project Manager | 10.8 | 9.4 |
| | Supervisor/Foreman | 27.0 | 25.0 |
| | Engineer | 5.4 | 0.0 |
| | Labourers | 16.2 | 12.5 |
| | All party | 5.4 | 3.1 |
| Government (Construction) | Project Owner | 63.0 | 50.0 |
| | Project Manager | 22.2 | 25.0 |
| | Supervisor/Foreman | 11.1 | 0.0 |
| | Labourers | 3.7 | 0.0 |
| | All party | 0.0 | 25.0 |
| Government (Health & Environment) | Project Owner | 37.5 | 60.0 |
| | Project Manager | 18.8 | 0.0 |
| | Supervisor/Foreman | 25.0 | 20.0 |
| | Engineer | 12.5 | 0.0 |
| Recycling Company | Project Owner | 0.0 | 100.0 |
| | Project Manager | 100.0 | 0.0 |
| Others (e.g. safety & procurement officers, architect) | Project Owner | 33.3 | 0.0 |
| | Project Manager | 44.4 | 50.0 |
| | Supervisor/Foreman | 11.1 | 25.0 |
| | Labourers | 0.0 | 25.0 |
| | All party | 11.1 | 0.0 |

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Participation of Men and Women in Construction Waste Management

Figure 4 shows the surveyed participation level of men and women in construction industry, from the respondents' perspectives. The respondents, especially the female supervisor/foremen and labourers, confirmed that there are less women working in the management level while there are more women working as labourers and handling construction waste. The graph of risk exposure shows that men and women are similarly susceptible to risks when handling waste generated from construction activities.

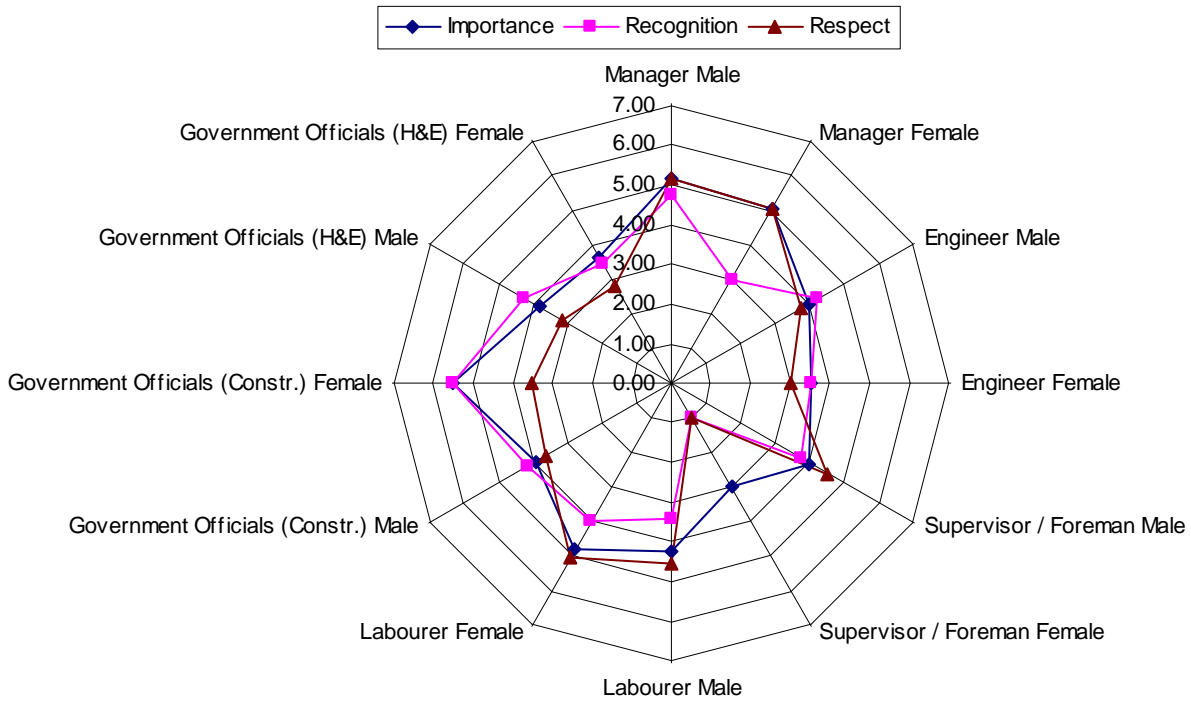


Fig.3. Level of Awareness on Gender Issues in Construction

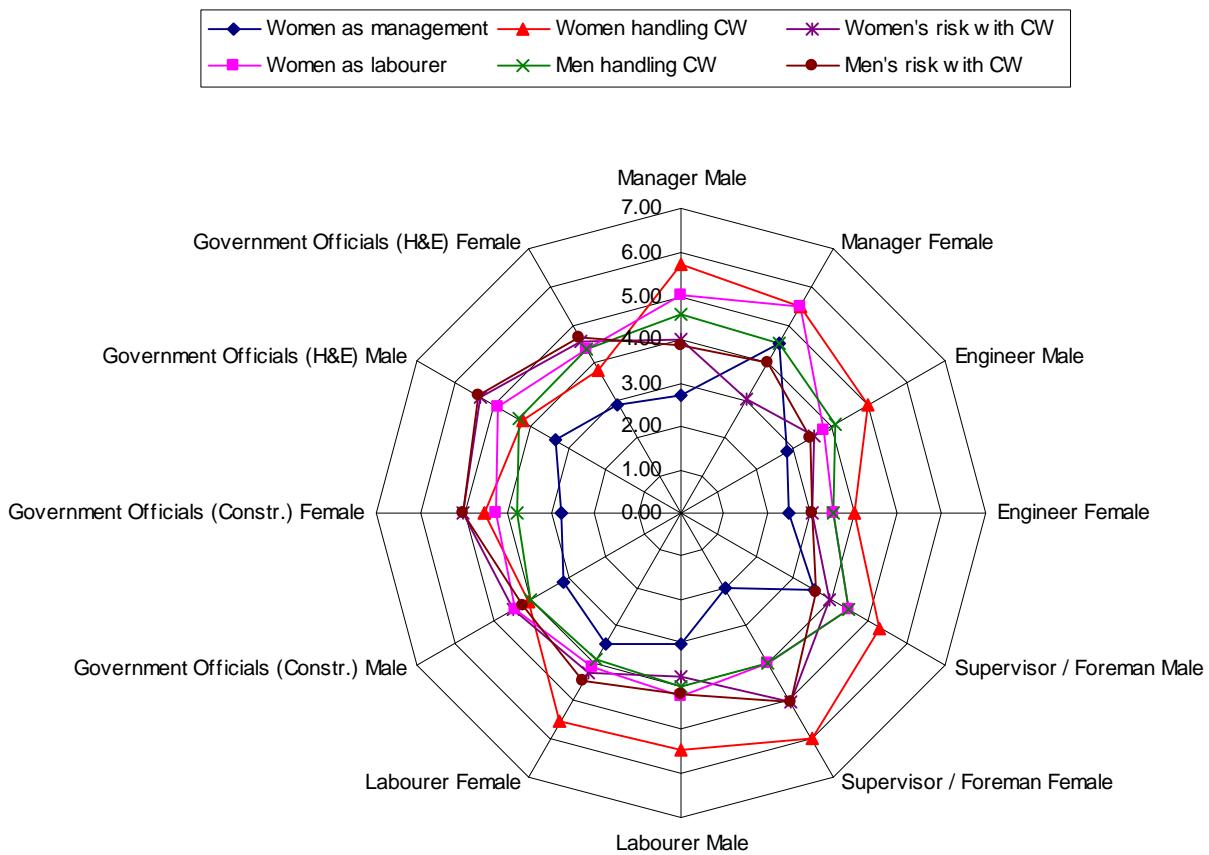


Fig.4. Participation of Men and Women in Construction Waste Management

5. DISCUSSION AND RECOMMENDATIONS

There was more survey response received from male respondents because more men were involved in the construction works. Each group of the respondent was dominated by men, except for the group of local residences which the researcher tried to balance the number of male and female respondents. However, the respondents' attitudes and perceptions were separately analyzed based on category of gender and the respondents' involvement with the construction.

The result indicates that most of the respondents perceived the waste management in construction operations as less important than other concerns such as profits and quality. It is also found that the construction operatives at management level (manager and engineer) included waste management in top-five ranking of their important concerns while male respondents in management level did not rank waste management as their top five priorities. Regarding the lower-management level (Supervisor/Foremen), they consider waste management as top concerns but still less important than other construction management issues related to cost, quality and time.

On the contrary, male and female labourers considered that the issue of health and safety was their highest concern. Male labourers considered waste management as the second most important concern. This is different from female labourers. This can be explained that women are physically more sensitive to environmental hazards related to construction waste such as dust and chemicals. Moreover, men are more likely to be engaged in skilled and dangerous jobs than women so that they are paid higher wages [14]. Women labourers assigned to take role as site cleaner and waste collector are considered as low skilled position so that they get low wages. Therefore, women labourers perceived works related to waste as less important since they had no incentives to perform such task.

As women from every group of the respondents considered CWM as important as other works with higher mean value than men's, increased participation of women at management level could better facilitate arrangement of CWM. Since the project owner and contractor were perceived as potential party to be responsible for CWM arrangement, they should take more proactive action to arrange preparation and implementation of CWM program. Then, female managers and engineer working for both project owner and contractors can be empowered and assigned to monitor this task because they are more aware of waste management. Consequently, both male and female supervisors/foremen should be equally supported to extend their on-site duties related to CWM.

At labour level, attempts should be made to encourage female workers to be happy with their jobs in handling waste at construction sites. To achieve this, more social and financial incentives are needed together with adequate healthcare. That is, the construction project management could give more importance to the CWM efforts by compromising the gap of social respect and income. Then the role of men and women in construction

industry becomes more widely recognized and adequately emphasized by assigning them important and appropriate responsibilities to waste management [15].

In addition, regarding the aspect of sustainable environmental management, specific roles and positions of women in environment and development have been recognized since the accomplishment of the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. Women's extensive experiences make them an invaluable source of knowledge and expertise on environmental management and appropriate actions [8]. Incorporation of their collective perspectives, experiences and contributions to sustainable development need, therefore, to be ensured.

The study further found that roles, attitudes, and perceptions of the construction operatives have interrelated effects on the on-site practices of CWM. Although the surveyed respondents indicated that they have positive attitudes towards CWM and perceived the essence of proper environmental management associated with construction activities, their roles in the project may not permit them to carry out the CWM scheme as wished as long as the management level, particularly the construction site managers and supervisors, fail to raise CWM awareness and to provide encouragement, procedural direction, and incentives. Knowing and understanding potential roles of male and female in CWM should be emphasized accordingly to their roles.

Nevertheless, there are still challenges for application of gender issues in GMS countries since, as stated in [16], the cultural and traditional practices that discriminate against women in developing countries can be identified. Besides, it is an undeniable fact that the construction industry is still male-nominated. In addition, the labourers are usually assigned to handle construction waste differently due to their physical conditions and nature of works. As such, attempting to provide equal incentives for waste-related work remains highly challenging as the management regards this task as non-profitable activities. Such challenges can be overcome in the future when the project management becomes more recognized with the profitable value of CWM through potential of 3Rs.

However, proactive CWM action from governmental organizations seems to be insufficient. As found from this study, there is large proportion of government officials working in the department of construction works that consider dumping construction waste to landfills is still preferable options. This perception may be appropriate practice in those municipalities with large landfill areas as it may be cheaper method but it will finally face the same situation as those cities whose landfill areas already run out. As such, another challenge of CWM practices is to introduce policy, rules, regulations, and law enforcement that particularly focus on CWM. Further, government officials need to be informed and trained to change their attitudes and raise their awareness of appropriate CWM efforts. In addition, an outreach for opinions from the construction operatives and the general public can help the government sector to appropriately prepare a CWM plan suitable to the actual and current situation. It should be stressed among GMS

countries in transition economy that the economic development must be essentially integrated with social and environmental sustainability.

6. CONCLUSION

Construction waste is becoming more serious problem to urban environment as it is now undesirable for landfills. Attitude and perceptions of the stakeholders, who are those directly or indirectly involved with the construction activities, can have important role in managing construction waste. This paper investigated and examined the attitudes and perceptions of the respondents who are construction stakeholders in various urban areas of Thailand by means of questionnaire surveys, interviews, and field observation. The result mainly presents the comparison of differences among groups of respondents as well as the gaps between male and female respondents. It is reported in this paper that women are generally more concerned with management of construction waste but they are in the environment that allows less power to manage or make decision. More women participated in labourer level but they were less concerned about waste management due to less encouragement and incentives.

With more cooperation of the construction operatives, construction waste generation can be reduced, appropriately handled, and correctly disposed. Further, the active participation from the general public, either male or female who are equally the stakeholders of construction projects, can be supportive surveillance on practices of construction operators. Empowering the right gender active for CWM can then pave the way to the success of CWM via applications of 3Rs approaches. As GMS countries have similar cultures and social beliefs, application of findings from this study may be useful for improving attitudes and perception of construction stakeholders. Increased awareness and recognized responsibility play important role in driving the well-designed CWM policy and plan to be widely accepted, economically viable, and successfully implemented. With regional CWM policy formulation, the GMS communities will successfully meet the challenges of getting prolonged benefits of balanced and sustainable development in the region.

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