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Bachelor Thesis

"Raising Awareness About Waste Management in Warehouses"

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Preface

Dear reader,

You are about to read my thesis “Raising Awareness About Waste Management in Warehouses”, which was conducted at Yusen Logistics. This research is written as my final assignment for the Bachelor in Industrial Engineering and Management at the University of Twente.

I want to thank Yusen Logistics for the opportunity to write my bachelor's thesis at this global operating company, where I could increase my interest in sustainability and work with people from different backgrounds and cultures. A special thanks to Cedric and Haizhu for their support, feedback, and making my time at Yusen Logistics a meaningful and valuable experience.

In addition to the support from the company, I was also supported by the university. I would like to thank Lin, my first supervisor, for helping me out whenever I had any questions, and Peter, my second supervisor, for his valuable feedback during the final stages of the report.

Finally, I want to thank my friends and family for their support during the last few months. They helped me with struggles, motivated me, and gave feedback when needed.

Hope you will enjoy reading this thesis!

Julian van der Wijk

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Management Summary

This thesis is looking for ways in which Yusen Logistics can increase awareness about waste management practices in its warehouses among employees, aligned with Circular Economy principles. This research identifies the problem statement, current situation, theoretical framework, best practices in other companies, and proposes solutions to increase waste awareness among employees while making sure this can be implemented on a global level. Due to a lack of awareness of this topic, and not having general policies or learning materials about waste management, too much waste is not recycled. To find solutions to raise awareness, the research question is formulated as follows;

"*How can Yusen Logistics raise awareness about waste management practices at their warehouses on a global level, aligned with circular economy principles?*"

To understand the current situation, the company data is analyzed to see what kind of waste is generated. Furthermore, a survey was conducted among employees responsible for waste management on a global level. With this survey, the current challenges and ways to improve the current situation are explored. Finally, a warehouse was visited to see real-life examples and challenges occurring in the warehouses. This thesis continues to focus on existing theories relating to circular economy, waste management, corporate social responsibility, ways to create awareness, how to formulate learning materials, and finally how to measure these outcomes. To understand how waste management is implemented by other companies, a warehouse visit was conducted to find some best practices. Next to this, an interview was conducted with a waste management company, to see how the theory is implemented in real life and find ways on how companies can maximize the impact of waste management. Lastly, a benchmark was made to see how other companies within the same field, logistics, are implementing waste management already.

The thesis addresses the challenges occurring currently at Yusen Logistics by proposing the following key solutions:

- Webinar: a synchronous training session for employees responsible for waste management, ensuring they understand the goals of the project, give insights on the e-learning, and share best practices among warehouses
- E-learning: available to all employees on a global level. This learning focuses on introducing the importance of waste management, implementation in the warehouses by some real-life examples, how they can contribute, and some tips that can be used in the warehouses
- On-site campaign: posters to remind employees of the given learning and give them a platform to talk about waste management and ask their questions
- KPI framework: to measure and monitor the outcome of the deliverables. These are based on global guidelines and help to continuously improve content

Due to limited time, the deliverables could not be fully implemented yet. Therefore, the learners could not give their feedback regarding the learning content, which resulted in an evaluation that was done with the employees responsible for implementing the deliverables. However, to successfully raise awareness among employees, Yusen Logistics should implement the deliverables and measure outcomes to ensure the deliverables are indeed improving the current situation. The key recommendations for this thesis are to translate the e-learning to maximize the number of employees' understanding of the e-learning, measure the outcomes, and use this to continuously improve the content, and lastly, to introduce a waste management campaign to engage employees in this topic.

Due to confidentiality considerations, certain appendices and figures have been omitted.

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List of Abbreviations

Opco(s)	Operating company(/-ies)
MPSM	Managerial Problem-Solving Method
SLR	Systematic Literature Review
CE	Circular Economy
PRM	Product Recovery Management
CSR	Corporate Social Responsibility
ESG	Environmental, Social, and Governance
ISO	International Organization for Standardization
ZW	Zero Waste
ZWTL	Zero Waste To Landfill
ZWIA	Zero Waste International Alliance
KPI	Key Performance Indicator
GRI	Global Reporting Initiative
CSG	Corporate Sustainability Group
PDT	People Development Team

1. Problem Identification

In this chapter, the problem identification is discussed with the company information, how and why the problem was chosen, and what the norm for this project is compared with reality.

1.1 Company Information

Yusen Logistics is a global supply chain logistics company founded in 1955, they provide ocean and air freight forwarding together with warehousing, distribution services, and supply chain management. With over 25,000 employees, they are located in 46 different countries and in 375 cities where they have 650 distribution centers/ offices and nearly 3.4 million square meters of strategically positioned warehouse spaces.

Their brand promise is to 'Create better connections' by applying their mission to become the world's preferred supply chain logistics company – applying insight, service quality, and innovation to create sustainable growth for business and society. This, together with their values of: Connected, Committed, and Creative, they have their vision stated as 'Connecting people, business, and communities to a better future-through logistics' (Yusen Logistics, n.d.).

Furthermore, Yusen Logistics places environmental, social, and governance issues at the center of its management focus; 'In terms of environmental issues, which we recognize as one of the most urgent and important areas' (Yusen Logistics, 2022). They are acting as a bridge and collaborating with various companies to solve social issues, in which they contribute to the realization of sustainable growth. To achieve this goal, they need to work together with their employees. This is the research's focus; creating more consensus among employees on waste management at the sites from Yusen Logistics.

1.2 Identification of Action Problem

As said, environmental issues are recognized as one of the most urgent and important areas at Yusen Logistics. To achieve this goal, the company has to be aware of different aspects of sustainability. One of the aspects that needs to be considered is the waste management at their warehouses. In the current situation, Yusen Logistics is dealing with too much waste that is not being treated in the best way for the environment, and therefore;
'*Waste management/ treatment needs improvement in line with circular economy principles'*.

Their warehouses are located in multiple areas around the world, with different local laws making it very hard to formulate a general guideline on waste management rules. The different operating companies (Opcos) are therefore managing waste based on local laws/ rules. This results in different processes per Opco and no general documentation on waste management.

Furthermore, the available data differs from one location to the other and is therefore not always as reliable as it should be. The way of collecting data is as follows: waste is collected and picked up by a third-party company that processes the waste. This third-party will later send an invoice, where the amount of waste is stated. Therefore, Yusen Logistics has to rely on external contractors for their data input, which makes the data coverage very low.

Another problem causing the waste not to be treated optimally for the environment is the fact that Yusen Logistics has an unclear waste classification. In some warehouses, they consider different types of waste, such as non-industrial and industrial, and in other warehouses there is

no difference made. This makes it difficult to make a general overview since it is unknown what waste they are dealing with in different warehouses.

Lastly, there is a lack of knowledge among the employees of Yusen Logistics about waste management. Since there is no awareness of recycling and due to a lack of training or communication about waste management, employees are not aware of the topic's importance and do not know how to deal with the waste created at the warehouses, other than following local regulations. All these aspects are causing the main effect, summarized in the Ishikawa diagram in Figure 1.

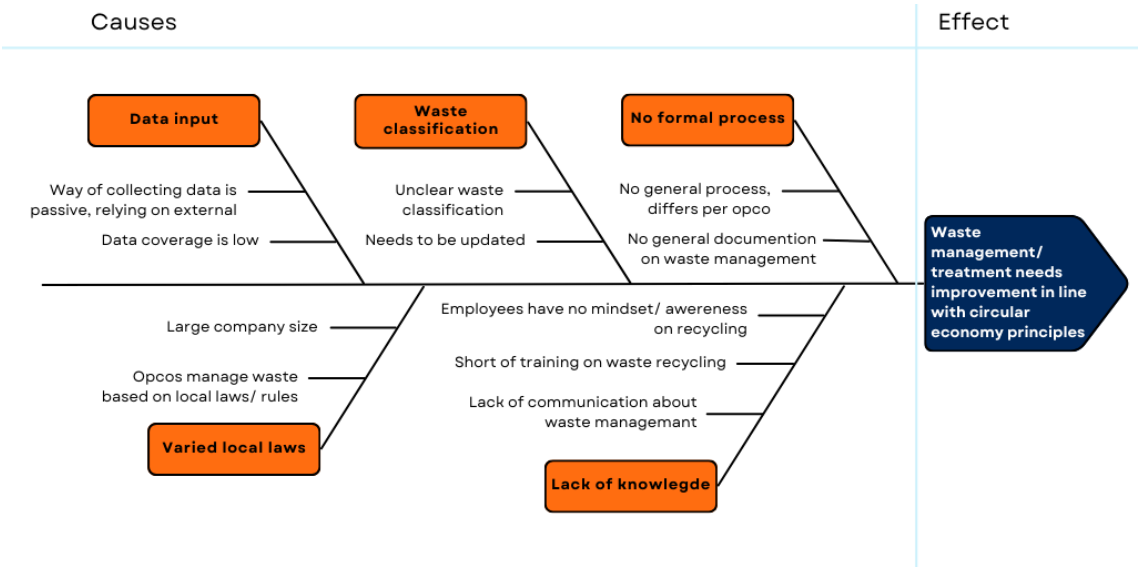

Figure 1 - Ishikawa diagram

1.3 Motivation of Core Problem

Looking at the action problem '*Waste management/ treatment needs improvement in line with circular economy principles*', multiple causes arise as seen in Figure 1. According to Heerkens & Van Winden (2017) a problem cannot be a core problem when the researcher does not influence the problem. Therefore, data input and varied local laws will not be selected as the core problem. The data input is regulated via third-party companies where the data is given, which cannot be changed, and the varied local laws are outside the field of Industrial Engineering and Management. The waste classification is only a small reason why waste management/ treatment needs to be improved and will not have as much effect as other core problems. Furthermore, this problem is again different per region due to different rules.

The remaining two problems are the lack of knowledge and that there is no formal process at Yusen Logistics right now. Heerkens & Van Winden (2017) discussed that in case of finding multiple core problems, the one with the biggest impact should be chosen. An important reason for not having a formal process is that there are multiple locations worldwide that all use their process and that there is no general documentation. Finding a solution to this problem will be, however, very difficult due to different rules in all areas, and might not be doable within the time frame.

The lack of knowledge results from no awareness of the topic, but also a shortage of training and a lack of communication. When raising awareness about waste management, it will be easier to

implement new rules/ processes in warehouses, since employees know why it is important to have those rules/ processes. Furthermore, raising awareness will help Yusen Logistics to sustain better waste management in the future and might help to improve other problems mentioned in the Ishikawa diagram as well. Therefore, the lack of knowledge is selected as the core problem.

1.4 Measurement Norm and Reality

Currently, there is no awareness among employees about waste management practices at warehouses on a global level, aligned with circular economy (hereafter CE) principles. Employees do not follow any learning material or general workflow regarding waste management. Therefore, they do not know the importance of this topic together with CE principles. Without the awareness and right mindset, it is hard to implement new waste management principles.

The norm, or preferred reality, is that the employees of Yusen Logistics will have a mindset and awareness about waste management and see the importance of this matter in their warehouses. When they understand the waste management practices aligned with CE principles, this norm will be reached after introducing new learning materials to employees.

2. Research Methodology

In this chapter, the research methodology is discussed. The problem-solving approach is explained in depth, together with the deliverables and research questions. Furthermore, the theoretical framework and research design can be found in this chapter.

2.1 Research Objective and Scope

This research is focused on raising awareness about waste management principles, aligned with CE principles, in warehouses at Yusen Logistics. The main focus is to get a better understanding of different theories about waste management, CE, and how to raise awareness among employees. The goal is to find a solution to the core problem and eventually partly solve the action problem, where waste management needs improvement in the warehouses.

2.2 Problem-Solving Approach

To improve the awareness among employees at Yusen Logistics about waste management, the Managerial Problem-Solving Method (MPSM) of Heerkens & Van Winden (2017) is used. The MPSM consists of seven phases;

1. Defining the problem
2. Formulating the approach
3. Analyzing the problem
4. Formulate (alternative) solutions
5. Choosing a solution
6. Implementing the solution
7. Evaluating the solution

The first phase, Defining the problem, is discussed in the first chapter. This can be summarized as; employees do not have enough awareness of waste management and therefore the waste management is not in line with CE principles.

The second phase, Formulating the approach, is formulated in this part based on the MPSM phases.

Going forward with analyzing the problem, which is the third phase of the MPSM, the current situation, existing data, and literature should be analyzed. This phase will start with a literature study, to gain more knowledge about waste management, CE, and raising awareness among employees. This newly gathered information will help analyze the current situation at Yusen Logistics. To find the knowledge gap, see what is missing and what aspect needs to be improved. By reviewing the existing data, the current workflow can be analyzed. This data covers how the company deals with its waste in different parts of the world. The data and literature should be compared to see where the workflow can be improved to raise more awareness. Furthermore, a warehouse visit at one of the locations in the Netherlands will be planned in the analyzing phase. With this warehouse visit, a better understanding of the way of working will be conducted, this can be compared to the company's data, and if this is in line with each other. Speaking/ interviewing employees to understand the current situation and what their perception is about waste management, would help to improve the insights on the topic. Lastly, interviewing other companies about their approaches to create awareness on the topic of waste management, seeing what their best practices are, and comparing this with the found literature could help generate solutions for the next phase.

After finalizing the current situation and comparing this with the found literature on waste management, CE, and creating awareness, in combination with the conducted interviews, the formulation of (alternative) solutions phase will be next. In this phase, solutions should be formulated on the gaps found in the previous phase, and how to improve those gaps to create more awareness on the topic. Here, a discussion with Yusen Logistics on what they think is most important to them, what should be in the solution, and what not, will lead to a solution that fits best for the company.

When the company's needs are clear, it is time to choose one of the proposed solutions of the previous phase. When a solution is chosen, feedback will be asked to the company to see whether they agree with the chosen solution and what they would like to see differently. When there is no need for a change, the next phase can start. If there is a need for a change in the solution, the previous phase will be evaluated again to find a more suitable solution for the company. This process will continue, within the time frame of ten weeks, until a preferred solution is found.

If a desired solution is found, the implementation of the solution can start. Putting all found information from the previous steps into practice. There is no need to find new information about the topic in this phase since the information from earlier steps will be used in this phase of the MPSM. An implementation plan will be conducted together with a step-by-step description of all the activities.

The last phase of the MPSM is the evaluation of the proposed solution. In this phase, an evaluation with the company is done, to see whether they are satisfied with the results of the solution. Furthermore, to see what they still would like to see differently, and if the solution is something that they would expect. In this phase, a conclusion can be made on the proposed research to the company, recommendations on further research, and the next steps Yusen Logistics needs to take to further improve its waste management.

2.3 Deliverables

Upon the completion of the aforementioned steps, the following main deliverables will be provided to Yusen Logistics;

- (learning) Materials for employees to raise awareness on the topic of waste management and ways to measure the outcome

To support this main deliverable, the following deliverables will be presented to the company to have a more comprehensive insight into the solution;

- Insights on the different waste management principles and the key elements of a circular economy
- Insights on how other organizations are implementing waste management into their business
- Recommendations on the next steps for raising awareness among employees

2.4 Research Question

Based on the core problem described in section 1.3, and the problem-solving approach, the research question is conducted. The main research question of this research is;

"How can Yusen Logistics raise awareness about waste management practices at their warehouses on a global level, aligned with circular economy principles?"

2.4.1 Sub-Questions

The next set of questions will support finding a solution to the given research question;

1. How is circularity currently implemented at Yusen Logistics?
2. What are the key elements of a circular economy?
3. What are different waste management principles?
4. What are strategies to raise awareness among employees regarding circular economy?
5. How can (learning) materials be designed and developed to increase employees' understanding of waste management?
6. How can the awareness among employees be measured?
7. How do other companies raise awareness among their employees about waste management?
8. How can (learning) materials be formulated for Yusen Logistics?
9. What conclusions and recommendations can be made from the conducted research at Yusen Logistics?

Looking at the different phases of the MPSM, the different sub-questions can be categorized into the different phases of the MPSM as follows;

Table 1 - Sub-question with MPSM

Sub-question	Phase of MPSM
1	3
2	3
3	3
4	3
5	3
6	3, 4, 5, 6
7	3, 4, 5, 6
8	4, 5, 6
9	7

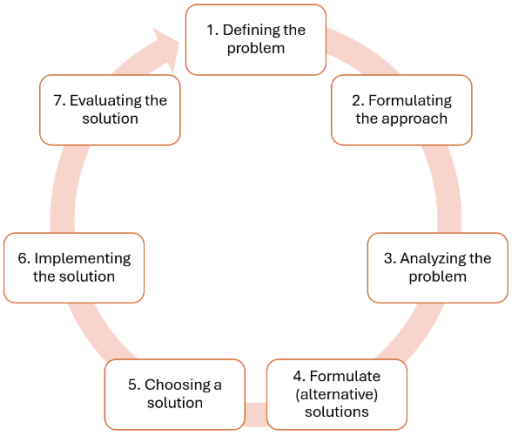

Figure 2 - MPSM (Heerkens & Van Winden, 2017)

2.5 Theoretical Framework

Currently, there is not enough understanding of CE principles or waste management among employees at Yusen Logistics. This assignment aims to gain more insights on this topic and create more awareness among employees. Therefore this thesis will focus on CE principles together with waste management strategies existing in theory. With a systematic literature review, these topics are evaluated and discussed in detail.

Next to the knowledge on the topic, this research will focus on how to create awareness among employees about waste management and sustainability. In Appendix A: Systematic Literature Review (SLR), multiple ways are considered to raise awareness. Education/ learning materials, better (management) communication, and empowering the staff to come up with ideas to change the CE and waste management within the company are the key findings of this SLR.

2.5.1 Key Constructs

For this research, a few key variables are used. Circular economy, sustainability, Corporate Social Responsibility (CSR), and waste management are the focus of the first part of this research. The second part of the research, raising awareness, is explored in the SLR found in Appendix A. The key concepts for this topic are summarized in the conceptual matrix, which can be found in Table A.5 of Appendix A. The key concepts for raising awareness among employees are Employee engagement, Education, Communication, and Awareness indicators.

2.6 Research Design

This section covers how the research is designed. What type of research is used, how the data is gathered and analyzed, and lastly what the validity and reliability are on the research.

2.6.1 Research Guide

For this research, multiple deliverables are presented to the company. The research is divided into three key parts: the circular economy, awareness creation, and exploration/ development of (learning) materials. In the following table, an overview can be found of what and how to achieve the parts needed for the deliverables;

Table 2 - Research Guide

Topic	What to achieve	How to achieve
The circular economy	Overview of current theories on waste management and CE	Literature study
	Overview of the current situation of Yusen Logistics	Analysis of company data, observation in a warehouse to compare data, and an employee survey
Awareness	Existing strategies for awareness creation	Literature study
	How to measure awareness	Literature study
	Current awareness among employees	Interviews
	How do other companies raise awareness of CE and waste management	Interviews, and Benchmark

(Learning) materials	What (learning) materials already exist	Literature study
	Finding the most important aspects for the company	Communication on what is needed in (learning) materials and what is not
	The (learning) materials	According to literature and company needs, make the (learning) material deliverable
	Evaluation of (learning) materials	Communicating with the company and comparing with the literature

2.6.2 Type of Research

Cooper & Schindler (2014) describe that the exploratory, descriptive, or causal research design belongs to the most important design types. When there is not a clear idea of the problem encountered during the research, an explorative study is useful. With this type of research, researchers can establish a clearer concept. It may also be useful when there is a lack of knowledge about the topic the research will be about. The exploratory design is less formalized but can save time and money. In more formal types of research, there is more structure where a hypothesis and research question are formulated. This is also the simplest form of a descriptive research type. In a causal study, there is a search for the correlation between two factors.

In this research, the exploratory and descriptive research types will be used. In the literature phase, new information needs to be gathered when looking for more information about waste management principles, key elements of a CE, and raising awareness. This will be done by exploring new (learning) materials. After the exploration phase, the current situation has to be described by analyzing the data, observing the current way of working in a warehouse, and speaking to employees.

2.6.3 Data Gathering Methods

Multiple ways of data gathering exist, Heerkens & Van Winden (2017) mentioned four examples; observations, interviews, questionnaires, and analyses of primary sources. During this research, all four data-gathering methods are applicable. During the literature review, information about the topic is analyzed from databases. To know what the problem is at the company and where the gap of knowledge is, the primary sources provided by the company are analyzed. However, to get a better understanding of this data, one warehouse will be observed to see how the given data can be linked to the real situation. Furthermore, to get a better image of the awareness, some employees should be interviewed to see where the knowledge gap is and how to improve this for a better solution at the end of the research. When a solution is developed, it should be presented to the company, in this communication approach, feedback will be asked to see if and how the solution can be improved.

2.6.4 Data Analysis Methods

After finalizing the literature study, the new information should be reviewed and selected based on its relevance. When information is relevant to the research, this data should be analyzed in more detail and processed in the report. The descriptive part of the research, observing the warehouse, will be described in the current situation. When analyzing the primary data and the interviews conducted, the data must be quantifiable. Heerkens & Van Winden (2017) describe this

process as operationalization, a multi-step process where the variable is described in indicators. For this research, this can be described as 'knowing how to properly deal with waste'.

2.6.5 Reliability and Validity

According to Heerkens & Van Winden (2017) reliability is focusing on the stability of the research results, in other words, is the outcome for similar research with the same approach conducted at another time still the same. Multiple data-gathering approaches are used to achieve higher reliability for this research. First, some literature will be evaluated, this will be compared with the current situation and available data from the company, and with the interviews conducted with employees. All three aspects should give a comprehensive result.

Validity is more focused on the content of research. Heerkens & Van Winden (2017) gives three different validity potentials. The first one being discussed is internal validity, which is concerned with the research design, measuring instrument formulation, and construction. Here it is important to have a varied research group to make sure the outcome applies to many. Next to this type, there is also external validity. The focus here is to see whether the outcome is useful in different settings. By researching how other companies raise awareness and compare this with literature, the external validity can increase due to the comparison of the results with other situations. Lastly, constructed validity is concerned with abstract concepts. It is important to specify what needs to be measured and how this is defined. In this research, a measurement of awareness should be specified, and how to reach this goal.

2.7 Summary Chapter 2

Chapter 2 discusses the research methodology, focusing on raising awareness about waste management practices in warehouses of Yusen Logistics, aligning with circular economy (CE) principles. The research follows the Managerial Problem-Solving Approach (MPSM) by Heerkens & Van Winden (2017), which consists of the phases: defining the problem, formulating the approach, analyzing the problem, formulate (alternative) solutions, choosing a solution, implementing the solution, and evaluating the solution.

This research involves literature review, company data analysis, warehouse observations, and interviews with employees and other organizations to find best practices. The thesis aims to find the knowledge gap and propose (learning) materials to improve waste management awareness.

The deliverables for this research include (learning) materials, insight on different waste management principles, the key elements of a CE, and best practices from other companies, and lastly recommendations for next steps. The main research question is: "*How can Yusen Logistics raise awareness about waste management practices at their warehouses on a global level, aligned with circular economy principles?*".

To answer this question, the methodology follows an exploratory and descriptive research approach. Data-gathering methods used are: observations, interviews, questionnaires, and analysis of primary sources. By emphasizing reliability and validity, findings are applicable in various situations.

3. Current Situation

In this chapter, the current situation is analyzed to find gaps to improve the core problem, which is the lack of knowledge. This is done by looking at the current company goals for waste management, analyzing the results of a survey among employees about waste management improvement, and a site visit to see the challenges in the warehouses.

3.1 Current Company Policies

In this section, the current company policies regarding waste management are discussed. The information is based on the sustainability report of Yusen Logistics (Yusen Logistics, 2024), and company data.

3.1.1 Current Learning Materials

Currently, there is no global learning specifically focusing on waste management available to all employees. There are some e-learnings related to sustainability topics, but these do not include topics regarding warehouse waste management.

3.1.2 Current Waste Management Goals

In their sustainability report, Yusen Logistics briefly explained waste management. They recognize that waste has a relevant impact on Yusen Logistics since they handle vast amounts of goods and materials. Which contributes to waste generation and resource consumption. To achieve their sustainability goals, they see it as crucial to address these impacts. The Corporate Sustainability Group oversees the management of the waste streams. They are implementing specific actions to minimize waste generation, such as recycling programs and properly disposing of hazardous waste. However, sharing expectations and recommendations regarding waste management is the goal for the upcoming year. Therefore, there is no current goal set for waste management (Yusen Logistics, 2024).

3.1.3 Common Warehouse Waste

The sustainability report mentions that Yusen Logistics is generating both industrial and non-industrial waste from their warehouses, packaging material, and expired cargo. In the warehouses, the focus of this research, this is also mentioned with the most common warehouse waste being Cardboard/ paper, plastics, and wood. Out of all warehouses, 52% are actively reporting the amount of waste produced. From the data source, a total of 17,499,232 kg of waste was produced by Yusen Logistics in fiscal year 2023 (April 2023 – March 2024). Of this waste, 54% was recycled, based on known data.

3.2 Employee Survey

To gain insights into employees' current understanding of waste management and identify opportunities for increasing awareness in warehouses, a global survey was conducted among employees responsible or involved in waste management at warehouses. The survey targeted employees from all regions of Yusen Logistics, except for Japan, which was excluded due to the lack of warehouses. A total of 55 valid answers were collected, and distributed as follows;

- North and South America: 8 responses
- Europe: 21 responses
- East Asia: 10 responses
- South Asia and Oceania: 16 responses

Out of 55 respondents, 72.7% (40 individuals) were directly responsible for waste management. The survey contains a total of eleven questions, from which two yes/no questions, two open-ended questions, two multiple choice questions (with multiple answer options), and five Likert scale questions. In Appendix B: Survey Questions Employees, an overview of questions can be found. In this section, the key results are discussed.

Current understanding

The first part of the survey contains questions regarding the current understanding of waste management among the respondents and whether they think waste management can improve sustainability.

- Understanding of waste management
  - 76.4% rated their understanding as "Good" or "Excellent".
  - All regions showed a majority with good or excellent understanding, however, the South Asia area had the highest proportion of "Poor" or "Neutral" responses.
- Importance to sustainability
  - 92.7% agreed or strongly agreed that waste management is important to improve sustainability, while only 7.3% neither agreed nor disagreed.
  - There was no significant difference between regions.

To understand what aspects are important to waste management according to the respondents, they were asked to describe a good waste management process in an open-ended question. The answers are categorized into six key themes.

- Waste Management Practices (40 responses)
  - Respondents mainly focus on using the R-strategies (Reducing, Reusing, Recycling, and Recovering) and the waste hierarchy
  - Separating waste correctly
  - Make sure to understand the waste produced
- Communication and Visualization (4 responses)
  - There is a need for clear signage and communication about goals
- Environmental and Economic Benefits (7 responses)
  - Proper waste management can bring economic benefits in reducing costs to resources and earning money by selling waste
  - Waste management has environmental benefits
- Performance Monitoring & Continuous Improvement (4 responses)
  - Monitor the waste that is produced and use this as input to improve practices
- Training and Education (3 responses)
  - Some respondents mentioned the importance of training to have proper waste management
- Legal and Company Policy (16 responses)
  - The need to follow legal rules and have a company policy to get a structured way of working

Current waste management practices

Secondly, the survey explored the use of waste management principles and awareness of local rules and regulations.

- Used waste management principles:
  - Recycling: 92.7%, Re-using: 69.1%, Reducing: 61.8%, Landfilling: 23.6%, and Recovery: 18.2%
  - Two responded "other", focusing on local rules and separation processes

- Awareness of local rules and regulations
  - 89,1% of respondents confirmed that they know that their current principles are in line with local rules and regulations.
  - Six respondents with no, including four directly responsible for waste management and five from the South Asia Area.

Training, Communication, and Visualization

The current clarity on training, communication, and visualization related to waste management was reviewed.

- Training
  - 56.4% rated existing training materials as clear or extremely clear.
  - 36.4% were neutral.
  - European respondents were positive, while other regions showed a majority neutral response.
- Communication
  - Respondents were mostly neutral about the clarity of communication goals and policies regarding waste management.
  - Only the European area rated current communication with a majority of “clear”, other areas mostly answered “neutral”.
- Visualization
  - Most respondents rated their current visualization regarding waste management as clear, with Europe again rating this topic as most clear.

Future improvements to raise awareness

Lastly, the survey examined what practices are desired to improve current awareness about waste management. Adding a question where respondents can give suggestions not mentioned in the survey yet.

- Improvement to see in the near future
  - Sharing best practices: 78.2%
  - Waste management campaign to motivate employees: 72.7%
  - Clear and direct communication: 69.1%
  - Regular training for employees: 61.8%
  - Other suggestions: Establish clear European standards, Encourage volunteering, Develop standard minimum rules and visualization, and set global waste practices and goals

Topics added by respondents:

The open-ended question was categorized into five key themes, reflecting on the suggestions that can be used to raise awareness among employees.

- Waste management practices (13 responses)
  - Respondents focused mainly on using better separation policies, and making use of the R-strategies (Reduce, Reuse, Recycle, Recover) of waste management.
- Communication and Visualization (12 responses)
  - There is a need for clear visual guidance to separate waste
  - Communication about goals, best practices, and data sharing
- Compliance & Global Standardization (10 responses)
  - Respondents mentioning the need for company rules relating to local rules, but also company standardization across the globe
  - Supplier selection rules, who can help with achieving the rules
  - Be aware of global policies

- Performance & Motivation (8 responses)
  - Respondents feel that a waste management campaign can help to raise awareness, and that these campaigns should be rewarded
- Training & Education (7 responses)
  - Employees would benefit from a structured training program

3.3 Warehouse Visit

A site visit was conducted to find challenges currently found at Yusen Logistics. The site visit aims to see how waste management is implemented and if challenges are occurring regarding waste practices. The warehouse of Yusen Logistics for this site visit is located in City A, the Netherlands.

The warehouse mainly generated three types of waste: cardboard waste from boxes, plastic waste from packing foil and plastic straps, and wood waste from broken pallets. All other materials are categorized as general waste. The warehouse has separate bins for each waste stream, clearly labeled and placed in accessible places around the warehouse. However, despite the clear labeling, incorrect waste separation still occurs frequently. For example, plastic waste streams are found in the Paper Waste Bin. When this happens, the third-party waste collector notifies the warehouse with pictures of the incorrect separation. To address this, supervisors announce the issue at the start of each shift, reminding employees about waste separation practices.

A challenge in the warehouse focused on waste management arises from the varying packaging requirements of multiple customers. Some customers request paper, while others require plastic tape and/ or additional plastic straps. Similarly, packaging materials differ, some customers prefer recycled plastics, others use paper cushioning, and some reuse their leftover bubble plastic. These differences make it difficult to implement a standardized packaging system, resulting in multiple waste streams. Additionally, cultural preferences play a role, as some prioritize quality over sustainable alternatives. For instance, a cardboard box pinned to a pallet was shown as an example, and how this produces extra waste and extra time to separate.

When looking at waste management, this warehouse mostly focused on making separating easy and simple. Not placing too many bins in one place, minimizing materials being dumped in the wrong bin. The warehouse was separated into different sections, all having a checklist to make sure the sections were managed well. This checklist included some aspects relating to waste management, such as ‘Are waste materials placed in the correct waste bin?’. This checklist was introduced by employees working in this warehouse. Whenever an employee has another idea to improve something in the warehouse, they can hand in an idea, explaining the current situation and how this can be solved. Whenever this idea is implemented, it will be highlighted at the central spot of the warehouse.

This warehouse was already using quite a few ways to reduce, reuse, or separate waste correctly. However, most tips and guidelines were introduced by the third-party waste collector. Before this waste collector helped the warehouse by streamlining the processes, the waste management was far less optimized. This waste collector also trained the staff of Yusen Logistics, making sure the waste could be picked up according to the rules. The employee giving the tour visit also emphasized that they are already implementing some best practices regarding waste management. However, they believe that if there were a platform where they could share this information and also learn from other sites, they would be able to implement even more ideas. This is to make sure not all different warehouses have to go through the same process of finding

ideas for the same problems. It was mentioned that due to the help of the waste collector and their connections to local suppliers of (environmental) products, they can find new solutions. Without these local contacts, they would not be able to find solutions like the ones they are using now. Lastly, it was mentioned that it would be beneficial if there were some guidelines about how waste management can be implemented in different warehouses. These guidelines should be used as input and adaptable to global differences. So, finding a general way for all warehouses, instead of warehouses making individual choices. These guidelines should furthermore be used to start a dialogue with employees working on the warehouse floor, they know best what works for them. By sharing the best practices and giving a small reward, employees are more motivated to find new ways to optimize processes.

3.3.1 Other Warehouse Examples

To ensure that the current situation is not solely based on a single warehouse, additional examples from other warehouse locations were considered. The examples were captured by Yusen Logistics employees during site visits, evaluating waste management practices. These examples show again that separating waste is a big challenge. Multiple waste streams end up in one single waste bin. Another challenge that is occurring in one of these sites, was the use of very similar bins with almost the same kind of posters on them. There is a higher risk of mixing the waste when transporting it to the designated container. Furthermore, in some sites, they do not compact the materials before throwing them into the bin. This results in the bin being filled up quite fast, which also results in more transportation time.

3.4 Summary Chapter 3

This chapter examined the current situation regarding Waste Management in Yusen Logistics, highlighting the key challenges occurring. Currently, there is no structured waste policy, learning, or global goals set regarding this topic. Data coverage remains low, with 52% of warehouses reporting data regarding waste, and 54% of waste, from the warehouses sharing data, is known to be recycled. A survey among 55 employees responsible for waste management on a global level was conducted to find ways to increase awareness about this topic. Even though respondents understand the topic, they acknowledge the importance of having better training, communication, and more standardized practices. A site visit confirmed that incorrect separation still occurs frequently, despite clearly labeled bins. Learning and best practices are mainly introduced by a third-party waste collector, rather than a company-wide strategy. This warehouse visit reveals the importance of having a platform to share best practices to learn from each other. Additional examples of other warehouses revealed again the challenges of separating waste correctly.

4. Theoretical Framework

In this chapter, the theoretical framework is discussed. Concepts about the circular economy, different waste management theories, ways to create awareness, how to make appropriate learning materials, and how to measure outcomes are covered in this chapter.

4.1 The Circular Economy

In the last few years, Circular Economy (CE) has become an important topic regarding global warming and climate change. Managers are challenged to integrate this CE into their business processes, by incorporating sustainability objectives into their operations (Awan et al. 2020). Before the concept of CE became widely used, businesses and researchers explored other strategies to integrate sustainability practices. One of these strategies is Product Recovery Management (PRM), which focuses on recovering as much of the economic and ecological value as possible, where the quantities of waste are reduced. PRM reintegrate returned products efficiently into the supply chain by processes such as repair, refurbishing, remanufacturing, cannibalization, and recycling (Thierry et al., 1995). Each different product recovery process involved the collection of used products and components, and the reprocessing and redistribution of these products/ components. The main difference of the product recovery processes is in the reprocessing phase, but all of them aim to extend product life cycles and reduce waste. Some challenges described by Thierry et al. (1995) about PRM are uncertainty in product return, quality variability, and the complexity of reverse logistics. Additionally, acceptance of recovered products in the market can be a challenge in the consumer perspective.

Thierry et al. (1995) emphasize the importance of on-going research on PRM to provide better insights of the economic benefits for different products and industries. CE is an approach to economic growth that is in line with sustainable environmental and economic development (Korhonen et al., 2018), by creating new business and job opportunities, saving material costs while reducing environmental impact and pressures (Kalmykova et al., 2018). The term CE is however still a concept that is evolving (Velenturf & Purnell, 2021) and therefore not fully implemented or understood by many. This results in companies who are still using the traditional linear model. This model, also known as the 'take-make-dispose' model, is causing serious harm to the environment (Korhonen et al., 2018). It is focused on turning services into products that can be sold, which is very wasteful since it relies on easily accessible resources in large quantities. This process focuses on efficiency, but the finite resources from nature cannot meet the demand. A need for change in the entire system seems necessary (MacArthur, 2013).

Only now society seems to see the need to switch from this linear model, where there is no care for resources or waste produced, to a more circular one. This new kind of model, where practices such as repair and recycling are important, as found in the concept of PRM as well, is being introduced out of concern for the environment (Velenturf & Purnell, 2021). However, it is important to know what this CE model entails. As said before, the term CE is still evolving and many different articles are written about this topic, mentioning slightly other concepts for CE. According to Korhonen et al. (2018) CE focuses on reducing the current production-consumption system, where the use of virgin materials, energy inputs, and waste should be minimized. This is done by using material cycles and renewables-based energy inputs. This idea is in line with the theory of Velenturf & Purnell (2021), where CE is improving resource use by minimizing the extraction of natural resources and preventing waste as much as possible, which is summarized in Figure 3;

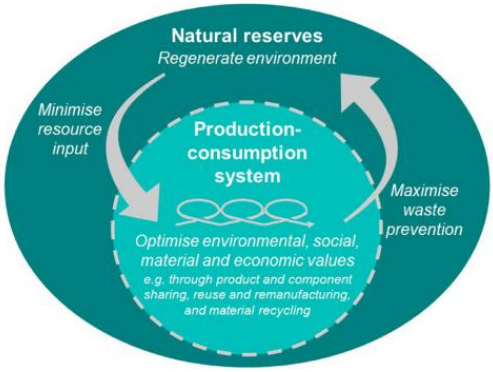

Figure 3 - CE by Velenturf & Purnell (2021)

A widely used and cited concept of CE is conducted by the Ellen MacArthur Foundation, a non-profit organization that is conducting evidence-based research on the benefits of a CE (Ellen MacArthur Foundation, n.d.-b). In the article of MacArthur (2013), this foundation describes CE as a study grounded in non-linear systems, referring to an industrial economy that intentionally is restorative. This system aims to rely on renewable energy and minimize waste and is therefore a system where materials never become waste. This is summarized in their 'Butterfly Diagram' (Figure 4), where they are focusing on two cycles; the technical (blue) and biological (green) cycle. Both cycles have their own goals, where the goal of the technical cycle is to recover materials through processes such as reuse, repair, and recycling, the biological cycle focuses on giving back to nature. Going from the linear 'take-make-dispose' system to the circular 're-enter' economy.

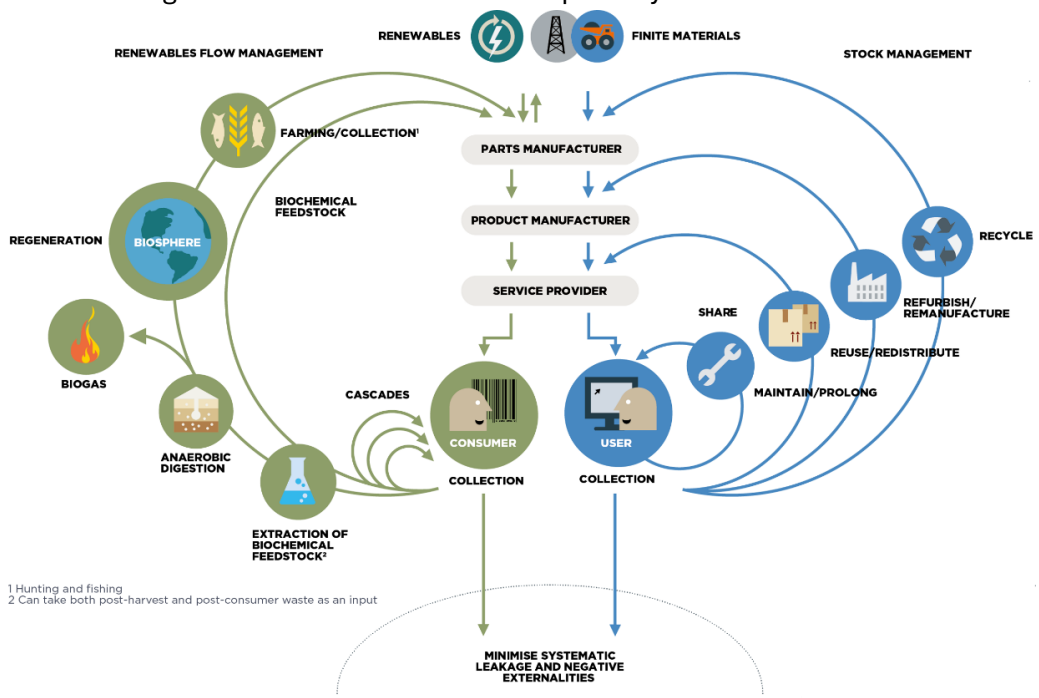

Figure 4 - Butterfly Diagram (Ellen MacArthur Foundation, 2021)

The foundation describes a set of principles for the CE as follows (Ellen MacArthur Foundation, n.d.-a):

- Eliminate waste and pollution:
  In the linear system, raw materials are made into products and thrown away as waste, much of this waste will end up in landfills. The planet's resources are finite; therefore, this system will not work in the long term.

- Circulate products and materials:
  This principle aims to keep materials in use, either as raw materials, components, or entire products. The value of the products and materials stays the same, and they do not become waste.
- Regenerate nature:
  The goal is to support natural processes and leave more room for nature. Waste is something introduced by humans, natural systems have always regenerated themselves.

The CE will stimulate new business opportunities, by saving material costs, since the materials will be reused, and increase employment, people need to be part of this process to work (Korhonen et al., 2018; Awan et al., 2020). Furthermore, CE is a mechanism to achieve stock optimization and waste prevention, by following the 4R strategy: Reduce, Reuse, Recycle, and Recover (Kalmykova et al., 2018). This 4R strategy is also mentioned by Kirchherr et al. (2023), where 221 definitions were analyzed to get a comprehensive definition of the CE. In this analysis they see the CE as a regenerative economic system, where end-of-life concepts should be replaced by reducing, reusing, recycling, and recovering materials. The aim of this is to contribute to sustainable development by creating a positive impact on the environment, economic, and social fields for the future generation. This aim can only be reached when the different stakeholders have the right capabilities and innovations. Velenturf & Purnell (2021) also discussed that CE should contribute to sustainable development by taking into account the environmental, social, and economic aspects. This will contribute to making the linear process less profitable, and therefore less preferable by businesses.

CE offers a new way of developing a circular system, by eliminating the linear production processes to support the sustainable goals, targeting zero waste and pollution. It is a closed-loop system, where materials return in the industrial process or are safely brought back to nature and where resource reduction in production and consumption is one of the goals (Awan et al., 2020; Nobre & Tavares, 2021).

4.2 Corporate Social Responsibility

All businesses make decisions, which have an impact on societies and natural systems, which can be both positive and negative (Ikerd, 2024). Therefore, corporations have a big impact on achieving sustainable development, which does not only focus on environmental goals, but also on e.g. skill training, job creation, or development of their products and services (Ashrafi et al., 2018). The environmental component in sustainable development is the damage caused by companies during production. By investing in environmental issues as a company, companies are often able to improve their reputation and increase their advantages compared to competitors. Therefore, the goals of the company should not only reflect on customers, but should entail opinions from their employees, suppliers, and all other stakeholders who influence goal achievement (Karácsony, 2019).

To make sure companies do meet and respond to sustainable development, the term Corporate Social Responsibility (CSR) was introduced. This is a business model where corporations show their concerns and commitment toward society and go even further than what companies are legally required to do (Ashrafi et al., 2018). Ikerd (2024) further discusses that CSR is a business response to the challenges arising in the ecological and social challenges for managing a sustainable business while focusing on social and ethical responsibilities. The ethical responsibilities focus on, among others, reducing pollution, recycling materials, and reusing

products. This is also discussed by Karácsony (2019), where it is mentioned that some of the most common practices of CSR in business are: waste reduction, selecting suppliers emphasizing sustainable development, and developing environmental standards. It is important for businesses that are CSR managed, that they have sustainable metrics to make their decisions, which can also be referred to as environmental, social, and governance (ESG) (Ikerd, 2024). ESG refers to criteria analyzing productivity, while also looking at the behavior and policies around sustainability. Not only is the environment taken into account, but also the reflection on the corporate managers and if they are transparent in their actions, the governance metric. The environmental metric includes topics such as the company's climate policies, waste management, and energy use. And lastly, the social metric focuses on e.g. employee training and workplace conditions. To verify whether a company is on the right track with its ESG goals, the International Organization for Standardization (ISO) can guide businesses in helping to achieve sustainable and ethical goals (ISO, n.d.). However, businesses that are achieving sustainable goals, have to continuously improve themselves and invest in new opportunities to develop sustainable and ethical business decisions, which will not only affect their own business goals but can also inspire other businesses to do the same (Ikerd, 2024).
CSR can help businesses achieve their goals and have a positive effect on resource reduction, the company's reputation, and social perception (Karácsony, 2019). As mentioned by Ashrafi et al. (2018), this is done even outside the scope of legal requirements. It will benefit the sustainable company in the long run, since unsustainable businesses have to rely on finite resources which will be very competitive (Ikerd, 2024).

4.3 Waste Management

As mentioned before, eliminating waste is an important aspect of the CE. Implementing CSR into the business will also help tackle sustainable challenges arising from production processes. Amasuomo & Baird (2016) describe waste management as the process where waste is collected, transported, and disposed of in the best possible way, which has a limited effect on the harmful side of waste. This should be done by taking the environment as an important factor. Next to environmental benefits, reaching company goals, cost savings, meeting legal requirements, and having a better company reputation, waste management can also improve efficiency by streamlining the processes and workflows (Beazley, 2023). Some waste methods are more preferable over others for certain businesses, some common methods are discussed in the following sections.

4.3.1 Waste Hierarchy

There are multiple ways to deal with waste, the waste hierarchy gives a framework for prioritizing the way of dealing with waste (Nilsen, 2020). This prioritizing goes from the most preferred option to the least preferred option (Zhang et al., 2022).

There are a lot of different ways to describe the waste hierarchy and how the levels are named in the pyramid. Nilsen (2020) describes the waste hierarchy in five levels, where the first level is 'reduce' and should be prioritized first to reduce the use of raw materials and energy and therefore minimize the potential amount of waste. In order of prioritizing, the following steps in this hierarchy are: reuse, recycle materials, incinerate with heat recovery, and landfill (see Figure 5). Barnett et al. (2023) agreed that reducing is the most preferred option in waste management since reducing waste is more sustainable than managing existing waste. Their waste hierarchy is very similar to the previous one, and has the following order from most to least preferred: source reduction, reuse, recycling and composting, energy recovery, and treatment and disposal

(landfilling) (see Figure 6). It can be seen that both waste hierarchies use the same order and (almost) the same terminology. Zhang et al. (2022) mentioned that the waste hierarchy was optimized to fit into specific purposes. It is therefore important to consider that the levels used in the hierarchy apply to the desired situation. They also mentioned that the only minor difference between a CE and the waste hierarchy is that the first concept does not allow waste, while the second one does. The different levels are further explained in the next section.

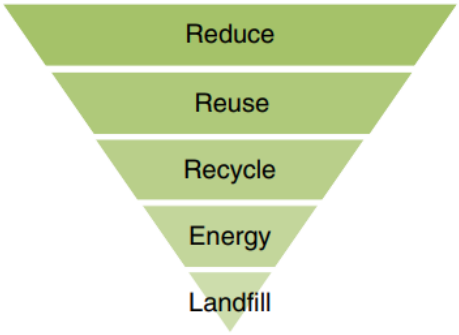

Figure 5 - Waste Hierarchy by Nilsen (2020)

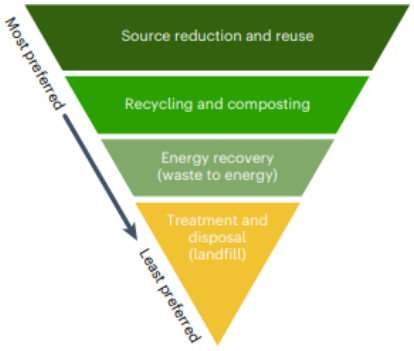

Figure 6 - Waste Hierarchy by Barnett et al. (2023)

4.3.2 R-frameworks

As discussed in both the section of the CE and waste hierarchy, it could be seen that the R strategy is used to reduce waste. These R-strategies are therefore highly related to the waste hierarchy (Zhang et al.. 2022). Sakai et al. (2011) mentioned that the widely used terms of Reduce, Reuse, and Recycle (3R) form the basis of waste management. These three principles are used in the waste hierarchy as well as energy recovery and landfill. This concept further developed into different strategies that vary from 3Rs to 10Rs. Potting et al. (2017) discussed the 10R framework as seen in Figure 7. The framework describes different circularity strategies in order from high circularity (low R-number) to low circularity (high R-number).

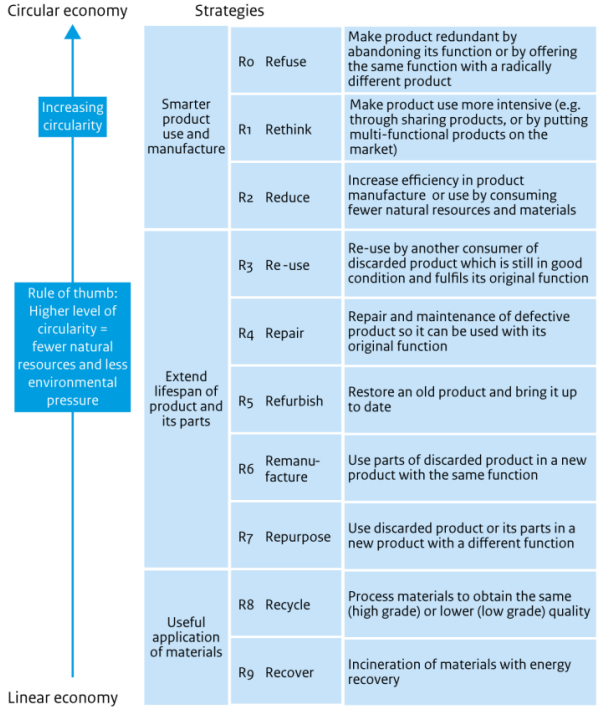

Figure 7 - 10R framework by Potting et al. (2017)

The different strategies are discussed by Morseletto (2020), and will now be further discussed.

R9 and R8 are categorized into the 'Useful Application of Materials' section, which focuses on waste destined for landfill, or burned with heat recovery. This section is normally the most expensive and where the product's original function is destroyed, therefore these are the least favorable in terms of circularity and lowest in the framework.

R9 – Recover – focuses on waste that is not recyclable, but used as an energy source.

R8 – Recycling – is a process that aims to have materials with the same (high-grade), or lower (low-grade) quality of the recycled materials. These recycled, or secondary, materials may be used for upcycling, a process targeting high-grade, or downcycling, a process targeting low-grade if upcycling is not possible. Recycling should be guided to limit the environmental impact and might differ per product. The focus should preferably be a closed-loop system, where the materials stay within the same industry and transportation is avoided.

'Extend Lifespan of Products and its Parts' belongs to R3-R7, which addresses strategies to keep finished goods, or their parts, in the economy as long as possible, and at the same time maintain or improve the value. This section should not limit innovation to products that are more environmentally friendly.

R7 – Repurpose – is finding a different function for parts and making new products. Repurpose differs from the other strategies in this group, since products, or their parts, obtain different functions. It is difficult to set up targets for this strategy since parts can get lost and it is hard to trace them.

R6 – Remanufacture – is using parts of a discarded product as new building blocks for a new product with the same function. The products need to have the same quality as a brand new one, and this strategy is industry-specific.

R5 – Refurbish – will restore an old product and bring it up to date to upgrade the function. Normally, only a part of the product is replaced to bring the product back to the quality needed, or to make it work again as it should.

R4 – Repair – focuses on the repairing and maintenance of a product that failed to have its original function again. This can be done by fixing or replacing broken parts.

R6-R4 are all operating with the company and its affiliated companies and are all aiming to postpone an obsolescence product. A product can be placed in all of the different categories, but can never be treated on multiple strategies simultaneously. Not many goals are set for these strategies since it is hard to predict when and if a product will be broken or has broken parts.

R3 – Reuse – is the second or further use of a product from which the condition is good and can fulfill its original purpose/ function. This can be as a second-hand product, where the ownership is changed, or as a hired/ shared product, where not the ownership but the user is changed. For reuse, it is important that products can be disassembled without taking too much time.

The last sub-section of the 10R framework is 'Smarter products use and manufacture', focusing on R0-R2. This category focuses on products that are already designed and developed. These strategies are preferred above all others to enhance a CE.

R2 – Reduce – is focusing on using fewer natural resources, which results in less energy, fewer natural resources, and less waste. It also focuses on reducing the number of owned products.

R1 – Rethink – is looking at ways to make products use-intensive, but also make other concepts of products that are more in line with a closed-loop system, such as using recycled materials for making products. Rethinking may also focus on easy repairable products.

R0 – Refuse – refers to ways to make the function of a product needless or looking for other products that can replace its function. It can also look for other materials or production options that are in line with a CE. This can be reached by banning certain products harming the environment.

The Waste Hierarchy and the R-framework are related to each other and very similar, and are present in all industries (Nobre & Tavares, 2021). It is however important to have the right focus, strategies that are focused on designing out waste, are more suitable for manufacturing companies, for example. Zhang et al. (2022) placed the different strategies into three phases, the pre-use (R0-R2), use (R3-R7), and post-use phase (R8-R9). These phases should also be taken into consideration when finding suitable strategies for the right focus.

4.3.3 Zero Waste

Zero Waste (ZW) is widely used because it promotes sustainable production and consumption, focusing on the R-framework, and restricting incineration and landfilling (Zaman, 2015). Franco-García et al. (2019) further discussed that ZW solves waste management problems at different production and consumption phases since it seeks to avoid unnecessary materials.

The Zero Waste International Alliance (ZWIA), describes ZW as follows; “The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.” (ZWIA, 2018).

According to the policies created by ZWIA (2014) ZW is achieved when 90% or more of all discarded materials are diverted from landfills. So even when some materials, 10% or less, are wasted, a company can reach ZW goals. According to Zaman (2015) Reaching a 100% diversion rate is impossible in our society's current waste management. The article further discusses that some studies claim to achieve ZW goals even though they use waste-to-energy technologies, where the waste is burned. This is not in line with the definition from the ZWIA.

To help reach ZW goals, ZWIA (2022) conducted a ZW hierarchy, which can be found in Figure 8. This hierarchy works similarly to the Waste Hierarchy, where the most preferred option is on top and the least preferred option is at the bottom. It can be used by all industries, and gives a more comprehensive overview of the 3R framework (Reduce, Reuse, Recycle), to encourage the development of policies starting at the top of the hierarchy.

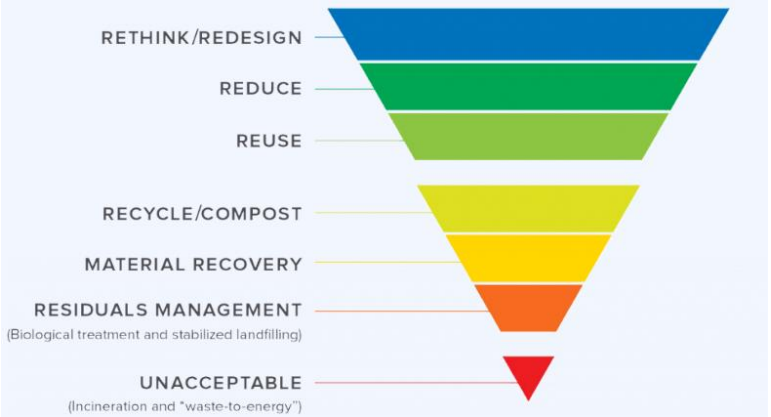

Figure 8 - Zero Waste Hierarchy by ZWIA (2022)

The last two levels are different from the R-framework and are briefly described by the ZWIA (2022) guidelines;

Residual management focuses on why and how something was wasted. The materials should be handled with care to limit environmental impact.

Unacceptable should be avoided at all times, since these wasted materials will harm the environment.

Another practice used a lot is Zero Waste to Landfill (ZWTL). The difference between ZW and ZWTL lies mostly in the focus. In ZWTL at least 99% of the waste should be diverted from landfills, which can be done by the principles of the 3R, but also by energy recovery. The last option, energy recovery or incineration, is not in line with ZW policies (Carbon Trust, 2017).

4.4 Awareness Creation

For companies, it is important to have their employees aware of their goals and how to achieve them. Veleva et al. (2017) describes that it is critical to raise awareness among employees to be able to move to a circular economy (CE). However, employee awareness on this topic is undeveloped and therefore there is a need for better awareness strategies in companies achieving CE goals. Unfortunately, as Veleva et al. (2017) describes that it is difficult to engage employees, managers who should engage their employees are facing their costs and do not prioritize this aspect. On the other hand, employees are the company's best ambassadors for identifying or implementing sustainable initiatives. The importance of involvement, and being aware of the situation, is examined by Kim et al. (2010), where the link between employees' perception and participation is compared. It was concluded that participation was more effective and had a positive outcome on the employee relationship.

CE can either mean very much or very little to people, it is therefore hard to implement one strategy as a company since not everyone is on the same line (Yamoah et al., 2022). However, employees play a crucial role. By having engaged employees who are aware of the situation, it will be easier to implement new strategies and see the importance of a CE not only now but also in the future (Yamoah et al., 2022). Still, a lot of employees are not engaged. However, having a better engagement will result in, among others, improved job satisfaction and meeting the company goals (Veleva et al., 2017).

In theory, different ways of raising awareness about CE principles are described. The most mentioned ones are training and education. 'By educating and training employees, you may develop a trained staff that understands circular concepts' (Mandal et al., 2024, p. 1478). This article further describes that training is an important consideration for a circular business model, not only for the short term but also for the long term. When companies invest in continuous education and training, the employees working in CE concepts are more encouraged to make decisions and innovations. That continuous knowledge is important is also mentioned by Akyazi et al. (2022), due to innovations, it is needed to keep training the staff and building a highly trained workforce. Without the training, employees will not be able to cope with all technologies related to CE. The presence of training is a key aspect of successful environmental management, a company should have the tools and knowledge to give this training and make in the end environmentally responsible decisions (Perron et al., 2006). Therefore, the training program should be available for all employees of a company, to make everyone aware of the positive impacts they can make. Making a difference company-wide, but also what the impacts are and how to reduce and prevent them (Staniškis & Staniškienė, 2019). With this way of working, giving

all the employees awareness about what kind of impact an individual can make, training can motivate employees in environmental activities (Perron et al., 2006). Unfortunately, there is still a lack of knowledge about CE and implementation in a business strategy, but education is a key concept for a positive change in perception and will guide the employees to the right focus point (Emmanuel et al., 2023). The knowledge and awareness about CE can positively change the influence of business leaders/ managers (the hidden culture of a company), but also measure what the knowledge is of the employees by reflecting their actions and behavior (the visible culture) (Yamoah et al., 2022). Veleva et al. (2017) even mentioned that one of the key areas of measuring employee engagement is education. Employees should get feedback about their progress and with this feedback, the company has to reevaluate where the opportunities are for increasing the CE. A last positive point of giving your employees the right education is that employees know the company's goals. When the goals are clear, staff can collaborate on CE questions and start a thoughtful dialogue (Yamoah et al., 2022).

Making sure all employees are aware of the goals of the company, a good communication approach is of great importance. Ongoing communication should be one of the top priorities to improve employee engagement, this does not only make sure employees know what the goals are, but is also a way to provide a new way of looking at CE as a business concept (Veleva et al., 2017). A way to communicate the goals of the company can be an on-site campaign, this is an easy way of communicating your goals fast with a lot of people present (Mandal et al., 2024). A lack of communication can end up in unaware staff and not meeting the CE goals of the company (Yamoah et al., 2022). Besides being aware of the goals, communication can lead to more employee contributions. It is a way for employees to raise their voices and have a platform to exchange ideas regarding the CE. Employees' ideas should always be taken into consideration, and, when applicable, be put into practice and recognized (Staniškis & Staniškienė, 2019).

The ideas that are created by employees with the communication approach, have to be supported by management. According to Yamoah et al. (2022), a lack of management support is a key issue in the circularity transition. There might be no promotion of CE, which can lead to different (personal) values of employees and their managers. Promoting CE within the company and letting employees participate in change processes can furthermore reduce resistance and motivate individuals towards change, as mentioned by Perron et al. (2006). They further describe that employees are of great importance, without them there is a slim chance of a successful outcome. They should be allowed and encouraged to participate in CE initiatives, to have a greater potential. Hosting initiatives for employees to come up with new ideas, with an award program, can also contribute to better awareness. Employees need to have knowledge about the topic to participate, and their awareness will increase. Corporate Social Responsibility (CSR) participation is defined by Kim et al. (2010) as "participative behaviors including having a say in the organization for CSR initiatives". There are multiple ways to empower employees to participate, and three of those ways are explained by Mirvis (2012): the first one is a transactional approach, where programs are developed for employees passionate about CSR. The second one is a relational approach, with this approach companies make, together with their employees, a commitment to social responsibility. The last approach is about development, where the company can fully activate its employees to make an impact. According to Yanginlar et al. (2022), by making use of internal CSR, there will be a positive outcome for employees, where they are urged but also motivated to make business changes. Here, the manager should have confidence about the topic towards the staff and be honest, since this affects the outcomes of the employees.

To know whether the employees are aware of the situation and engaged in the CE goals of the company Veleva et al. (2017) described there should be indicators to measure this awareness. Currently, these indicators often are lacking and not many companies are making use of such indicators. In itself, the indicators will not bring change but are important to raising awareness, and in the end, fulfill the CE goals of the company. Some of these indicators can be described as: empowering, promoting and encouraging teamwork and collaboration, providing support and recognition, and helping people grow/ educate. These indicators are in line with the before-found theory and should be taken into consideration when addressing employees' awareness.

4.5 Learning Materials

One way to increase employee awareness is learning, introducing learning to a large group can be done through e-learning. This type of learning is especially beneficial for groups of working people used as training (Czarnecka & Daróczi, 2017). Nathan (2011) further discusses that this type of learning can be given to people working in different parts of the world, making lower costs for this type of learning due to less travel times or in-class time. It also allows learners to learn more material in less time. Therefore, global organizations recognize that making a standardized e-learning is beneficial in different countries. However, Nathan (2011) discussed that some elements should be taken into account when making globally standardized e-learning. These are: language, cultural elements, and local regulations. According to Peck (2023), before a company decides to use e-learning, the following aspects should be taken into consideration to identify the needs of the company:

1. If there is an opportunity to improve performance,
2. If the problem is worth solving,
3. If the problem is caused by a lack of knowledge (or skills), and
4. If the problem can be solved by practice

If all these aspects are answered with yes, e-learning is a way to tackle the problem by increasing knowledge.

Clark & Mayer (2016) describe e-learning as a tool to support learning where the instructions are delivered on a digital device. The goal of e-learning is to help the learners reach a personal learning goal or improve job performance to reach company goals. One type of e-learning is called asynchronous e-learning, where the learner can take the e-learning individually, at any time, and any location. Synchronous e-learning, or webinars, are given online. Learners can follow the learning in real time but from different places. These types of e-learning are often recorded as well, making it accessible for learners to watch them at their own pace. Within e-learning, there are two different ways to classify them. The first one is focused on information sharing or awareness building, called inform programs. These programs are used, e.g., to describe the organization to new employees, or give an update/ summary on (new) policies and procedures. On the other hand, there is the perform program. This kind of e-learning is used to build specific skills. Companies can choose to use either an inform- or perform e-learning, while others are making use of both aspects to get comprehensive e-learning.

After the decision is made to develop e-learning, the second step is to make an action map, where the main objective is identified. With this action map, the development of a written text-based storyboard starts. This summarizes the main learning activities of the e-learning in text, but also describes how the experience of the learner will be, such as given feedback. In this part of development, feedback from different stakeholders can be easily implemented and should be taken into consideration before going to the next phase. This next phase is making the design,

where the layout is presented. In this phase, it is important to make slides that are quite similar in layout. In this way, it will be easier to adapt when getting feedback. Moving on to make a prototype of the e-learning. This prototype mirrors how the e-learning would look in real life, to see if there are any issues with interactive tools. The last step is developing the final product, after getting approval from the prototype. Every interaction should be tested, by multiple people, to minimize the chance of having non-working interactions when the e-learning is live (Peck, 2023).

Continuing with the content that is presented, Clark & Mayer (2016) mentioned that the information shared in e-learning should be evidence-based. Meaning that it has to be based on research. Furthermore, it is better to use a conversational style of writing over an academic way of writing, in this way, people learn better in e-learning environments. When giving feedback, this should be in a polite way, and it is better to give explanations rather than corrective feedback. This kind of feedback helps the learner understand how to proceed with the task in the right way. Praising learners for correct answers should be minimized as well. When introducing several different concepts within one e-learning, it is better to break up these topics into different sections and chapters, this gives a better overview to the learner and what is expected from them.

Clark & Mayer (2016) further discussed some ways to take into consideration when designing e-learning, focusing on both some pitfalls to avoid and some principles e-learning should contain. These points are discussed below.

To make e-learning and design it, Clark & Mayer (2016) mentioning some features to take into account:
Customized training - Making it possible for learners to go through the learning at their own pace, e.g., going through the platform and navigating on personal needs.
Engagement in learning - All learning requires engagement. This can be done by clicking on boxes, selecting the right answer, or using text during a webinar.
Multimedia - Learning is more effective when combining words and graphics, called multimedia. Words are written text, graphics are e.g. photos, charts, or drawings. When learners can connect text and graphics, they are more likely to understand the topic.
Acceleration of expertise - E-learning can provide learners with the ability to tackle real-life problems and learn how to solve them in minutes instead of days.
Add sufficient practice - When the goals are not reached, identify gaps, reevaluate the learning, and add learning when necessary.
Mirror the job - Skill building for job-specific tasks requires real-life examples.
Provide effective feedback - An incorrectly answered question is a teaching moment, this helps reach the right mindset.
Distributed and mixed practice among learning events - Rather than giving learning at one time, it is recommended that learning should be distributed in multiple events. This can be done by media, extending the learning over time.

Lastly Clark & Mayer (2016) describes some pitfalls when making e-learning, listed below, which should be avoided.
Too much of a good thing - It can be tempting to use several different elements, such as animations or pictures, to support your content. However, people can only process a limited amount of information when given instructions, so less is often better.

Not enough of a good thing - In contrast with the previous aspect, e-learning can also contain too few features to promote context. They may contain a lot of visuals, but no engagement, and will lose the attention of learners.
Losing sight of the goals - Not evaluating the outcome of the training, makes it hard to see whether the organizational goals are reached.
Discovery learning - A non-structured e-learning, where learners do not have guidance about what to learn. This can be overwhelming and they might overlearn the concept.
E-learning with extraneous words - Using too many words and large text might lose the interest of learners and result in poorer results
E-learning with extraneous graphics - Using too many (unnecessary) graphics can be distracting, they can interfere with the attempt to understand the concept.

4.6 Measurement

Three indicators are important for raising employee awareness. These are (continuous) learning, communication, and engagement. It is, however, important to be able to measure these indicators. All organizations measure their performance (Parker, 2000). Parker (2000) discusses that organization measure their performance for several reasons, including: identifying success, showing if improvements work, making decisions based on facts, and helping understand their processes. Ishaq Bhatti et al. (2014) further discussed that performance indicators are used to measure, compare, and manage overall performance by defining physical values. These indicators can be used for performance measurement, where organizations can ensure they are in the right direction, achieving targets, and controlling the overall organization. There are several fundamentals described by Parker (2000) to ensure a good outcome of the performance indicators. First of all, the performance measurement should be in line with the organization's strategy. There must be a focus on those topics that are most important, therefore the measures must be selective and in line with the organization's vision, mission, and strategy. Secondly, there must be a commitment to the measurement. This means that management should fully support the measurement, to give helpful information. The lower-level employees should understand and be committed to the measures. When the measurement is used to improve performance, the lower-level employees need to know what is expected from them. Management should communicate the measurement and what it entails. Therefore, the measurement should also affect the performance. The link between behavior change and measurement can be direct and should entail performance.

Performance measurement is also used to compare different organizations in the industry (Ishaq Bhatti et al., 2014). A way of determining how well an organization is performing compared to other, external, organizations, is described by a benchmark (Parker, 2000). Besides the other performance measurements, this can give a good overview of "best practices" of other organizations. Performance measurements are normally tracked over time and show how quickly performance improves, but not the overall performance. This is when a benchmark is beneficial, to compare the overall performance. Organizations should not only rely on these benchmarks since it might be that other organizations are already improving.

When starting a performance measurement, first some key performance indicators (KPIs) should be established to have a better view of the process (Ishaq Bhatti et al., 2014). The Specific, Measurable, Attainable, Relevant, and Time-bound (SMART) method is used to assess the relevance of used KPIs. This method is a widely used concept to make this assessment, according to Ishak et al. (2019). This article further discusses that not all goals will obtain all five criteria,

however, it is used as a guideline for developing more achievable goals. The different SMART goals are defined as follows (Macleod, 2013):

Table 3 - SMART explained

Specific	The goal is tangible and understood by everyone
Measurable	Objectives should be quantifiable
Attainable	The goal should be achievable
Relevant	Align with values and objectives
Time-bounded	The goal is set for a certain time frame

Based on the theory of awareness creation strategies - (continuous) learning, communication, and engagement - different KPIs should be established for awareness about waste management, together with KPIs for the waste management itself. As found before, ISO can be used as a guideline to measure whether a company is on the right track in its ESG goals. These measures are summarized in ISO (2024), ESG implementation principles. Another organization helping businesses measure their impact is the Global Reporting Initiative (GRI), helping businesses take responsibility for their sustainable impact (GRI, n.d.). Both organizations are widely used to measure sustainable performance.

4.7 Summary Chapter 4

In this chapter, several concepts are discussed. Starting with the CE, this concept promotes sustainable development by minimizing waste and resources, while incorporating concepts such as reuse, recycling, recovering, and repair. CE stimulates new business opportunities and will be more beneficial in the future than current linear business processes. Implementing those strategies and making decisions have an impact on societies and natural systems. CSR is a business model where corporations show their concerns and commitment towards these impacts. With a CSR business model, the metrics of ESG can guide companies toward reaching their goals and continuously improving themselves. Making use of this business model will help to tackle sustainability challenges, such as waste management. This is the process where waste is collected, transported, and disposed of in the best possible way with limited effect on the environment. Waste management can have a positive impact on cost reduction, company reputation, streamlining processes, legal aspects, and reaching company goals. The (zero)waste hierarchy and R-framework are tools to reduce waste. Emphasizing the importance of waste reduction and the harmful effects of dumping waste improperly. However, to reach company goals, it is important to have a highly trained staff. Employees should be aware of waste management and company goals. A key awareness strategy is education, and continuous learning, combined with strategies such as communication, and engagement. Where management support is of great importance to promote the challenges. Developing e-learning material can reach a great audience of your employees when deployed globally. Effective e-learning design incorporates, among others, multimedia, engagement activities, and real-life examples. Lastly, it is important to measure the outcomes of awareness creation. This can be done by KPIs and ESG goals as written in ISO and GRI. By making use of these metrics, performance can be measured in a SMART way, which can also be used to see how one company performs compared with others.

5. Best Practices

To establish awareness creation for Yusen Logistics to raise awareness, some best practices are explored. First of all, a warehouse visit was conducted to explore opportunities to reduce and manage the waste properly. Next, an interview was conducted with a waste management company, to understand how waste management practices are implemented in real life. Lastly, a benchmark of different logistics companies was made, to find common practices.

5.1 Warehouse Visit Best Practices

A warehouse visit was conducted to understand best practices and how to implement ways to reduce waste and create awareness. This warehouse visit was conducted at the warehouse of Company Y, at Schiphol. Some key aspects of the visit are discussed in this part.

The first aspect of this warehouse visit was the communication approach to their new policies. Whenever there is a new policy, including the ones relating to waste management, this new policy will be communicated in two ways. First of all, at the entrance of the warehouse, the common entrance, employees can read news and updated policies. Whenever a very new policy is introduced, they will make use of a small alarm light emphasizing the newest policies. This light was introduced to draw the attention of the employees. After the introduction of the light, they discovered that more employees were aware of new policies. Secondly, in the first two weeks of a new policy, team leaders took five minutes to briefly introduce the new policy at the beginning of every shift. In this way, they could easily see whether everyone read and understood the new policy.

At the same place, at the warehouse entrance, employees could hand in ideas about improvement points for the warehouse. This includes ideas for sustainability aspects such as waste management. Every week, they considered all ideas to see which one could benefit the warehouse the most. The idea that was chosen is highlighted in the weekly announcement with the people who came up with it. They saw an increased number of ideas when introducing this highlighting section in the weekly announcement, and more awareness of this idea collection point.

To make sure the waste is correctly disposed of, the warehouse has multiple signs on what materials should go in which bin. An example of this is that at some point they received quite some fines from their recycling pick-up company, for not separating different kinds of plastics in the right way. They introduced two different kinds of bins for the different types of plastics, in their case these were ‘straps and colored foil/ plastic’ and ‘transparent foil/ plastic’. On these different bins, they placed pictures of the different types of plastics with, for example, the phrase ‘ONLY, Transparent foil/ plastic’. When these new bins with pictures were introduced, they announced this at the entrance with the light and in the briefing sessions before the new shift, and realized a decrease in fines. This clear and easily understandable communication material was not only used for the plastic bins but also for the paper/ cardboard bins and the chemical waste disposal station. Without too much text and a clear picture, it was explained what kind of waste should go in what bin. This resulted, as mentioned, in fewer fines, but also in less waste placed in random places due to employees who did not know what to do with the waste.

A last practice, which is focused on the reduce and reuse strategies of the R-framework, is the introduction of reusable boxes. These boxes are shipped from Japan to the warehouse with materials and are foldable. The materials are unloaded from the boxes, and these boxes can be stored folded in the warehouse for shipment back to Japan. Not only are the boxes themselves reusable, but also the bands keeping the boxes in place can be reused again. With this introduction, they minimized single-use boxes and bands. Another reusing practice they introduced was regarding the packing list. Normally, they would print a label for the address on a sticker and a separate piece of paper for the packing list, which is added to the box for the client. They saw an opportunity to limit the paper usage, to print the packing list on the back of the sticker of the address. In this way, they only had to print one piece of paper with both functions.

In general, this warehouse had quite a few innovative ideas to reduce waste. It was clear that the right communication and engagement activities helped in developing more awareness and a better understanding of waste separation.

5.2 Interview Waste Company

To better understand waste management practices and challenges in companies, a semi-structured interview was conducted with a company specializing in waste management. The company where this interview was conducted is Company Z, this company collects, processes, reuses, and recycles waste. They offer this service to different kinds of companies, making use of the zero-waste strategy. They would like to be involved in minimizing the general waste, focusing on recycling, one of the last R's. The respondent is the Resources Manager at Company Z focusing on CE principles. An overview of the question can be found in Appendix C.

As said, the company is trying to minimize general waste. When the waste cannot be processed anymore, and all recyclable materials are separated, it goes to the incinerator. Here the waste is used for energy recovery. As discussed earlier, recovery is the least preferred option in the R-framework, the respondent mentioned this as well:

"It is not good, but is the best of the worst solution."

However, this principle is still preferred over landfill and it would be best to go higher up the R-framework, to reduce the use of materials and resources. The recycling of, among others, paper, is nowadays money-making instead of a cost source. It is not much, but according to the respondent, it is worth taking a look at this while making a business case.

The reduction of general waste is also a challenge in warehouses as mentioned in the interview:

"Our main goal is to have as many waste streams that can be recycled to take out of the general waste. And that is also the company's responsibility."

It was mentioned that the separation process should be taken seriously. The company should look at its operations, where the waste streams originated, and what process belongs to which part of the waste. When this is known, companies can decide what kind of bins they should use, such as paper, plastic, or wood. According to the respondent, warehouse waste mostly concerns these types of waste, paper/ cartons, plastic, and wood. Normally, with waste from households, the general waste goes through a sorting facility where the last recyclables are taken out, this is a

government-sponsored program. For companies, this is too expensive so the waste has to be correctly separated beforehand.

Another challenge that may arise in warehouses is the mentality towards waste management. Without the right mindset, it will be hard to get recyclables out of the general waste:

"If you have a lesser green heart, a lesser circular mentality, then you think, I will throw it in the general waste. That is the easiest, that way you have the least thinking process."

Next to this mentality challenge, people working in warehouses might have different cultures, nationalities, and languages. This makes it hard to find a way for all employees to be willing to recycle, or separate the waste:

"For warehouse waste, the challenge is to have working people on the floor to have a way to separate that works for them. That it is very easy to separate, that it can be easily collected as well."

Lastly, data collection and new technologies are also seen as a challenge. Companies are making sustainability reports, for which they need data. Normally waste is weighted, but this does not always work. It can be done by a chip inside the truck picking up the waste, however, the respondent mentioned:

"It is a chip that has to go through the back of the truck, and then so it is still a bit of a relative discovery and we can fill in the blank with it. Let's say an estimation of how much it has weight."

Not a lot of new techniques exist in waste management. There are some experimental techniques, which are only starting to go to small plants. However, it is still waiting for the "*holy grail"* for recycling, e.g. plastics.

Finally, ways to raise awareness were discussed. First of all, the biggest challenge is the separation process of waste. One way of making this process easier, as the respondent mentioned, is letting your employees know what was found in the general waste that could have been recycled. The waste company does this as follows:

"Once a year we do a check where we go through your general waste, really physically go through the general waste and see what is in there. You always see a lot of stuff that still can be recycled."

This can be a bit confronting, but does help to see your current situation. The company continues to take pictures of those waste streams, making a suitable poster for the warehouse to remind employees to separate the waste. The poster should have understandable text and pictures. Visualization is also key in separation. Making large billboards at the recycling stations, with e.g. an arrow to the right bin and the correct language. A whole story in a newsletter will, according to the respondent, not always be read, so it should be *"short and sweet"*. Lastly, color coding can help to make separation easier, making for every waste stream one color.

The respondent further explained the importance of education. A company should take its employees step by step through the process of separation, to make sure everyone knows what should be done. How this education is done and in what format, is up to the company, what fits

them best. The company should know its staff and what they are capable of. As long as you take on one thing at a time:

"If you really try to implement everything that is possible, they will be flooded. So go from general waste separation first, the easy things, and then go a little bit further each time."

5.3 Benchmark on Waste Management

A benchmark was conducted, as found in Table 4, to help understand how other logistics companies set up targets for waste management, how they raise awareness about the topic, and how this compares with Yusen Logistics' current practices. The information used for the benchmark is found in the most recent sustainability report from the respective company (CMA CGM, 2023; DHL, 2023; DSV, 2023; Kuehne+Nagel, 2023; Nippon Express, 2024; Yusen Logistics, 2024).

Table 4 - Benchmark Waste Management

Company	Yusen Logistics	DHL	DSV	Nippon Express	Kuehne Nagel	CMA CGM Group
Number of Employees	25,358	~594,000	~75,000	74,438	80,938	146,040
Operating Area	Worldwide	Worldwide	Worldwide	Worldwide	Worldwide	Worldwide
Waste Mentioned in Sustainability Report	Yes	Yes	Yes	Yes	Yes	Yes
Waste Management Target	N/A	Avoid waste and digitize processes	Total recycled waste: 53%	1% reduction of industrial waste	Zero waste to landfill by 2030	Zero waste to landfill in some sites
Waste Management Strategy	N/A	Recycling, CE Promotion	Waste Hierarchy	3R (Reduce, Reuse, Recycle)	Reduce, Reuse, Recycling	Sorting, Recycling, and Recovering
Waste Separation Practices	N/A	N/A	Sorting schemes for: paper, cardboard, and Plastics	Focus on sorting paper	N/A	Focus on: paper and cardboard, plastic, and metal
Data Monitored by ISO and GRI	Yes	Yes	Yes	Yes	Yes	Yes
Training/ Awareness on Waste Management	N/A	Training combined with an environmental protection program – all employees	N/A	In-house training, training for all employees	Communication campaign to increase waste awareness	Waste topic included in CSR training, challenges to reduce impact, strengthen impact on waste collection – job specific
Leadership around Waste Management	N/A	N/A	A sustainability board supporting activities around waste management	Training for responsible operators	Continuous improvement experts to support initiatives	N/A

From the sustainability reports, it can be seen that all companies, except Yusen Logistics, have a specific waste management target. Most companies are reaching this goal by implementing CE principles and waste management practices, such as Reducing, Reusing, and Recycling. By focusing on separation practices, such as sorting schemes and specific warehouse waste, the companies are reducing the waste sent to landfills. Furthermore, most companies use a specific waste management e-learning or communication campaign to increase awareness. Lastly, almost all companies have management employees responsible for supporting initiatives. As seen at Nippon Express, responsible operators get training focused on waste management to be able to answer questions.

6. Proposed Solution

Based on the answers to the employee survey in Chapter 3, the theory in Chapter 4, and the best practices from other companies in Chapter 5, different deliverables are proposed to raise awareness about waste management among employees, which are presented in this chapter.

6.1 Proposed Waste Management Theory

Taking into account the findings from the employee survey, 23.6% of the warehouses that participated in the survey are still sending their waste to landfill. This is, according to the discussed waste management theories, the least preferred option due to the negative impact on the environment. This makes it clear that waste management is needed to lower this number. Furthermore, when looking at the order of most used principles according to the survey in the company, this is not in line with the order of preference of waste theories. The order of used principles is currently: Recycling, Reusing, Reducing, Landfill, and Recovery

After evaluating and proposing multiple waste management principles, the traditional waste hierarchy was found as the most suitable principle for Yusen Logistics. The order of this hierarchy is: Reduce, Reuse, Recycle, Recover, and Landfill. This hierarchy does include landfills as the last necessary resort, while the Zero Waste (ZW) hierarchy focuses more on the Rethink and Redesign and sees landfills as not acceptable. The ZW hierarchy is less appropriate to Yusen Logistics due to its focus on product design. Since Yusen Logistics does not manufacture its products, but serves as a logistics company receiving and sending products from and to customers, they have no direct influence on the design phase. This can also be seen in the benchmark, where other logistics companies are using the hierarchy or parts of this hierarchy.

The R-framework further explains the importance of selecting the right strategies for the business. For Yusen Logistics, these are from most to least preferred: Reduce, Reuse, Recycle, Recover, and Landfill. Making it possible to Reduce waste where possible, e.g., the amount of single-use materials used as packaging, as seen as a best practice in the warehouse visit. Or to Reuse materials in another part of the warehouse. In the interview with a waste company, it was mentioned that it is important to have correct separation practices to be able to recycle as much as possible and get as much waste out of the general waste as possible. In this interview, it was also mentioned that Recovery for general waste is still a better option than Landfill, and can generate energy from waste. Lastly, Landfill is explained to be the very last resort and that it should be minimized whenever possible.

In conclusion, the hierarchy being used for Yusen Logistics can be found in Figure 9, the explanations for the different strategies are listed in Table 5. These explanations are simplified versions of the ones found in literature, to make sure all employees can understand how to use and implement the strategies.

Table 5 - Strategies Explained

Reduce	**Use** and **buy fewer materials**, use only materials that are really needed.
Reuse	**Use** the product/ material **again** without any processing.
Recycling	**Collect** and **process** waste materials **separately** and turn them into **new products**.
Recover	Generate **energy** from general (non-recyclable) waste.
Landfill	**Very last resort**, and should be avoided whenever possible.

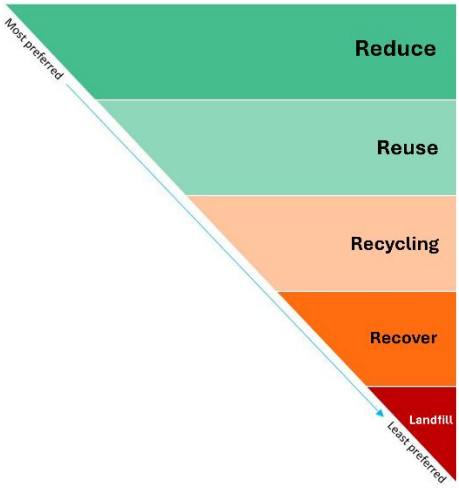

Figure 9 - Proposed Waste Hierarchy for Yusen Logistics

6.2 Proposed Learning and Communication Materials

The key finding in raising awareness is education combined with proper communication about company goals. In this section, the deliverables for learning and communication materials are presented. In the employee survey conducted to understand the current situation, it was analyzed that most respondents believe that training and education, clear communication (about goals and best practices), visualization, and standard rules/ monitoring globally will lead to better awareness. These inputs are used to propose some materials to Yusen Logistics.

6.2.1 Webinar for Management

It was found that CE can only be reached when all stakeholders have the right capabilities. This requires companies to involve employees and integrate CSR principles, including the development of environmental standards and an emphasis on sustainable development.

According to the theory discussed, companies need to mention the company goals to successfully raise awareness among employees. Managers, in this research these are the managers responsible for waste management, have a critical role in achieving this objective. By having the right knowledge on the topic, managers can engage their teams and have a positive change in influencing the business. A lack of management support can lead to no CE promotion, resulting in different values between employees and the company's goals. Lastly, by communicating goals, a platform is created to exchange ideas regarding CE concepts. As seen in the benchmark, Nippon Express is training the responsible operators for waste management to make sure operations go according to company policies.

To make sure that the managers responsible for waste management are aware of the deliverables about creating awareness about waste management among employees, a webinar will be given. A recorded webinar is a synchronous e-learning, where learners follow the learning in real-time but from different places, making it fit for this management presentation since the webinar will be given to all regions across the world. The webinar will mostly focus on sharing ideas and awareness building about waste management, making the webinar an inform program.
This webinar contains the following information:

- An introduction about the importance of proper waste management and why/ how there is room for improvement on this topic at Yusen Logistics. This part includes some real-life examples from the warehouses of Yusen Logistics and a summary of the results of the employee survey conducted to review the current situation.

- An overview of the upcoming e-learning (which will be discussed in section 6.2.2). Managers will be introduced to the learning content to ensure they can support employee questions related to waste management.
- Some best-practice sharing of practices implemented by warehouses regarding waste management, to improve internal communication and help each other out to find new ways to improve waste management together.

The webinar contains engagement activities, such as feedback questions and quiz questions. According to theory, this is an important aspect that should be included in e-learning. Furthermore, Multimedia will be used to explain the concepts in words and pictures, based on real-life examples.

6.2.2 E-Learning All Employees

Managing a business according to CSR does not only mean that companies should focus on environmental goals, but also on skill training. This is the social metric from ESG, focusing on employee training. Training and education have been found as one of the most mentioned key concepts in theory to raise awareness among employees. Having an educational program is therefore a key aspect of successful environmental management and should be available to all employees. Learning is also a way to engage employees more, but without the right knowledge about the topic, employees will not participate. The benchmark shows that multiple companies within logistics companies are making use of learning to educate their employees about waste management practices.

In theory, it was suggested that a company needs to consider four aspects when deciding to implement e-learning. When all aspects are answered with yes, implementing e-learning is the right way to increase knowledge. The following aspects need to be taken into account:

1. **Opportunity to improve performance:** yes, correct waste management implementation can minimize waste.
2. **Problem worth solving:** yes, as identified in the current situation, some sites are still dumping their waste into landfills or separating incorrectly, negatively affecting the environment.
3. **Problems caused by lack of knowledge:** yes, there is currently no global learning material on waste management.
4. **Problem solvable by practice:** yes, employees can apply learned material to daily warehouse practices.

Since all aspects are considered with yes, educating employees can be done by e-learning. Furthermore, e-learning is mostly beneficial when given to a large group in different countries. This is an effective way for Yusen Logistics since their employees are based in all parts of the world. The e-learning will be asynchronous, making it possible for employees to take the e-learning individually, at any time, and any place.

The main objective of the e-learning is to increase knowledge about Waste Management, rather than implementing new rules or policies, and ultimately lower the amount of waste in warehouses. By including practical examples to cover the theory in the warehouses. The design will be similar to other e-learnings from Yusen Logistics, making sure employees are already familiar with the system. There are several elements an e-learning should contain, and some pitfalls to avoid when developing an e-learning. How these are implemented in the proposed e-learning, can be found in Table 6:

Table 6 – Requirements and Pitfalls of E-Learning

	Aspect	Implementation
Requirements	Evidence-based information	All information given in the e-learning regarding theory is based on the theoretical framework in Chapter 4.
	Conversational writing style	The e-learning will contain a non-academic writing style, for better understanding.
	Effective Feedback	When answers are incorrect, learners will get a small recap of the theory with an explanation of why this was not correct.
	Breaking up chapters	The e-learning will have several chapters, with different sub-sections. This will limit the amount of information on one page and will make sure that there is a clear overview.
	Customized training	The platform makes it possible for learners to go back to previous chapters, and stop and continue at all times.
	Engagement in learning	During the e-learning, learners are required to click on buttons to continue, click the right answers in quiz questions, and click on buttons to reveal information.
	Multimedia	The theory is explained in words with pictures to support this theory. The pictures are from warehouses of Yusen Logistics, making them recognizable.
	Acceleration of expertise	Problems encountered in warehouses are used to explain the theory and the importance of change.
	Sufficient practice	When the goal is not reached after the implementation of the e-learning, the content should be re-evaluated and extra materials should be added.
	Mirror the job	Real-life examples are used in this e-learning to make the problems recognizable.
Pitfalls	Too much of a good thing	The engagement in the e-learning and pictures is minimized to only necessary usage. This avoids having too many features in the e-learning
	Not enough of a good thing	The e-learning will not be text-only but will contain multimedia and engagement.
	Losing sight of the goals	When the main goal of reducing waste is not reached, the e-learning should be re-evaluated.
	Discovery learning	Learners will go over guided e-learning with fixed content, making sure they do not overlearn the topic.
	Extraneous words	The theory and text used are understandable and shortened to minimize text.
	Extraneous graphics	Only graphics contributing to the e-learning are used.

One of the pitfalls of an e-learning is too much information, it is important to not implement everything at once. Learners can only process a limited amount of information. Therefore, the following topics are included in the e-learning, covering the most important aspects for now to increase knowledge and improve waste management practices in warehouses:

Table 7 - E-Learning Topics

Introduction	In this section, learners will be introduced to the topic. They will go through some real-life negative impacts waste can have when not managed well. Furthermore, there is a short overview of the benefits of waste management, such as more efficient work, and a better company reputation.
Waste at Yusen Logistics	(available) Waste data from Yusen Logistics is used to compare with real-life examples to give a tangible perspective on the waste.
Theory	Circular Economy, Waste Management, and the used Waste Hierarchy (as seen in Figure 20) are introduced. The levels of the waste hierarchy are discussed with an example from warehouses on how to implement these. Furthermore, a short overview of separation is given on the most common warehouse waste from Yusen Logistics.
Separation	Learners are going over some best practices on how to make separation easier and how this can benefit workflow.
Your contribution	A few reasons on how employees can contribute to improving waste management are given, with a brief explanation of how this can be done.
Next steps	To close up the e-learning, learners are given a link to a platform where they can ask questions, share ideas, and discuss the key elements that they have learned. This section also contains a feedback moment, employees can give their feedback about the e-learning, which can be used for improving the e-learning in the future.

All sections, except for the introduction and next steps, will have an introduction or close-up question to see whether learners understood the topic. Before going to the 'next step' section, learners will make a short quiz, containing three questions about the waste hierarchy, and separation processes. If learners would like to reevaluate the material from the e-learning, they do not need to remake the entire e-learning. They can directly go to the part they would like to reevaluate.

In the current situation, a common mistake is made in the separation process. Therefore, it was chosen to go into more detail about this topic. By explaining how to make this easier with some real-life examples, employees can focus on the separation challenges of the warehouses.

The e-learning will be used to share ideas, create awareness, and build new skills. Making this a combination of inform- and perform e-learning, with a comprehensive waste management knowledge building. Since the e-learning mostly focuses on warehouse waste, the e-learning will be mandatory for all employees, both blue and white color employees, working in the warehouses, but also be suggested to all other employees from Yusen Logistics.

6.2.3 Communication Material: On-Site Campaign

To remind the employees in warehouses about the importance of waste management practices, a series of posters was developed containing impactful quotes. This on-site campaign is a visual reminder to employees, to implement key aspects of the e-learning mentioned in the previous

section. In the theoretical framework, it was found that learning is recommended to be given in several events, to extend learning over time.

Ongoing communication is important to improve employee awareness. An on-site campaign can be used as an easy way of communicating your goals fast with a lot of people present. With an on-site campaign, goals, policies, and important waste management aspects can be promoted and communicated, possibly leading to more ideas from employees and increasing engagement.

During the warehouse visit conducted at Company Y, it was discussed that this warehouse used an on-site campaign to communicate new policies. Clear posters, light signing, and mentioning new policies at the beginning of the shift, made sure employees were more aware of new policies. Furthermore, posters combined with easily understandable language (and visualization) are key for effective communication. Which is very helpful in warehouses with employees from multiple nationalities. The Benchmark also showed that companies are using visual campaigns to improve sorting practices and awareness about the topic of waste management. For the materials made for Yusen Logistics, the on-site campaign will be used as a reminder that support learned material from the e-learning in a poster format. By repeating key messages from the e-learning in a visual way, the posters might help to remind learners of the newly acquired knowledge and encourage waste management conversations.

The content of the on-site campaign will be written in short, easily understandable language, including topics of:

- Theoretical insight: concepts from the waste hierarchy, in line with the content of the e-learning, as a reminder of the newly gathered knowledge.
- Company data: waste data used to compare how much waste is generated by Yusen Logistics, emphasizing the need for minimizing this number.
- Motivation to separate: emphasizing the importance of this topic.

Communication can lead to employees sharing their ideas, leading to improvement. The posters will be placed at central places accessible to all employees. The goal of this on-site campaign is to remind employees of their learning, but also to motivate employees to share ideas and start a conversation about the topic. As in the Company Y warehouse, the topic will be discussed and emphasized at the beginning of the shift. This is to make sure all employees are aware of the topic. The campaign consists of a series of twelve posters, refreshed every month.

6.3 Proposed Key Performance Indicators

For CSR-managed businesses, it is important to have sustainable metrics described in ESG. ESG can be measured by guidelines from ISO and GRI, widely used guidelines to measure sustainable performance. In the benchmark, it was seen that all other logistics companies made use of these two guidelines. Applicable ISO and GRI measurement standards are described in (GRI, 2016, 2020, 2024; ISO, 2024). In theory, some indicators were mentioned, focusing on awareness creation. Combining the theory and adjusting the KPIs to apply to Yusen Logistics, the following KPIs are proposed to measure the outcomes, based on the SMART method:

Table 8 - KPIs for Measuring Outcomes

ESG metric	**Categories**	**KPI**
Environment	Waste Management	Total waste produced in warehouses in metric tons annually
		% of waste diverted from landfills and incineration annually
		% of waste being recycled annually
		% decrease in purchased single-use materials in one year
Social	Training and Education	# of employees completing the waste management e-learning within the first year of launch
		% of invited employees who attended the webinar
	Training Time	The total training time in hours in Waste Management
	Employee Satisfaction	# of employees rating the e-learning as effective and helpful for their job
	On-site campaign	# of warehouses with visual separation signs
		# of warehouses with waste management poster materials
Government	Legal	# of violations in warehouses of local environmental regulations regarding waste management
	Policy integration	# of warehouses using waste management metrics

After talking to the company, these are the chosen KPIs that are in line with the company goal of reducing waste and increasing awareness about waste management among employees, and can be used to see whether the proposed solutions are helping to reach this goal.

7. Evaluation

Previously, some requirements and pitfalls were discussed, which should be implemented or avoided in creating content, these aspects are used for evaluation and discussed in this chapter. The evaluation was conducted with employees responsible for the implementation to evaluate the proposed deliverables and their potential to improve the current situation. During the research, the content was continuously improved based on feedback to ensure its relevance. This evaluation focuses on the final version of the deliverables, except for the waste hierarchy and key performance indicators (KPIs), since these were selected in agreement with Yusen Logistics. The evaluation aims to determine whether employees believe the proposed deliverables will improve the current situation and to identify further improvement points, and can be found in Table 9.

7.1 Evaluation of Deliverables

Table 9 - Evaluation of Deliverables

Topic	Criteria	Findings
Webinar	Introduction of topic	Discussed in slides by focusing on the importance of the topic.
	Guidance on e-learning	Webinar provides an overview and an introduction to the audience about the e-learning.
	Engagement	Through interactive questions, there is engagement in the webinar.
	Clarity of content	Content was found easy to follow and clear.
	Impact on sharing best practices	Webinar will help to increase sharing the best practices, but due to IT settings and internal issues this might have a limiting effect.
	Policy implementation	This webinar serves as a guide rather than introducing new policies.
	Overall impact	First time to have a general and global focus on waste management, improving the current situation where there is no global focus on this topic.
	Improvement points	The webinar should be understandable to employees who do not use English as their working language. Especially focusing on giving the presentation at a slower pace.
E-Learning	Structure and writing style	The e-learning mainly uses pictures to introduce or explain topics. The used writing style is non-academic. Furthermore, feedback is used as a learning point where learners can reevaluate theory when given an incorrect answer.
	Goal achievement	The e-learning is a small part of a bigger waste management project, and, on its own, does not directly achieve the goal of minimizing waste. It is a first step and will help to increase knowledge and awareness.
	Content of E-learning	The content chosen for the e-learning is limited to essential topics to avoid overwhelming learners.
	Critical components	The following aspects are considered successfully implemented in the evaluation: evidence-based learning, use of subsections, customized training (individual learning pace),

		engagement, multimedia, real-life examples, learner feedback for improvement, balance with picture and text uses.
	Overall impact	The e-learning helps in creating a global message on how waste management can be executed and will increase knowledge and awareness of this topic.
	Improvement points	Currently, the e-learning content is written in English. To reach a bigger audience, the content should be translated into local languages.
On-Site Campaign	Reminder to learning	The posters used for this on-site campaign will help learners to have a reminder about the learned materials.
	Promotion of idea-sharing and discussion	If the content of the posters is discussed during the morning start-up, it can help to discuss the topic, and employees can talk together on how to minimize waste.
	Overall impact	This deliverable can help to ensure attention to waste management.
	Improvement points	The on-site campaign should help to introduce more engagement activities, such as finding the best idea. However, this will be a bit more time-consuming, and more focused on as next steps.

7.2 Key Takeaways Evaluation

The evaluation of the webinar, e-learning, and on-site campaign highlights their impact on creating awareness about waste management at Yusen Logistics. The webinar successfully introduced the topic and is the first time having a global focus on the topic. The e-learning will help in creating a global message, where real-life examples are used as learning material and learners can go over the content at their own pace. The on-site campaign will serve as a reminder of learned material. However, improvement – such as local language accessibility - can increase the impact of the deliverables. These deliverables are a starting point on reducing waste, and will help to create more awareness and knowledge about waste management.

8. Discussion, Conclusions, and Recommendations

In this chapter, the research is concluded by answering the sub- and main questions of this research, together with the discussion, limitations of the research, and Recommendations to Yusen Logistics. This chapter will answer the last sub-question: “What conclusions and recommendations can be made from the conducted research at Yusen Logistics?”

8.1 Discussion

After developing and proposing the deliverables, and evaluating them with the company, it is concluded that the deliverables are improving the current situation. Currently, Yusen Logistics does not have a standardized global awareness program regarding waste management. Making knowledge different across warehouses. By implementing the webinar, e-learning, on-site campaign, and providing KPIs to measure outcomes, the current situation is changed to reach the goal of raising more awareness.

One of the key deliverables is the globally accessible learning material. Before this research, there was no global standardized education material regarding waste management. The e-learning addresses this by having a standardized learning module for all employees, where all employees receive the same knowledge. The webinar provides a platform for employees responsible for waste management to be introduced to this project and share best practices. Furthermore, the poster campaign helps to remind employees of the importance of waste management and gives them a platform to share their ideas or ask questions and concerns. And lastly, with the measurement tools, Yusen Logistics will be able to measure and monitor outcomes.

However, due to time constraints, it was not possible to implement the materials and gather feedback from learners. Without this feedback, the learning is not perfectly tailored to global employee needs yet. Despite this limitation, the proposed deliverables will make a basis for future improvements to minimize waste and create a more standardized approach to waste management.

8.2 Limitations

According to Cooper & Schindler (2014) all research studies have their limitations, and there are almost no perfect studies. Some of the limitations have little effect on the research, whereas other limitations may invalidate the entire research. This research contains some limitations as well, primarily related to time constraints, data collection, and regulations considerations.

One of the main limitations of this research is the restricted timeframe. The research was conducted within three months, which limited the time to explore theories that could be used for this research. Additionally, due to time constraints, the proposed deliverables could not be implemented. This resulted in no measurement of the deliverables, and if these deliverables changed the awareness of waste management. This impacted the feedback as well. Since employees did not make key deliverables, such as e-learning, feedback could not be collected from this target group.

Another limitation concerns data collection from the employee survey. Even though the survey covered all areas of Yusen Logistics, the amount of responses varied across areas. Consequently, it is challenging to determine whether the conclusions about the current situation apply to all warehouses. In addition to the employee survey, a limitation of this research is the interview

conducted with a waste management company. Since the interview was only conducted with a single company, the findings are limited to one perspective, making it impossible to compare information with other experts.

Furthermore, the research did not take into account all the different laws from the different regions. The objective was to make a standardized e-learning and webinar on waste management. Therefore, the deliverables are developed based on general guidelines rather than taking into account the laws of different regions.

Finally, the study mainly focused on qualitative data, due to a lack of availability of quantitative data. This makes the research more subjective. Additionally, the employee survey about the current situation was given online rather than in person, which may have led to misunderstanding or misinterpretation of certain questions. Which might affect the accuracy of the responses.

8.3 Conclusion

Yusen Logistics is dealing with a lack of knowledge about waste management, due to a lack of training and communication. The effect of this problem was that there was too much waste not being separated correctly. To increase the awareness of waste management in warehouses among employees, and find a solution to this problem, the following research question was introduced;

"*How can Yusen Logistics raise awareness about waste management practices at their warehouses on a global level, aligned with circular economy principles?*"

8.3.1 Conclusion Sub-Questions

To answer the main research question, a set of sub-questions was made. These sub-questions and corresponding answers can be found below. A more detailed answer to the questions can be found in chapters 3, 4, 5, and 6.

Chapter 3:

1. *How is circularity currently implemented at Yusen Logistics?*

   Circularity, and especially waste management, is in the early stage of development. They acknowledge the importance of the topic, but there is no global policy yet. Most areas are following local rules and regulations, but due to a lack of data, it is hard to say how much waste is generated. According to a survey conducted among employees, there is a need for a company policy, together with training and education, clear communication, and visualization to increase awareness and improve waste management. The most commonly used waste management strategy is Recycling, followed by Reusing, Reducing, Landfill, and Recovering, which is not an optimal order when looking at the waste hierarchy. The warehouse visit shows that most mistakes are made in the separation process. Recyclables still end up in the general waste bin, where these materials could have been separated into the designated bin. Furthermore, the circularity mostly relies on local rules and input from waste collectors.

Chapter 4:

2. *What are the key elements of a circular economy?*

The Circular Economy is mostly focused on moving away from the linear "take-make-dispose" system. CE is an approach to regenerative economic growth in line with sustainability goals. The key elements of a CE are;

- Eliminate waste and pollution: Reducing the use of virgin materials and harmful production practices.
- Circulate products and materials: Keep used materials in use, such as raw materials, components, or entire products. By using R-strategies as Reduce, Reuse, Recycle, and Recover.
- Regenerate nature: Support natural processes and leave room for nature.

3. *What are different waste management principles?*

Waste management is an important part of the CE, which is described as the process where waste is collected, transported, and disposed of in the best possible way with limited effect on the environment. Discussed waste management theories are;

- The Waste hierarchy: Focusing on prioritizing waste management strategies in order from most to least preferred: Reducing, Reusing, Recycling, Recovering, and Landfilling.
- Zero Waste Hierarchy: Focusing on eliminating waste, by restricting Recovering, and Landfilling. This hierarchy is mostly focusing on the redesign of production processes.
- R-framework: Expanding the waste hierarchy, emphasizing to concentrate on the right focus of the industry. Considering the pre-use, use, and post-use-phase of products within organizations.

4. *What are strategies to raise awareness among employees regarding circular economy?*

There are several ways to raise awareness among employees, the key strategies are;

- Training and Education: Providing continuous learning to all employees is a key aspect of successful environmental management. It guides employees to the right focus point and gives a positive change in perception.
- Management Support: Managers have a critical role in achieving sustainability goals. A lack of management support can result in no CE promotion.
- Communication: Ongoing communication is important to have employees aware of goals, but also to create a platform where they can ask questions and share ideas.
- Engagement: Employees should be allowed and encouraged to participate in CE initiatives, which can reduce resistance and motivate individuals to change.

5. *How can (learning) materials be designed and developed to increase employees' understanding of waste management?*

Effective learning consists of several design elements, with the most important elements outlined below;

- Evidence-based information: Information based on theory.
- Feedback and writing style: Conversational writing style and feedback are used as learning moments,
- Breaking up chapters: Not giving all information in one chapter or section.
- Customized training: Allow people to go back to previous information.
- Engagement: Do not make a text-based learning only.
- Multimedia: Use supportive graphics to the text.
- Real-life materials: Make sure materials are in line with real-life examples and that a problem can be solved within minutes instead of days.
- Sufficient Practice: Re-evaluate when goals are not reached.

Learning can be given synchronously, which is followed at the same time but at different places, or asynchronously, where people can make the learning at different places and times. Learning can be inform- or perform based, based on information building and awareness creation or building skills respectively, or a combination of the two.

6. *How can the awareness among employees be measured?*

Awareness focusing on sustainable practices can be measured by KPIs based on ESG metrics. This can be measured by guidelines from ISO and GRI, which are widely used guidelines for companies to reach their sustainable goals. KPIs should be defined by the SMART rules, where KPIs will not obtain all five criteria, but can guide the development of more achievable goals.

Chapter 5:

7. *How do other companies raise awareness among their employees about waste management?*

A benchmark conducted on other globally operating logistics companies revealed that other organizations set specific waste management goals, mostly on reducing certain types of waste. To reach these targets, companies made e.g. customized schemes and visual communication tools, such as posters. Most of the companies implemented e-learning programs to increase knowledge about waste management among employees. These programs were designed for either all employees or job-specific roles, and some companies designed learning especially for responsible operators. Other companies made use of sustainability experts, who can answer specific questions or support sustainable initiatives.
During a site visit to explore best practices, it was observed that clear and easily understandable posters had a big impact on waste separation. By clear communication, new policies were introduced at the beginning of the shift, making employees more aware of these. Additionally, employees are encouraged to share ideas relating to sustainable practices, including waste management.
An interview with a waste management company highlighted the importance of getting as much waste out of the general waste as possible. A big challenge lies in the different mindsets of employees regarding sustainability. To address this challenge, it was recommended to use poster communication to reflect on the current situation. These posters should be simple, minimizing text, and visual, using real-life examples. Lastly, new information should be introduced to employees in steps. When introducing everything at once, it can result in employees being overwhelmed.

Chapter 6:

8. *How can (learning) materials be formulated for Yusen Logistics?*

Based on the current situation, found literature, and best practices from other companies, different materials are introduced, which are listed below;

- Waste theory: It is important to concentrate on the right focus for the company when choosing a waste theory. By looking at the current situation, where there are still warehouses dumping waste at landfills, and considering that Yusen Logistics does not design its products, the waste hierarchy was selected as most suitable for Yusen Logistics. The waste hierarchy focuses on different strategies, from most to least preferred: Reduce, Reuse, Recycle, Recover, and Landfill. By prioritizing waste in this order, waste should be minimized or separated correctly to avoid incineration or landfill.
- Webinar: Management is of great importance to increase sustainable practices in warehouses, they should motivate employees and be able to answer questions to

promote company goals and policies. To increase management support, a webinar is introduced explaining why this research was conducted, how the employees from warehouses are educated, and share some best practices to start a dialogue on how to reduce waste together. The webinar will be given synchronously to employees responsible for waste management in all areas of Yusen Logistics.

- E-Learning: An asynchronous e-learning will be implemented to increase knowledge about waste management, especially focusing on warehouse waste. In this e-learning, employees will go over the topics: why waste management is important, some theories, best practices, and how they can contribute. The e-learning is based on design rules as described in question five and will be mandatory for all employees working in warehouses and be suggested for all other employees.
- On-site campaign: To recall new gathered knowledge from the e-learning, a poster campaign for warehouses will be introduced. This poster contains theory from e-learning, company data, and motivational quotes. The goal of this poster is to create an environment where employees start a dialogue and share ideas on how to improve waste management.

8.3.2 Conclusion Main Question

Now the sub-questions are answered, the main question can be answered as well;

"How can Yusen Logistics raise awareness about waste management practices at their warehouses on a global level, aligned with circular economy principles?"

This research found ways on how Yusen Logistics can raise awareness about waste management practices in warehouses on a global level, aligned with circular economy principles. The findings indicate that a global knowledge building around waste management is necessary to ensure all employees have the same and the right knowledge.

The main research question can be divided into different parts, the first part focuses on the theory regarding the circular economy and waste management. The CE emphasized the importance of eliminating waste and keeping materials in use for as long as possible. Waste management has a key role in achieving these goals, by reducing, reusing, and recycling materials rather than being incinerated or landfilled. To support this, the waste hierarchy was identified as most suitable for Yusen Logistics. This hierarchy prioritizes waste strategies in order of: reducing, reusing, recycling, recovering, and lastly landfill materials when there is no other option. Since some warehouses are still landfilling materials, the focus must encourage employees to use the more preferred options in the waste hierarchy to ensure the waste sent to landfills will decrease.

Raising awareness among employees is necessary to improve waste management practices. A key element of raising awareness is done by training and education, making sure employees have the right knowledge on the topic. Management support is crucial to reaching goals, implementing new strategies, and supporting employees by answering questions, motivating them to implement new strategies, and finding new ways to improve waste management. To achieve this, a webinar for employees responsible for waste management is introduced. This webinar will introduce the goal of the project, the importance of waste management, provide an overview of the e-learning, and share some best practices. For employees, an e-learning module will provide structured training on waste management, real-life warehouse examples, and tips on how to separate and contribute to increase waste management practices at warehouses. Next to this

training, communication is key to make sure employees are reminded of the importance of waste management. By introducing a poster campaign, and repeating the e-learning content, a platform is created where employees can share their ideas on improving waste management.

Since Yusen Logistics is operating worldwide, and awareness should be created on a global level, accessibility of the materials is essential to reach the goal. To ensure all employees will receive the same knowledge, the e-learning module will be available to all employees. The webinar will be given to all employees responsible for waste management from all different areas. Additionally, creating a platform to share ideas and best practices across all areas, will avoid all warehouses having to find ways to improve waste management individually.

Finally, to ensure the content provided in learning and communication is up-to-date, continuous improvement must be implemented. The impact of the deliverables should be measured by KPIs based on ISO and GRI, aligned with ESG practices. This success and impact of the deliverables can be evaluated and content can be adjusted when necessary. By collecting feedback from learners and measuring the amount of waste reduced, Yusen Logistics can monitor the effectiveness of the deliverables.

In conclusion, Yusen Logistics can raise awareness among employees about waste management in warehouses on a global level, by implementing learning available for all employees, improving communication (to managers), reminding with on-site (poster) materials, and sharing best practices. By monitoring and measuring outcomes, Yusen Logistics can continuously improve and adapt when necessary to reduce the amount of waste.

8.4 Recommendations

After answering the main questions on how Yusen Logistics can improve awareness about waste management, some recommendations are given. These focus on the implementation of e-learning, measuring outcomes, continuous improvement, the on-site campaign, and employee engagement activities.

8.4.1 E-Learning Translation

The e-learning should be translated into multiple languages to make it accessible to employees from all areas. Currently, e-learning is written in English, limiting the understanding of non-English-speaking employees. Since this e-learning will be given to a global audience, the content has to be translated into local languages to have the biggest impact.

8.4.2 Measure and Monitor Outcomes

It is important to measure and monitor the outcomes of the deliverables. Measuring and monitoring can help to understand the impact of the deliverables and whether these will help to reduce waste. The KPIs in the proposed deliverables should be implemented to support the goal of creating more awareness. Furthermore, aligning these monitoring effects will enable Yusen Logistics to benchmark its performance against similar companies within the same industry and make it possible to identify opportunities to improve.

8.4.3 Continuous Improvement

Continuous improvement of the deliverables will ensure up-to-date content and materials relevant to the employees' needs. By implementing feedback from the e-learning, webinar, or poster content, employees will get a more tailored learning approach. If the desired outcomes are

not reached by current content or employees are not satisfied with current content, this should be updated accordingly.

8.4.4 On-Site Campaign

The posters presented in the on-site campaign are in the very early stages of development and should be further developed to maximize their effectiveness. The on-site campaign mostly focuses on reminding employees about the new gathered knowledge from the e-learning, and should therefore be implemented after the e-learning is launched. This ensures the on-site campaign's content can be used as reminders, rather than introducing new concepts. After introducing the content, feedback should be considered to further develop the material on the posters.

8.4.5 Engagement

In the theoretical framework, it was mentioned that engaging your employees is a way to raise awareness on a topic. Employees must first have the right knowledge to participate in such activities. Therefore, in the current research, it was decided to focus on knowledge-building first, before introducing engagement activities. However, engagement is seen as an important factor in raising awareness. Employees will feel more engaged and are more likely to follow new policies. Results from the employee survey also suggested having a waste management campaign to raise awareness. The next step for Yusen Logistics, after the implementation of the e-learning, is to introduce a waste management related engagement activity. This activity would focus on all areas, to share best practices found after the campaign. In this way, employees can find ways to minimize waste together and learn from each other.

8.4.6 Implementation

The different recommendations require several steps to be implemented. This section presents a step-by-step approach for implementing the recommendations. For each topic, the approach outlines the specific steps that need to be taken, identifies the responsible team or individual for each step, and indicates the recommended timeline for executing the step. Teams that are mainly responsible for the implementation are the Corporate Sustainability Group (CSG), and the People Development Team (PDT). This step-by-step approach can be found in Table 10, where feedback is given in different steps to make sure the content used for the different topics is up to date. When the feedback is given within a topic, this feedback is given before the publication of that topic. In the continuous improvement steps, feedback is given after publication of the deliverables.

Table 10 - Step-by-Step Approach for Implementations of Recommendations

Topic	Step	What	Who	When
Translate E-Learning	1	Identify required languages based on employee countries and contact local teams. Provide guidelines and templates for translation.	CSG	This step has to be carried out before the other steps regarding translating.
	2	Translate e-learning content and follow up with questions and concerns.	Sustainability Local Contact Person	After step 1 is completed.
	3	Collect final translated versions.	CSG	After step 2 is completed.
	4	Create a list with participants that are required to make the e-learning.	CSG	Simultaneously with step 1.

Publication of E-Learning	5	Test whether technical aspects, and if the engagement elements work/ language version. Resolve the issues if there are any.	PDT	After step 3 is completed.
	6	Send out publication date to relevant employees. Publish e-learning, learners will get a notification when they are invited to make the e-learning.	CSG, PDT	After steps 4 and 5 are completed.
On-Site Campaign Development	7	Sent out current poster material to gather feedback	CGS	Simultaneously with steps 1 and 4.
	8	Implement changes regarding feedback and design final materials.	CSG	After step 7 is completed.
	9	Distribute posters to sites and communicate what is expected from local teams.	CSG	After steps 6 and 8 are completed.
	10	Communicate per new poster what the topic is about, and for how long this will be the topic.	CSG	After step 9 is completed, continue till the last poster.
Measure and Monitor	11	Collect data from deliverables (number of learners, quiz results, number of warehouses with posters, etc.).	CSG	After steps 6 and 10 are completed.
	12	Monitor performance with KPIs based on ESG pillars, benchmark results against competitors, and share outcomes to employees.	CSG	After data is collected in step 11.
	13	Identify improvement points for deliverables.	CSG	After step 12 is completed. Or information is received from step 25.
Continuous Improvement	14	Gather feedback on published content, identify content gaps or outdated information, and adjust the content (when feedback is given) accordingly when needed.	CSG	After step 13 is completed.
Engagement	15	Set up an organization committee which will oversee the engagement activity.	CSG	After steps 6 and 10 are completed.
	16	Select one warehouse to pilot this activity. Where the majority of employees completed e-learning, and on-site campaign posters are in use. Contact this warehouse and invite them to participate.	CSG & Committee	After step 15 is completed.
	17	Develop rules for participation, templates where ideas/ results can be presented, and how this should be handed in. Ensure that they are adaptable to local regulations. Send to pilot warehouse. Answer questions regarding pilot.	Committee	After step 16 is completed.
	18	Collect feedback from the pilot to adjust the rules and templates. Adjust current materials accordingly.	CSG & Committee	After step 17 is completed.
	19	Launch a global challenge, invite sites to participate, and send them the rules, timeline, and project goals. Then, give local leads guidelines with communication guidance and submission instructions.	CSG & Committee	After step 18 is completed.

	20	Communicate the challenge to warehouse employees and explain in startup meetings how they can hand in ideas.	Local Team Lead	After step 19 is completed.
	21	Roll out ideas and send updates to committee. Help warehouse employees where needed.	Local Team Lead	After step 20 is completed.
	22	Track participation and engagement across areas and communicate regular updates in the sustainability journal and send reminders to participants.	CSG & Committee	After step 20 is completed, and simultaneously with step 21.
	23	Select the best ideas per area and share best practice across sites. Give employees recognition in the sustainability newsletter, and provide rewards.	Committee	After steps 21 and 22 are completed. Information from those steps is input for selecting winners.
	24	Measure outcome and impact of the challenge, and communicate those to employees.	CSG	After step 23 is completed.
	25	Send out feedback to participants about improvement points for future challenges.	CSG	After step 24 is completed.

The recommendation to pilot the engagement activity at one of the warehouses was made to test the initiative on a smaller scale before implementing this globally. Implementing this pilot across a larger number of sites, could lead to more complexity and challenges. The chosen pilot site should have the majority of its employees complete the e-learning to ensure they have the right and necessary knowledge of waste management. Additionally, the pilot site should actively engage with the on-site poster campaign, and be committed to waste management. The pilot will provide a controlled, small-scale environment in which feedback on the activity rules, communication, and templates can be gathered. This feedback will be used to refine materials and improve the process before scaling it to a global campaign.

In step 23, the plan is to select one winner per region. The activity encourages a more diverse set of ideas based on local rules and regulations by choosing regional winners. Furthermore, the goal of this activity is to share best practices. By highlighting multiple best ideas, more best practices will be communicated and other sites can learn from different ideas and implement those most applicable for their sites.

To improve clarity and provide an understanding overview of the different steps, the step-by-step approach outlined in Table 10 has been translated into a visual element, shown in Figure 10. In this visual element, each topic is color-coded, as indicated in the legend, to distinguish the topics.

The “reminder/ follow-up” symbol indicates when the responsible team, that needs information for that step, must send reminders or follow-ups to ensure responses are received or to verify whether the receiving teams still understand their tasks. For the pilot steps in the engagement activity, dotted arrows are used. These dotted lines indicate that these steps do not need to be repeated after the improvement phase. Since the continuous improvement loop will go back to the start and content should be revisited, this would mean the pilot version has to be repeated. However, feedback gathered from the global activity should be used to identify areas for improvements in future global events. As a result, after completing the first engagement activity, steps 15 to 18 can be skipped, and the process will continue at step 19.

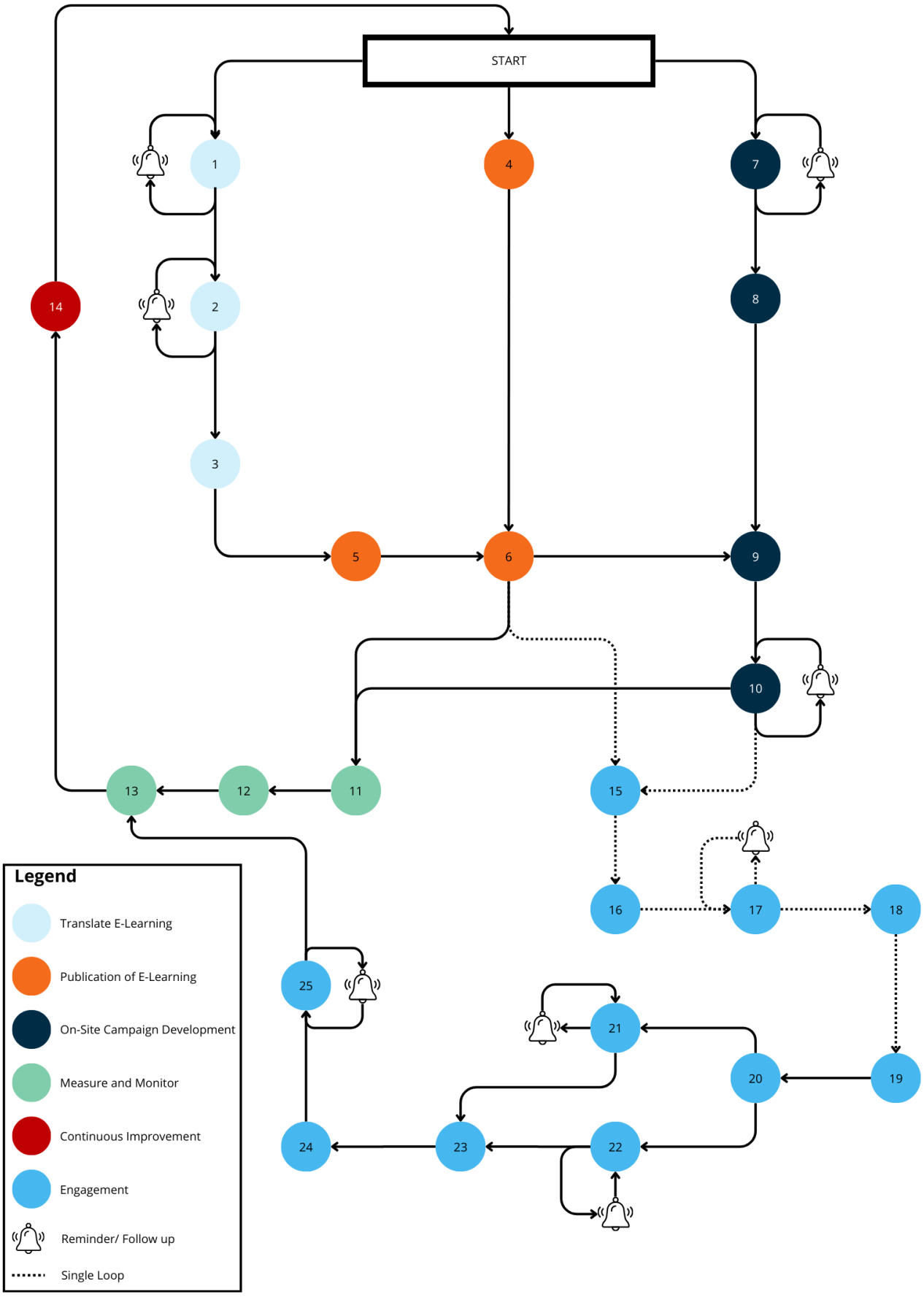

Figure 10 - Step-by-Step Approach Visual

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Appendix A: Systematic Literature Review (SLR)

In this section, a Systematic Literature Review (SLR) is conducted. For this SLR a research question are answered systematically by reviewing and finding relevant articles found in search engines. The goal of the bachelor assignment is to raise awareness about waste management in warehouses at Yusen Logistics. Before developing solutions to this problem it is important to know how to raise awareness among employees and what strategies already exist to do so. Unfortunately, knowledge of this topic is lacking. Therefore, the SLR is used to better understand strategies to raise awareness among employees.

The first step of conducting an SLR is to define a research question, which is as follows;

"*What are strategies to raise awareness among employees regarding circular economy?*"

Secondly, it is important to define the inclusion and exclusion criteria. This aims to get information fitting your specific research goal. Without these criteria, there might be a lot of information not relevant to your topic or too few outcomes to conduct proper research. In Table A.1 these inclusion and exclusion criteria are shown.

Table A.1 - Inclusion and exclusion criteria

Criteria	Inclusion or exclusion	Explanation
Articles written in English	Inclusion	To make sure of understanding, only English-written articles are included
Pre 2005 articles	Exclusion	A lot of new concepts are introduced every year, so articles written before 2005 are excluded to limit the outcome
Educational articles about schools	Exclusion	The research is not about education in schools, so schools, universities, or similar institutions should be eliminated
Sustainable topics	Inclusion	The research is about raising awareness of waste management and sustainable practices

For this SLR the databases Scopus and Web of Science is used. These two databases contain a broad range of articles in different fields. Both are large multidisciplinary databases with peer-reviewed content. Since the research question is not focused on one specific research field, these multidisciplinary databases will give a broader range of articles that can be used to integrate different theories.

To make sure that the right articles will be found, a search string is set up with the help of the key concepts, found in Table A.2. The key concepts of the research question are strategies, raising awareness, and employees. Since the assignment is about raising awareness of waste management and sustainability, these key concepts will also be added to the search as well. To find articles that best fit the question, some related terms, narrower terms, and broader terms will all be added to the search string.

Table A.2 - Key concepts

Key concepts	Related terms/ synonyms	Narrower terms	Broader terms
Strategies	Strateg*		
Raising awareness	Increase awareness, promote awareness, employee awareness	Employee engagement	Behavior change, education, sustainable behavior
Employees	staff	Workforce	Personnel
Waste management	Waste reduction, waste minimization	Recycling, zero waste	Sustainable waste, waste, Circular economy, circular principles, closed-loop system, resource efficiency

In the table truncations (*) are used to be able to found a variety of words in the search string. The different key concepts are separated from each other with the AND Boolean. This Boolean makes sure that all concepts are taken into consideration. The key concepts, their synonyms, narrower- and broader terms are separated from each other with the OR Boolean. The OR Boolean will find all different paraphrases of the key concepts and make sure that multiple articles are found.
The found key concepts and their synonyms, narrower- and broader terms are summarized in a search string. With this search string, several articles are found in the databases, which are summarized in Table A.3.

Table A.3 - Outcome of SLR

Search string	Scope	Date	Date range	Number of entries	comments
Scopus					
("raise awareness" OR "increase awareness" OR "promote awareness" OR "employee awareness" OR "sustainable behavior" OR "behavior change" OR "education" OR "employee engagement") AND ("employees" OR "workforce" OR "staff" OR "personnel") AND ("strateg*") AND ("waste management" OR "waste reduction" OR "waste minimization" OR "sustainable waste" OR "recycling" OR "zero waste" OR "circular economy" OR "circular principles" OR "closed-loop systems" OR "resource efficiency" OR "sustainable production")	Article title, Abstract, Keywords	26-10	2005-2025	115	A lot of articles about healthcare, education, households, and engineering, which are not in the direction of this research. Eliminate those.
("raise awareness" OR "increase awareness" OR "promote awareness" OR "employee awareness" OR "sustainable behavior" OR "behavior change" OR "education" OR "employee engagement") AND ("employees" OR "workforce" OR "staff" OR "personnel") AND ("strateg*") AND ("waste management" OR "waste reduction" OR "waste minimization" OR "sustainable waste" OR "recycling" OR "zero waste" OR "circular economy" OR "circular principles" OR "closed-loop systems" OR "resource efficiency" OR	Article title, Abstract, Keywords	26-10	2005-2024	55	Still quite some results, go over titles and abstracts to remove non-related topics.

"sustainable production") AND NOT ("tourism") AND NOT ("higher education" OR "school" OR "university") AND NOT (“hospital” OR “healthcare”)					
Web of Science					
("raise awareness" OR "increase awareness" OR "promote awareness" OR "employee awareness" OR "sustainable behavior" OR "behavior change" OR "education" OR "employee engagement") AND ("employees" OR "workforce" OR "staff" OR "personnel") AND ("strateg*") AND ("waste management" OR "waste reduction" OR "waste minimization" OR "sustainable waste" OR "recycling" OR "zero waste" OR "circular economy" OR "circular principles" OR "closed-loop systems" OR "resource efficiency" OR "sustainable production")	Title, Topic, Author keywords, Keyword plus	27-10	2005-2024	189	A lot of articles are about higher education, healthcare, tourism, and households. Remove those.
("raise awareness" OR "increase awareness" OR "promote awareness" OR "employee awareness" OR "sustainable behavior" OR "behavior change" OR "education" OR "employee engagement") AND ("employees" OR "workforce" OR "staff" OR "personnel") AND ("strateg*") AND("waste management" OR "waste reduction" OR "waste minimization" OR "sustainable waste" OR "recycling" OR "zero waste" OR "circular economy" OR "circular principles" OR "closed-loop systems" OR "resource efficiency" OR "sustainable production") NOT ("higher education" OR "universities" OR "school") NOT ("healthcare") NOT ("tourism") NOT ("household" OR “municipal”)	Title, Topic, Author keywords, Keyword plus	27-10	2005-2024	32	Go over titles to remove titles that are not important to research.
Total					88
Removing of duplicates					1
Removed based on title					21
Removed after screening/ reading					53
No access					5
Total selected articles					**8**

During the SLR multiple articles were written within the field of medicine, tourism, or about waste generated by households. By removing those fields, a better amount of articles was selected. However, still a lot of articles not relevant to the research could be found in the search. Those articles were removed based on the title or after reading the abstract.

From the search string, eight articles were selected to be reviewed. These articles, with the authors, year of publication, and the core findings, can be found in Table A.4. After reading the first article some other articles were found, with the use of the snowballing effect, which was within the field of the research and relevant to the research question. These articles are also added to

the table with selected articles, concluding a total of ten articles used in the integration of the theory part.
All key concepts from the different articles can be found in the conceptual matrix in Table A.5.

Table A.4 - Selected articles

Title of article	Core findings	Field of study
The need for better measurement and employee engagement to advance a circular economy: Lessons from Biogen's "zero waste" journey (Veleva et al., 2017)	Awareness about sustainability is not considered an important factor in businesses. Key factors for highly engaged workforce are described with examples to engage employees.	Business management
Identification of constraints for an effective application of construction waste management plan in Poland (Emmanuel et al., 2023)	Formal training and awareness strategies are suggested as the most important way to engage employees.	Civil engineering
Analyzing the Enablers of Circular Economy: A Sustainable Manufacturing Perspective (Mandal et al., 2024)	Educated staff will help a longstanding sustainable business.	Process integration and optimization for sustainability
Demystifying corporate inertia towards transition to circular economy: A management frame of reference (Yamoah et al., 2022)	Education to have a better perception of Circular economy principles. Furthermore, top management support is needed to have a better awareness of the company	Production economy
Continuous Application of Preventive Environmental Strategies as a Way to Introduce Social Responsibilities in Companies (Staniškis & Staniškienė. 2019)	Employees should follow a training program, communicate with different departments and their ideas should be integrated within the company.	CSR in companies
Identifying Future Skill Requirements of the Job Profiles for a Sustainable European Manufacturing Industry 4.0 (Akyazi et al., 2022)	Continuous training is the only way to make sure employees stay engaged now and in the future.	Recycling
Green Supply Chain Management as a Determinant of Corporate Social Responsibility and Corporate Reputation (Yanginlar et al., 2022)	Management should have a positive way of looking into the business goals. Without it, employees do not see the importance.	Supply chain
Improving environmental awareness training in business (Perron et al., 2006)	Training and educating staff is the first step in creating awareness among employees. Furthermore, companies should have some kind of award program for engagement.	Business training
Corporate Social Responsibility and Employee-Company identification (Kim et al., 2010)	This article came from 'snowballing' the first article and used relevant information about company image and the relationship with employees	Business ethics
Employee engagement and CSR: Transactional, relational, and developmental approaches (Mirvis, 2012)	'Snowballed' from the first article. An important way of engaging employees within CSR	Human resource management

Table A.5 - Conceptual Matrix

Concept →	Sustainability			Awareness			
Publication ↓	Zero waste/ waste reduction	Circular economy	CSR	Employee engagement	Education	Communication	Awareness indicators
Veleva et al. (2017)	X	X		X	X	X	X
Emmanuel et al. (2023)	X			X	X	X	
Mandal et al. (2024)		X			X	X	
Yamoah et al. (2022)	X	X		X	X	X	
Staniškis & Staniškienė (2019)	X		X		X	X	
Akyazi et al. (2022)	X	X			X		
Yanginlar et al. (2022)	X		X	X			
Perron et al. (2006)		X		X	X		
Kim et al. (2010)			X	X			
Mirvis (2012)			X	X			

Appendix B: Survey Questions Employees

Purpose: To get a better understanding of current awareness of waste management and identify opportunities to increase awareness

Questions:

1. Are you responsible for the waste management at your OpCo? (yes/ no)
2. What is your understanding of the current waste management process/ rules of your site? (very poor, poor, neutral, good, excellent)
3. How would you describe a good waste management process? (free text)
4. What waste management rules/ principles are currently used at your site? (multiple answers possible)
    a. Recycling
    b. Re-using of materials
    c. Landfill
    d. Energy Recovery
    e. Reducing (e.g. single-use materials)
    f. Others, namely;
5. Do you know if the waste management rules are currently consistent with the local relevant laws and regulations? (yes/ no)
6. How clear do you find the current waste management training/ education on recycling/ separating?
   (not clear at all, somewhat clear, neutral, clear, extremely clear)
7. How clear do you find current communication on waste management goals/ practices/ policies?
   (not clear at all, somewhat clear, neutral, clear, extremely clear)
8. How clear do you think the current separation signs are for disposal in your warehouse?
   (not clear at all, somewhat clear, neutral, clear, extremely clear)
9. What would you like to see as improvement actions in the near future? (multiple answers possible)
    a) Clear and direct communication on waste management, such as signs, posters, etc.
    b) Provide regular training to employees on a regular basis
    c) Sharing of best practices and ideas
    d) A waste management campaign or challenge to motivate employees
    e) Others, namely;
10. Do you believe that better waste management can improve sustainability?
    (strongly disagree, disagree, neither agree nor disagree, agree, strongly agree)
11. Anything you would like to add, that can help create more awareness about waste management? (free text)

Appendix C: Interview Questions Waste Company

1. Can you briefly explain the different waste management principles you use as a company and how?
2. As a waste management company, how do you help business to minimize their waste?
3. If you look at typical warehouse waste, what is the best way to classify the waste streams and how to treat them?
4. If the waste is collected, but not sorted properly, how do provide feedback on how to improve?
5. With this feedback, is it easier for employees to adapt accordingly?
6. What is the best way to collect data on different waste streams?
7. Can this data also be used to optimize processes?
8. What do you do with materials that cannot be recycled anymore?
9. How do you make sure employees separate waste correctly?
10. When educating your staff, what is the best strategy with the most impact?
11. Are there technologies making it easier to separate waste?

Appendix D: Survey to Analyze Deliverables

This survey is to evaluate the proposed materials for Yusen Logistics and to analyze whether the proposed materials will help to improve the current situation, by answering whether employees of Yusen Logistics responsible for implementing the deliverables agree or not with the following aspects;

Topic	Aspects	Yes	No	Notes
Webinar	The webinar introduces the importance of the topic	☐	☐	
	The webinar gives a clear guideline for the e-learning content	☐	☐	
	The webinar is engaging	☐	☐	
	The content is easy to follow	☐	☐	
	The webinar will increase the sharing of best practices	☐	☐	
	The webinar will increase the willingness of attendees to implement new policies	☐	☐	
	Does this webinar improve the current situation, and why?	☐	☐	
	Is there anything that can be improved in the webinar? If so, what?	☐	☐	
E-Learning	The e-learning is evidence-based (meaning content should be based on theories)	☐	☐	
	The writing style is conversational	☐	☐	
	Feedback is used as a learning moment	☐	☐	
	Learners are engaged in the e-learning (e.g. by buttons or answering questions)	☐	☐	
	Learners should be able to go back to previous chapters themselves	☐	☐	
	The e-learning should contain multimedia (text and supporting pictures)	☐	☐	
	The e-learning contains real-life examples and mirrors the job	☐	☐	
	Learners can give feedback about the e-learning	☐	☐	
	There is a good balance between pictures and text (not too much text or too many pictures)	☐	☐	
	The goal of the project can be reached with the given content	☐	☐	
	Learners should not be overwhelmed by the content	☐	☐	
	The e-learning contains the most important aspects	☐	☐	
	Does this e-learning improve the current situation, and why?	☐	☐	
	Is there anything that can be improved in the e-learning? If so, what?	☐	☐	
On-Site Campaign	The content will help the learning process and remind people about the topic	☐	☐	
	The campaign will help employees share ideas and start a dialogue	☐	☐	
	Does this campaign improve the current situation, and why?	☐	☐	
	Is there anything that can be improved for the on-site campaign? If so, why?	☐	☐	