# THE ROLE OF GREEN LOGISTICS AND SUPPLY CHAIN MANAGEMENT OF RECYCLING WASTE MANAGEMENT ON GREEN ENVIRONMENT OF THAILAND

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**Abstract** The purpose of this study was to examine the role of logistics and supply chain management in green environment. The mediating role of waste management was also considered in this study. Therefore, the relationship between green logistic, green supply chain, waste management through recycling and green environment was considered. Population of the study was based on the waste management companies and employees of these companies were considered as the respondents. A questionnaire was used for data collection and questionnaires were distributed in waste management companies of Thailand. 420 questionnaires were distributed among the employees of waste management companies. Finally, structural equation modeling was used for data analysis by using Partial Least Square (PLS). This study found that green logistic has positive effect on waste management. Green supply chain has positive effect on waste management. Additionally, waste management through recycling has positive role in green environment. Furthermore, green logistic has direct effect on green environment. In addition to this, green supply chain has positive effect on green environment.
**Keywords** Green logistic, green supply chain, waste management, recycling, green environment.

## INTRODUCTION

In the recent decade, the environmental pollution is one of the major concerns among the nations, worldwide. As the pollution is increasing day by day due to the increase in industries Increase in pollution causing several serious issues for the human beings. It is not only affecting the human beings, but also it is affecting the other species living on the earth. That is the reason whole world is worry about the increase in pollution and damage of environment. This is one of the great challenges for the world to reduce the pollution and increase the quality of environment. With the increase in business activities, the pollution is also increasing. Therefore, how to control pollution without stopping the operations of business organizations is one of the big questions. Solution of this question is not easy to find, although nations are constantly working on this problem. As the previous studies highlighted that green environment is most important for the people and it is one of the major challenges facing by the nations (Agyabeng-Mensah et al., 2020; Srivastava et al., 2020).

Although several companies are working on the environmental issues, however, still this issue is increasing in the world and require significant intention of practitioners. Environmental issues have several disadvantages, particularly, the major disadvantage of environmental problem is health issues. Due to the increase in environmental problems, health issues are increasing. Therefore, health issues due to the environmental problem must be addressed. Several previous studies also highlighted that environmental problem is one of the major issue in the current decade (Adelana et al., 2011; de Jonge, Elliott, & Orive, 2002). Therefore, this study is an attempt to highlight the role of various industries to decrease the environmental pollution and increase the environmental performance by promoting green environment.

Thailand is one of the countries where the environmental issues are increasing day by day. There are several reasons due to which the environmental problems are increasing in Thailand. (Kerdpitak & Jermsittiparsert, 2020) First, there is increase in traffic which cause to increase the smoke which has major negative effect on environment and decreasing the performance of environment. It is the major issue in all the countries, the role of smoke from the vehicles is increasing day by day which has major role to decrease the performance of

environment. It is one of the main hurdles to maintain green environment. (Kerdpitak, Mekkham & Girdwichai, 2019).Secondly, factories are increasing in Thailand. With the increase in business operations, factories are also increasing which has major influence to decrease the environmental performance. Because factories are spreading wastage in the environment which is the major cause of pollution. Several previous studies highlighted that pollution is increasing due to the vehicles and factories (Qadeer et al., 2020; Yang, Fan, & Zhao, 2020). The management at world level is trying to reduce the issue of wastage from factories by adopting various techniques. Moreover, the researchers are working to make various vehicles which will be environmentally friendly and will not harm the environment. Hence, this study is also an effort to handle this problem by providing various ways through green logistic and green supply chain.

According the current study, various strategies can promote green environment and decrease the environmental issues. First, logistics has major role in green environment through different ways. Generally, the practices of green logistic decrease the pollution in the environment and enhance the environmental performance. Logistic is consists of various services which are majorly based on the transfer of goods from one place to another place. This activity to transfer the goods from one place to another place which has major role to use vehicles having crucial role to increase the pollution in the environment and decreases the environmental performance by damaging the green environment. Therefore, green logistic has important role to promote green environment (Ibrahim et al., 2019)

Furthermore, supply chain management also has important role in environment and sustain the green environment by increasing the environmental performance. In supply chain management, green supply chain is supportive to the green environment. The concept o green supply chain is now increasing in the nations to enhance the quality of environment by decreasing the pollution. Green supply chain is also given in Figure 1. Therefore, both the green logistic and green supply chain are the major parts of green environment and has the ability to enhance quality of environment. Previous investigations are also highlighting the green supply chain importance for the environment (Alananzeh et al., 2017; Khaksar et al., 2016). Furthermore, green supply chain has important role in waste management through recycling. Along with this, the green logistic also has contribution to the waste management which has direct relationship with the Green environment. According to the current study, green supply chain and green logistic has positive role in waste management which further has the ability to promote green environment. Hence, the mediating role of waste management was also considered in this study.
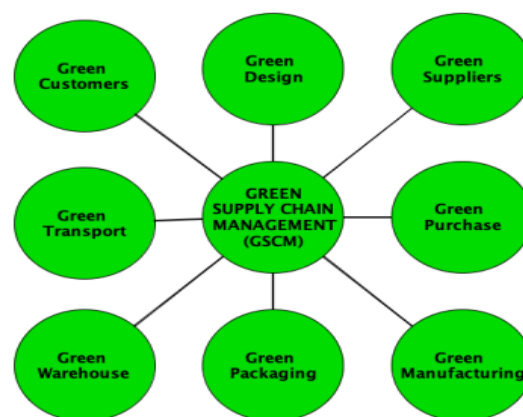


**Figure 1** Green Supply Chain Management

The purpose of this study is to examine the role of logistics and supply chain management in green environment. Therefore, the relationship between green logistic, green supply chain, waste management through recycling and green environment was considered. Several previous studies examined the green environment and waste management (Ingrao et al., 2019; Khaksar et al., 2016; Srivastava et al., 2020; Vetter et al., 2017), however, these studies have not examined the role of green logistic and green supply chain in waste management and

green environment which is important to study. Hence, this study filled the significant literature by examining the effect of green logistic and green supply chain in green environment.

## LITERATURE REVIEW

Waste management is the high priority of nations due to increase in environmental problems and decrease in the green environmental performance. Waste management comprises the activities as well as actions compulsory to manage waste from its inception to its final disposal. This comprises the collection, transport, treatment as well as disposal of waste, together with monitoring as well as regulation of the waste management procedure. Increase in the waste management activities increases the environmental performance by promoting the green environment and after decreasing the issues related to the pollution. The current study highlighted the waste management for green environment because it has major area to promote green environment. Another major element of waste management is recycling. In whole world, recycling is adopted as major tool to reduce the waste and increase the quality of environment. Therefore, this study highlighting the waste management through recycling activities. Without mentioning the recycling activities, waste management cannot be performed. As recycling has major influence on green environment and waste management (Gu et al., 2019; Nabavi-Pelesaraei et al., 2017; Ranjan et al., 2016).

According to the current study, green logistic has influence on waste management through recycling. Further, waste management through recycling effect positively on green environment. Similar to this, green supply chain is also helpful which effect on waste management through recycling. Again, in this case, waste management through recycling effect to promote green environment. Therefore, waste management through recycling is playing a mediating role in the current study. Figure 2 shows the relationship between green logistic, green supply chain, waste management through recycling and green environment.



**Figure 2.** Theoretical framework of the study showing the relationship between green logistic, green supply chain, waste management through recycling and green environment

### Hypotheses Development

Logistics is usually the comprehensive organization as well as implementation of a multifaceted operation. In a general business sense, logistics is the administration of the flow of things between the point of beginning and the point of consumption to meet the necessities of customers or corporations. Logistic operations are common among the nations and it is the necessary to fulfil the needs. Logistic operations are based on the transfer of goods from one place to another place. While doing the logistic operations, the role of vehicles is most crucial for the environment. Generally, smoke from the vehicles has major role in environment. Usually, it has negative effect on the environment because it increases the pollution in the environment. Particularly, in Thailand, with the increase in logistic operations, the environmental performance is decreasing. Logistic operations in Thailand has major importance to fulfill the

needs (Koohathongsumrit & Luangpaiboon, 2020). However, the problem created by the logistic in the environment can be decreased with the help of green logistic. As highlighted by the number of previous studies that green logistic has important role in environment (Agyabeng-Mensah, Ahenkorah, & Korsah, 2019; Baah, Jin, & Tang, 2020). Furthermore, green logistic has positive role in waste management. Increase in the green logistic has important connection with waste management through recycling. To promote the green environment, the role of waste management is most important which is connected with recycling. Generally, increase in green logistic has the potential to effect positively on waste management and finally, waste management has positive role in green environment.

**Hypothesis 1** Green logistic has relationship with waste management through recycling.

**Hypothesis 2** Green logistic has relationship with green environment.

**Hypothesis 3** Waste management through recycling mediates the relationship between green logistic and green environment.

A supply chain is a network in a company as well as its suppliers to yield and distribute a precise product to the final buyer. This network comprises diverse activities, people, entities, information, and resources. To form a product, the process of brining raw material to the company and after manufacturing of product and transfer to the end consumer contain supply chain. Therefore, supply chain activities are most important to handle all the operations in the company in accurate ways and to fulfil all the requirements within time. These supply chain activities have influence on green environment. The way of doing supply chain activities has influence on environment. To decrease the negative effect on environment, the role of supply chain is important. Supply chain activities has the ability to decrease the environmental pollution and increases the environmental performance. In this process, green supply chain is important which has positive influence on the environment. Generally, it increases the green environment. The term green supply chain denotes to the idea of integrating sustainable environmental procedures into the traditional supply chain. Generally, it has positive role to promote environmental performance which is also mentioned by the previous studies (Feng et al., 2018; Jermsittiparsert, Sutduean, & Sutduean, 2019). Increase in green supply chain increases the green environment. The waste management is important in this process. Waste management is influenced by the green supply chain which further has influence on green environment. As waste management has relationship with green environment (Lu et al., 2019). Waste management through recycling has the ability to promote green environment.

**Hypothesis 4** Green supply chain has relationship with waste management through recycling.

**Hypothesis 5** Green supply chain has relationship with green environment.

**Hypothesis 6** Waste management through recycling mediates the relationship between green supply chain and green environment.

**Hypothesis 7** Waste management through recycling has relationship with green environment.

## RESEARCH METHODOLOGY

To examine the relationship between variables, this study designed a survey questionnaire (Räisänen et al., 2020). Survey questionnaire was designed with the help of previous studies using the variables, namely; green logistic, green supply chain, waste management through recycling and green environment. The measures were adapted from previous investigations and questionnaires was used for data collection. Therefore, a questionnaire was used for data collection and questionnaires were distributed in waste management companies of Thailand. 420 questionnaires were distributed among the employees of waste management companies. Cluster sampling was applied in this study for data collection which is suitable to collect data from wide range of population (Johnson, Baburajan, & Sulekha, 2020). As the Thailand is also spread on wide area and waste management companies are working in whole country, therefore, in this situation, area cluster sampling is most suitable technique.

## FINDINGS

Findings of the study is the key part of every research study which is based on the results. In this study results are generated through data analysis and the findings of the study extracted from the data analysis. However, before to move further for data analysis, this study examined the data to check the errors in the data. Various types of errors in the data such as missing value, outlier, normality of the data etc. has the potential to influence the results. Therefore, to prevent the current study from various issues related to the outlier and missing value, data screening was carried in this study. It is given in Table 1.

**Table 1** Data Statistics

|        | Mean  | Median | Min | Max | SD    | Kurtosis | Skewness |
|--------|-------|--------|-----|-----|-------|----------|----------|
| GL1    | 3.563 | 4      | 1   | 5   | 1.337 | -1.893   | -0.587   |
| GL2    | 3.506 | 4      | 1   | 5   | 1.309 | -0.872   | -1.533   |
| GL3    | 3.678 | 4      | 1   | 5   | 2.002 | -0.786   | -0.78    |
| GL4    | 3.605 | 4      | 1   | 5   | 1.46  | -1.954   | -0.726   |
| GL5    | 3.479 | 4      | 1   | 5   | 1.221 | -0.734   | -1.497   |
| GSC1   | 3.452 | 4      | 1   | 5   | 1.254 | -0.882   | -0.4     |
| GSC2   | 3.839 | 4      | 2   | 5   | 0.869 | -0.554   | -0.35    |
| GSC3   | 3.693 | 4      | 2   | 5   | 1.011 | -0.497   | -0.122   |
| GSC4   | 3.648 | 4      | 2   | 5   | 0.829 | -1.451   | -1.234   |
| GSC5   | 3.705 | 4      | 2   | 5   | 0.822 | -0.554   | -0.113   |
| GSC6   | 3.674 | 4      | 2   | 5   | 0.829 | -0.494   | -0.181   |
| GSC7   | 3.713 | 4      | 2   | 5   | 1.012 | -1.103   | -0.179   |
| GSC8   | 3.747 | 4      | 2   | 5   | 1.13  | -1.276   | -0.355   |
| WMR1   | 3.67  | 4      | 2   | 5   | 1.057 | -1.241   | -1.112   |
| WMR2   | 3.782 | 4      | 2   | 5   | 1.139 | -1.197   | -0.471   |
| WMR3   | 3.617 | 4      | 2   | 5   | 1.148 | -1.377   | -0.235   |
| WMR4   | 3.72  | 4      | 2   | 5   | 1.125 | -1.333   | -0.259   |
| GE1    | 3.632 | 4      | 2   | 5   | 1.126 | -1.329   | -0.227   |
| GE2    | 3.782 | 4      | 2   | 5   | 1.115 | -1.166   | -0.444   |
| GE3    | 3.628 | 4      | 2   | 5   | 1.116 | -1.299   | -0.242   |
| GE4    | 3.663 | 4      | 2   | 5   | 1.101 | -1.248   | -0.272   |
| GE5    | 3.739 | 4      | 2   | 5   | 1.014 | -1.079   | -0.236   |
| GE6    | 3.759 | 4      | 1   | 5   | 1.114 | -1.123   | -0.415   |
| GE7    | 3.678 | 4      | 1   | 5   | 1.056 | -1.114   | -0.191   |
| GE8    | 3.816 | 4      | 2   | 5   | 1.143 | -1.167   | -0.516   |
| GE9    | 3.659 | 4      | 1   | 5   | 1.166 | -1.257   | -0.345   |
| GE10   | 3.739 | 4      | 2   | 5   | 1.104 | -1.249   | -0.311   |

Note: GL = Green Logistic, GSC = Green Supply Chain, WMR = Waste Management through Recycling, GE = Green Environment

Table 1 shows that data has no outlier. Along with the outlier, missing value is also examined (Aydin & ŞENOĞLU, 2018) which is given in Table 1 showing that data has no missing value. Hence, it is proved that data is free to proceed for the further analysis.

Therefore, after data screening, this study moves towards the data analysis which carried out with the help of Partial Least Square (PLS), a most suitable technique to analyze the primary data (Henseler & Chin, 2010; Henseler et al., 2014; Rajaratnam et al., 2014). PLS outer model is given in Figure 3 in which the factor loadings are given.
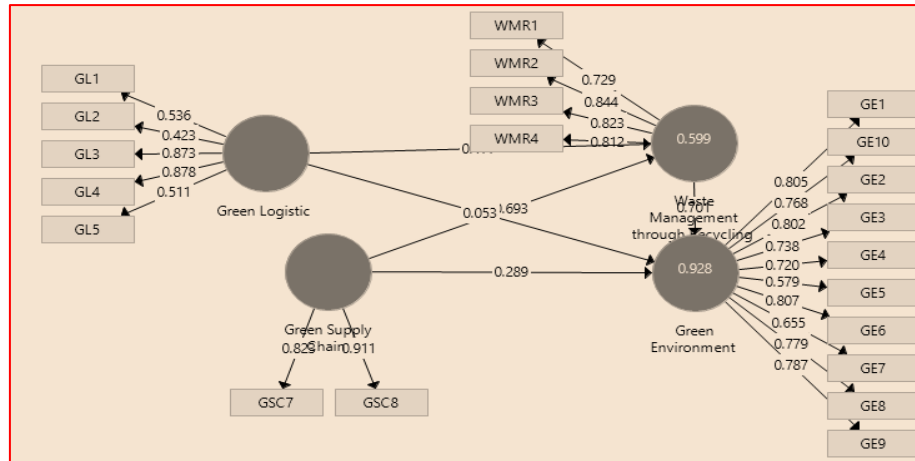


**Figure 3** Measurement Model

**Table 2** Factor Loadings

|  | **Green Environment** | **Green Logistic** | **Green Supply Chain** | **Waste Management through Recycling** |
|---|---|---|---|---|
| GE1 | 0.805 |  |  |  |
| GE10 | 0.768 |  |  |  |
| GE2 | 0.802 |  |  |  |
| GE3 | 0.738 |  |  |  |
| GE4 | 0.72 |  |  |  |
| GE5 | 0.579 |  |  |  |
| GE6 | 0.807 |  |  |  |
| GE7 | 0.655 |  |  |  |
| GE8 | 0.779 |  |  |  |
| GE9 | 0.787 |  |  |  |
| GL1 |  | 0.536 |  |  |
| GL2 |  | 0.423 |  |  |
| GL3 |  | 0.873 |  |  |
| GL4 |  | 0.878 |  |  |
| GL5 |  | 0.511 |  |  |
| GSC7 |  |  | 0.823 |  |
| GSC8 |  |  | 0.911 |  |
| WMR1 |  |  |  | 0.729 |
| WMR2 |  |  |  | 0.844 |
| WMR3 |  |  |  | 0.823 |
| WMR4 |  |  |  | 0.812 |

The Role of Green Logistics and Supply chain management of recycling waste management on Green environment of Thailand

Note: GL = Green Logistic, GSC = Green Supply Chain, WMR = Waste Management through Recycling, GE = Green Environment

**Table 3** Reliability and Validity

|  | **Alpha** | **rho_A** | **CR** | **(AVE)** |
|---|---|---|---|---|
| Green Environment | 0.911 | 0.915 | 0.926 | 0.558 |
| Green Logistic | 0.716 | 0.829 | 0.791 | 0.452 |
| Green Supply Chain | 0.681 | 0.729 | 0.859 | 0.754 |
| Waste Management through Recycling | 0.815 | 0.822 | 0.879 | 0.645 |

Figure 3 shows that green logistic is measured by using five scale items used in the questionnaire to measure green logistic. Eight items were adapted by the current study to examine the green supply chain; however, six items were deleted due to low factor loadings and two items were retained. Waste management through recycling is measured by using four scale items. Finally, green environment is measured by using nine scale items and given in Table 2. Table 2 shows that all the variables; green logistic, green supply chain, waste management through recycling and green environment have factor loadings above 0.5. Only one items have factor loading below 0.5 but above 0.4. Additionally, the current study examined the composite reliability (CR) and average variance extracted (AVE) is also examined. CR is examined for green logistic, green supply chain, waste management through recycling and green environment, it is found that CR is above 0.7. Along with this CR is also above 0.5 for green logistic, green supply chain, waste management through recycling and green environment which is recommended by Hair et al., (2017).

**Table 4** Cross-Loadings

|  | **Green Environment** | **Green Logistic** | **Green Supply Chain** | **Waste Management through Recycling** |
|---|---|---|---|---|
| GE1 | 0.805 | 0.361 | 0.577 | 0.743 |
| GE10 | 0.768 | 0.351 | 0.525 | 0.786 |
| GE2 | 0.802 | 0.318 | 0.596 | 0.717 |
| GE3 | 0.738 | 0.361 | 0.577 | 0.597 |
| GE4 | 0.72 | 0.417 | 0.522 | 0.609 |
| GE5 | 0.579 | 0.289 | 0.77 | 0.501 |
| GE6 | 0.807 | 0.325 | 0.86 | 0.716 |
| GE7 | 0.655 | 0.317 | 0.579 | 0.699 |
| GE8 | 0.779 | 0.349 | 0.711 | 0.811 |
| GE9 | 0.787 | 0.329 | 0.539 | 0.798 |
| GL1 | 0.176 | 0.536 | 0.128 | 0.17 |
| GL2 | 0.119 | 0.423 | 0.059 | 0.122 |
| GL3 | 0.425 | 0.873 | 0.348 | 0.38 |
| GL4 | 0.441 | 0.878 | 0.359 | 0.415 |
| GL5 | 0.193 | 0.511 | 0.131 | 0.195 |
| GSC7 | 0.604 | 0.305 | 0.823 | 0.537 |

| | | | | |
|-------|-------|-------|-------|-------|
| GSC8  | 0.827 | 0.321 | 0.911 | 0.751 |
| WMR1  | 0.66  | 0.315 | 0.599 | 0.729 |
| WMR2  | 0.799 | 0.38  | 0.743 | 0.844 |
| WMR3  | 0.791 | 0.332 | 0.547 | 0.823 |
| WMR4  | 0.773 | 0.334 | 0.526 | 0.812 |

Note: GL = Green Logistic, GSC = Green Supply Chain, WMR = Waste Management through Recycling, GE = Green Environment

Furthermore, this study examined the relationship between green logistic, green supply chain, waste management through recycling and green environment by using the PLS inner model which is recommended in literature by several studies (F. Hair et al. 2014; Hair, Ringle, & Sarstedt, 2013; Hair et al. 2012; Peng & Lai, 2012). While examining the inner model, the direct effect of green logistic was examined on green environment. The direct effect of green supply chain was examined on green supply chain. Furthermore, direct effect of green logistic was examined on waste management through recycling. Finally, direct effect of green supply chain was examined on waste management through recycling.

The direct effect of green logistic on green environment found positive and significant with t-value 2.773. The direct effect of green supply chain was examined on green supply chain which is found significant with t-value 10.247. Furthermore, direct effect of green logistic on waste management through recycling was examined. It is also significant having t-value 3.669. Finally, direct effect of green supply chain on waste management through recycling is also significant with t-value 21.751. Hence, green logistic and green supply chain has positive effect on waste management through recycling. Additionally, green supply chain and green logistic also has positive effect on green environment. In this direction, the effect of waste management through recycling on green environment is also positive and significant which has the t-value is 28.017.
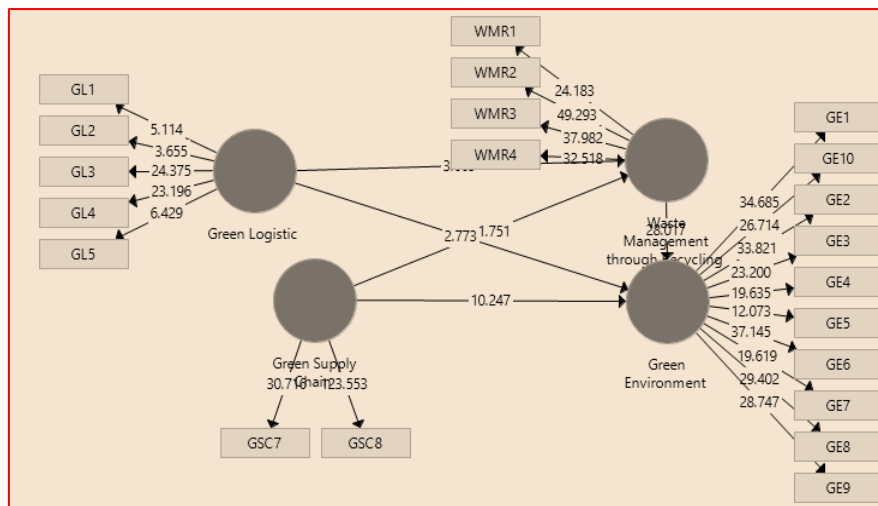


**Figure 4** Structural Model

**Table 5** Direct Effect Results

| | **Beta** | **Mean** | **SD** | **T Value** | **P Values** |
|---|---|---|---|---|---|
| | | | | | |

| Green Logistic -> Green Environment | 0.053 | 0.053 | 0.019 | 2.773 | 0.006 |
|---|---|---|---|---|---|
| Green Logistic -> Waste Management through Recycling | 0.177 | 0.182 | 0.048 | 3.669 | 0 |
| Green Supply Chain -> Green Environment | 0.289 | 0.291 | 0.028 | 10.247 | 0 |
| Green Supply Chain -> Waste Management through Recycling | 0.693 | 0.692 | 0.032 | 21.751 | 0 |
| Waste Management through Recycling -> Green Environment | 0.701 | 0.7 | 0.025 | 28.017 | 0 |

**Table 6** Indirect Effect Results

| | Beta | Mean | SD | T Value | P Values |
|---|---|---|---|---|---|
| Green Logistic -> Waste Management through Recycling -> Green Environment | 0.124 | 0.127 | 0.033 | 3.726 | 0 |
| Green Supply Chain -> Waste Management through Recycling -> Green Environment | 0.486 | 0.484 | 0.03 | 16.31 | 0 |

This study also examined mediating role of waste management through recycling. The mediating role of waste management through recycling was examined between green environment and green logistic. The mediating role of waste management through recycling was also examined between green supply chain and green environment. These results are given in Table 6. The mediation analysis was performed by using the instructions of Preacher and Hayes (2008). Results of both mediation effect is also given in Figure 5 and Figure 6. The mediating role of waste management through recycling between green environment and green logistic is significant with t-value 3.726. The mediating role of waste management through recycling between green supply chain and green environment is also significant with t-value 16.3. Hence, it shows that waste management through recycling reflect the positive effect of green logistic and green supply chain on green environment. The histogram for the mediation effect of waste management through recycling between green environment and green logistic is given in Figure 5. The histogram for the mediation effect of waste management through recycling between green environment and green supply chain is given in Figure 6. Finally, r-square value is given in Figure 3 which is 0.928 for green environment. It shows that all the variables; green logistic, green supply chain and waste management through recycling are expected to bring 92.8% change in green environment. The r-square value explaining the strong variance in green environment
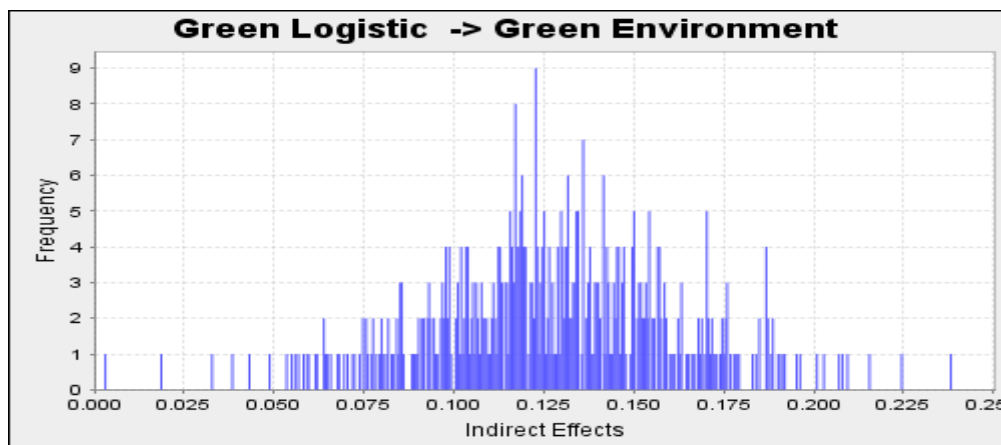
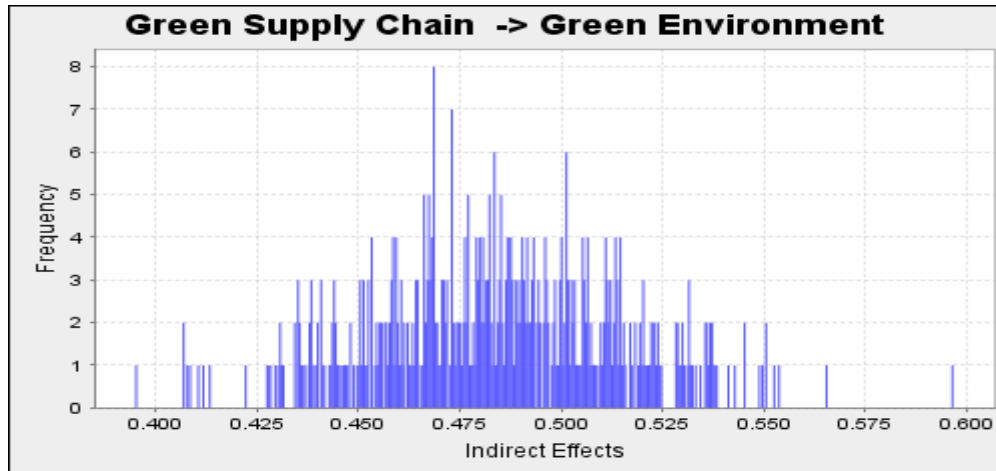**Figure 5** Indirect Effect: Green Logistic -> Waste Management through Recycling -> Green Environment



**Figure 5** Indirect Effect: Green Supply Chain -> Waste Management through Recycling -> Green Environment

## CONCLUSION

This study examined the relationship between green logistic, green supply chain, waste management through recycling and green environment along with the mediating role of waste management through recycling. The purpose of this study was to examine the role of logistics and supply chain management in green environment. Survey questionnaire was used for data collection and questionnaires were distributed in waste management companies of Thailand. According to the results of this study, green environment has key role in the community having significant importance for the human beings. Low environment performance has negative role on human due to several disadvantages. However, to promote green environment, the role of waste management has most crucial. Without the promotion of waste management, the green environment cannot be promoted. Therefore, it is found that green waste management has positive effect on green environment. Increase in the waste management practices increases the green environment. In the process of waste management, recycling is the mandatory part. Recycling must be applied to promote waste management. However, there are two major elements which has the ability to promote waste management. These elements are; green logistics and green supply chain. It is found that green logistic has positive effect on waste management. Increase in green logistic increases the waste management through recycling. Green supply chain has positive effect on waste management. Therefore, increase in green supply chain increases the waste management through recycling. Moreover, waste management through recycling has positive role in green environment. Furthermore, green logistic has direct effect on green environment which shows that green logistic increases the green environment. Finally, green supply chain also has direct relationship with the green environment. Hence, green supply chain has positive effect on green environment. Therefore, green logistic and green supply chain has positive effect on waste management through recycling and waste management through recycling has positive effect on green environment.

### Theoretical Implications

The current study has several implications for the literature because this study tests the unique relationship which is not examined by the previous studies. This study examined the role of waste management through recycling on green environment. Several studies examined the role of waste management on green environment; however, previous studies have not

considered the recycling in relations to the waste management. Furthermore, this study examined the mediating variables; waste management through recycling which is not examined in previous studies. First, the mediating role of waste management through recycling was examined between green environment and green logistic. Second, the mediating role of waste management through recycling was also examined between green supply chain and green environment. Hence, the relationship between green logistic, green supply chain, waste management through recycling and green environment is one of the unique relationships which is examined by the current study and contributed to the literature.

## Practical Implications

The relationship examined in this study and results of the study has several implications for the waste management companies. This study suggested the waste management companies to promote green logistic as the green logistic has the ability to promote green environment. Furthermore, this study suggested the management of waste management companies to promote green supply chain among companies which has major importance to maintain green environment. Furthermore, management should promote recycling to enhance the waste management activities. Therefore, in Thailand, the growing problems of environment can be reduced with the help of green logistic activities because logistic activities are the major producers of smoke which has the ability to decrease the quality of the environment. In this case, the green logistic can decrease the green environment. Hence, the current study providing several insights for the practitioners to increase environmental performance.

## REFERENCES

Adelana, S., Adeosun, T., Adesina, A., & Ojuroye, M. (2011). Environmental pollution and remediation: challenges and management of oil Spillage in the Nigerian coastal areas. American Journal of Scientific and Industrial Research, 2(6), 834-845.

Agyabeng-Mensah, Y., Ahenkorah, E., Afum, E., Agyemang, A. N., Agnikpe, C., & Rogers, F. (2020). Examining the influence of internal green supply chain practices, green human resource management and supply chain environmental cooperation on firm performance. Supply Chain Management: An International Journal.

Agyabeng-Mensah, Y., Ahenkorah, E. N. K., & Korsah, G. N. A. (2019). The Mediating Roles of Supply Chain Quality Integration and Green Logistics Management Between Information Technology and Organisational Performance. Journal of Supply Chain Management Systems, 8(4).

Alananzeh, O., Algiatheen, N., Ryati, R., Albayyari, R., & Tarhini, A. (2017). The impact of employee's perception of implementing green supply chain management on hotel's economic and operational performance. Journal of Hospitality and Tourism Technology.

Aydin, D., & ŞENOĞLU, B. (2018). ESTIMATING THE MISSING VALUE IN ONE-WAY ANOVA UNDER LONG-TAILED SYMMETRIC ERROR DISTRIBUTIONS. Sigma: Journal of Engineering & Natural Sciences/Mühendislik ve Fen Bilimleri Dergisi, 36(2).

Baah, C., Jin, Z., & Tang, L. (2020). Organizational and regulatory stakeholder pressures friends or foes to green logistics practices and financial performance: investigating corporate reputation as a missing link. Journal of Cleaner Production, 247, 119125.

De Jonge, V. N., Elliott, M., & Orive, E. (2002). Causes, historical development, effects and future challenges of a common environmental problem: eutrophication Nutrients and eutrophication in estuaries and coastal waters (pp. 1-19): Springer.

F. Hair Jr, J., Sarstedt, M., Hopkins, L., & G. Kuppelwieser, V. (2014). Partial least squares structural equation modeling (PLS-SEM) An emerging tool in business research. European Business Review, 26(2), 106-121. doi:https://doi.org/10.1016/j.jfbs.2014.01.002

Feng, M., Yu, W., Wang, X., Wong, C. Y., Xu, M., & Xiao, Z. (2018). Green supply chain management and financial performance: The mediating roles of operational and environmental performance. Business Strategy and the Environment, 27(7), 811-824.

Gu, F., Zhang, W., Guo, J., & Hall, P. (2019). Exploring "Internet+ Recycling": Mass balance and life cycle assessment of a waste management system associated with a mobile application. Science of the total environment, 649, 172-185.

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017). An updated and expanded assessment of PLS-SEM in information systems research. Industrial Management & Data Systems, 117(3), 442-458. doi:https://doi.org/10.1108/IMDS-04-2016-0130

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. doi:https://ssrn.com/abstract=2233795

Hair, J. F., Sarstedt, M., Pieper, T. M., & Ringle, C. M. (2012). The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications. Long range planning, 45(5-6), 320-340. doi:https://doi.org/10.1016/j.lrp.2012.09.008

Henseler, J., & Chin, W. W. (2010). A comparison of approaches for the analysis of interaction effects between latent variables using partial least squares path modeling. Structural Equation Modeling, 17(1), 82-109. doi:https://doi.org/10.1080/10705510903439003

Henseler, J., Dijkstra, T. K., Sarstedt, M., Ringle, C. M., Diamantopoulos, A., Straub, D. W., Calantone, R. J. (2014). Common beliefs and reality about PLS: Comments on Rönkkö and Evermann (2013). Organizational Research Methods, 17(2), 182-209. doi:https://doi.org/10.1177/1094428114526928

Ibrahim, I., Sundram, V. P. K., Omar, E. N., Yusoff, N., & Amer, A. (2019). The Determinant Factors of Green Practices Adoption For Logistics Companies in Malaysia. A Case Study of PKT Logistics Group Sdn. Bhd. Journal Of Emerging Economies and Islamic Research, 7(1), 14-23.

Ingrao, C., Arcidiacono, C., Bezama, A., Ioppolo, G., Winans, K., Koutinas, A., & Gallego-Schmid, A. (2019). Sustainability issues of by-product and waste management systems, to produce building material commodities: A comprehensive review of findings from a virtual special issue. Resour. Conserv. Recycl, 146, 358-365.

Jermsittiparsert, K., Sutduean, J., & Sutduean, C. (2019). The Mediating Role of Innovation Performance between the Relationship of Green Supply Chain Management Skills and Environmental Performance. International Journal of Supply Chain Management, 8(3), 107-119.

Johnson, A. R., Baburajan, C., & Sulekha, T. (2020). Anaemia among adolescents: A community-based study using cluster sampling in villages under Sarjapur Primary Health Centre, Bangalore urban district. Indian Journal of Health Sciences and Biomedical Research (KLEU), 13(3), 244.

Kerdpitak, C.,mJermsittiprasert, K. (2020). Influence of Engineering Education and Integrated Quality & Environmental Management on Quality, Firm and Environmental Performance. Test Engineering and Management. 82(1), 3452 - 3463.

Kerdpitak, C., Mekkham, W. & Girdwichai, L.(2019). Effective Waste Management as a Predictor of Competitive Advantage: Mediating Role of Green Purchasing and Logistics. International journal of Supply Chain Management. 8(5), 830-841.

Khaksar, E., Abbasnejad, T., Esmaeili, A., & Tamošaitienė, J. (2016). The effect of green supply chain management practices on environmental performance and competitive advantage: a case study of the cement industry. Technological and Economic Development of Economy, 22(2), 293-308.

Koohathongsumrit, N., & Luangpaiboon, P. (2020). Multi-objective Risk Assessment Management via Zero-One Desirability Programming Model: Thailand-Cambodia Beverage Logistics Solutions. Paper presented at the Proceedings of the 2020 The 6th International Conference on Frontiers of Educational Technologies.

Lu, W., Chi, B., Bao, Z., & Zetkulic, A. (2019). Evaluating the effects of green building on construction waste management: A comparative study of three green building rating systems. Building and Environment, 155, 247-256.

Nabavi-Pelesaraei, A., Bayat, R., Hosseinzadeh-Bandbafha, H., Afrasyabi, H., & Berrada, A. (2017). Prognostication of energy use and environmental impacts for recycle system of municipal solid waste management. Journal of Cleaner Production, 154, 602-613.

Peng, D. X., & Lai, F. (2012). Using partial least squares in operations management research: A practical guideline and summary of past research. Journal of operations management, 30(6), 467-480.

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior research methods, 40(3), 879-891.

Qadeer, A., Saqib, Z. A., Ajmal, Z., Xing, C., Khalil, S. K., Usman, M., Ahmed, S. (2020). Concentrations, pollution indices and health risk assessment of heavy metals in road dust from two urbanized cities of Pakistan: Comparing two sampling methods for heavy metals concentration. Sustainable Cities and Society, 53, 101959.

Räisänen, P., Hedman, L., Andersson, M., Stridsman, C., Lindberg, A., Lundbäck, B., . . . Backman, H. (2020). Non-response did not affect prevalence estimates of asthma and respiratory symptoms-results from a postal questionnaire survey of the general population. Respiratory Medicine, 106017.

Rajaratnam, S. D., Munikrishnan, U. T., Sharif, S. P., & Nair, V. (2014). Service quality and previous experience as a moderator in determining tourists' satisfaction with rural tourism destinations in Malaysia: A partial least squares approach. Procedia-Social and Behavioral Sciences, 144, 203-211.

Ranjan, R., Pathak, R., Singh, D. K., Jalaluddin, M., Kore, S. A., & Kore, A. R. (2016). Awareness about biomedical waste management and knowledge of effective recycling of dental materials among dental students. Journal of International Society of Preventive & Community Dentistry, 6(5), 474.

Srivastava, V., Goel, G., Thakur, V. K., Singh, R. P., de Araujo, A. S. F., & Singh, P. (2020). Analysis and advanced characterization of municipal solid waste vermicompost maturity for a green environment. Journal of Environmental Management, 255, 109914.

Vetter, S. H., Sapkota, T. B., Hillier, J., Stirling, C. M., Macdiarmid, J. I., Aleksandrowicz, L., Smith, P. (2017). Greenhouse gas emissions from agricultural food production to supply Indian diets: Implications for climate change mitigation. Agriculture, Ecosystems & Environment, 237, 234-241.

Yang, M., Fan, H., & Zhao, K. (2020). Fine-Grained Spatiotemporal Analysis of the Impact of Restricting Factories, Motor Vehicles, and Fireworks on Air Pollution. International Journal of Environmental Research and Public Health, 17(13), 4828.