

Systematic process of waste management for sustainable operations of hotel industry

Wijesekara, D.M.P.

University of Moratuwa, Sri Lanka

dmpwijesekara@gmail.com

Sridarran, P.

University of Moratuwa, Sri Lanka

Abstract

Hotel industry contributes to Gross Domestic Product of Sri Lanka by 12.5% (2018) which is a considerable value. Hotel industry contributes for a considerable amount of daily wastes since there are number of hotel networks which are spread throughout the country. Determining the sustainability adaptation of the Sri Lankan hotel industry is crucial since there is not a strict legal background that specifically governs the hotel industry waste, except for a few regulations related to tourism. Addressing gaps in between such requirements and waste management systems in hotels from the perspective of the Circular Economy concept, this research identifies match making opportunities for hotel industry waste. This ensures that waste is not thrown away and is used in the production process of other goods or providing services. Although many studies on the concept of CE have been carried out globally, it is a novel topic in the Sri Lankan context. Further, research that adapted the CE concept for managing hotel industry waste is scarce. This research therefore investigates on applying the CE concept for managing hotel sector waste by analyzing, the 6R principles associated with the CE concept, the waste match making process and its cost implications. A case study strategy with semi structured interviews as the data collection tool was used in the study. Case studies were preceded by a brief pilot study to set the context for the main study. Manual content analysis method was used for analyzing the collected data. Through the research findings, it was revealed that the possibility of adapting waste exchanging program for hotel industry mainly depends on the category and the location of the hotel. Even though the barriers exist, those can be mitigated through proper vendor selection and waste match making. This research identified possible waste matches, pros and cons of such matches and the enablers, barriers and favorable outcomes of such match making exercises.

Keywords: Sustainability, Circular Economy (CE), Waste exchanging, Match making, Hotel industry

INTRODUCTION

Hotel and Travel sector has been evolving steadily as a promising sector. (Kumaresan, 2014).

Sri Lanka is one of the most renowned tourist destinations, a key factor that fuels the growth of the hotel industry (Umasuthan and Park, 2018). The high growth rate of the hotel sector

aggregates the issue of waste production consistently (Deva Brinda, Sundar and Deva Priya, 2020).

The hotel industry is a significant waste generator which is responsible for 11,749 tons (72,941 cubic meters) of waste annually. Out of these 7,707 tons (49,590 cubic meters) are generated through normal daily operations and are sent to landfills. An additional 3,595 tons (21,208 cubic meters) of recyclables are diverted from daily waste and collected for recycling. However, there is evidence of waste management practices undertaken in the Sri Lanka (Fernando, 2019). Solid waste can be categorized into food waste, garden waste, plastic/ polythene, glass and paper (Camilleri-Fenech *et al.*, 2020).

The Circular Economy concept is initially about waste management towards sustainability. In simple terms, it is about a waste/by-product being used as a resource for the processing of another product (Bekchanov and Mirzabaev, 2018). Waste prevention, innovation through wastes and boosting economic growth are outcomes expected through a circular economy. The Circular Economy concept opens new doors for novel business opportunities by closing material loop holes, prolonging product life cycles and saving resources (Mentink, 2014).

Match making is a new concept that was introduced recently, regarding the consideration of potential matching to exchange their waste. Through the concept, it is expected to divert waste meant for disposal to the production process of another industry instead (Reike, Vermeulen and Witjes, 2018). Applying this concept to the hotel industry would make a noteworthy change in many other industries since most of them are interconnected with other products/services supplying industries, which are directly affected if the hospitality industry. (Lewandowski, 2016).

Developing a model which includes the identification of other interconnected industries with the hospitality industry, identifying and estimating the types of generated waste, resource needs of other industries, the possibility of exchanging waste, and determining the cost-effectiveness of exchanging waste is the ultimate goal of this research.

Concept of sustainability

The sustainability concept represents the idea of balanced consideration between economic, social, environmental, and technological aspects (Stahel, 2016). The roots of the sustainability policy concept can be found back in 1987 in the Brundtland Report. With the time being, the concept

evolved and re-defined as a collaboration of three dimensions: social, economic and environmental. Furthermore, it interprets that the concept of sustainability as a concern of using the resources while ensuring the well-being of future generations. It is highlighted that, importance of sustainable usage of irreplaceable natural resources (Kuhlman and Farrington, 2010).

The most common definition for sustainability is to, being able to fulfill requirements of present generation while ensuring that future generation can meet their needs (Strathern and Stewart, 2018). Sustainability is reviewed as a development model which is leading to future but intended to be efficient for today as well. There are different values, perspectives, visions and definitions are presented along with the criticisms such as being too broad and vague (Adloff, 2019). Concepts of Circular Economy and sustainability are getting noticed for government, industries and other institutions for closing loopholes of economy and being fundamental for competitive advantage (Pieroni, McAloone and Pigosso, 2019).

Origin and adaptation of the Circular Economy concept

With the concept of Circular Economy, it is expected to implement wellbeing with least or no material. Prolongation of the product life, search for multiple options/uses from the same product, and industrial symbiosis can be demonstrated as practical implications of the concept of circular economy. The term 'Circular Economy' can be simply described as turning goods that are at the end of their service life into inputs/raw material for another product, closing loops in industrial ecosystems and thereby reducing waste (Stahel, 2016). The concept of circular economy first came to use in the late 1980s, at a time where concerns on sustainable development was growing.

The traditionally used linear extract-produce-use-dump material and energy flow model, of the modern economic system is unsustainable (Frosch and Gallopoulos, 1989). As defined by Korhonen et al. (2018), circular economy refers to a shift from the traditional linear economic model to product, component and material reuse, remanufacturing, refurbishment, repair, and upgrading to eco-friendly energy sources such as solar and wind and waste derived energy, ensuring a circular flow of resources. This circular flow of resources will directly reduce the extraction and the resultant depletion of natural resources. (Rahman and Kim, 2020).

China was the first country in the world to adopt the concept of Circular Economy in 2008 with a strong collaboration of almost all the parties of the government, by applying for national decision making and demonstration of a nationwide system at three levels Enterprises, Eco industrial parks

an regions in order to resolve shortage of natural resources (Yong, 2007). Circular Economy is recommended as an approach to economic growth that is aligned with sustainable environmental and economic development (Ellen MacArthur Foundation, 2015).

What is the 6R concept and practical implications?

In regards to solid waste management, 3R concept is one of the most successful and widely used concepts. Several approaches were developing through last few decades and 3R has become the most promising one. 3R's (Reduce, Reuse, and Recycle) system were proposed with priority on source minimization, intermediate treatment then final disposal and enlighten the waste generators to practice 3R's as a substantial measure to reduce, reuse and recycle the generated solid waste there all day (Jibril *et al.*, 2012).

However with the broad attention for these sustainability concepts, 3R concept was developed into 6R concept, adding recover, redesign, and remanufacture to the conventional 3R. Especially, the 6R concept is regarded as the basic principle of sustainable design and manufacturing (Yan and Feng, 2014). The basic principle of CE is to look for methods to eliminate waste and designing new alternatives for waste with minimum energy consumption. As a result of that, 6R concept plays an important role in regards to Circular Economy, providing a base line (Devadula and Chakrabarti, 2015). Broad study on 6R consideration is important to enhance the product quality, end life planning strategy and product life cycle (Kuik, Nagalingam and Amer, 2011).

Hotel industry in Sri Lanka, waste crisis of the hotel industry in global context

Tourism is the third largest largest export earner in the economy, after textiles and garments in Sri Lanka. Sri Lanka is an increasingly popular travel destination in world an there are many factors such as natural, cultural, geographic (Ministry of Tourism Development and Christian Religious Affairs, 2016). In year of 2012 Sri Lanka passed two milestones in its tourism history by evolving as a "million tourist destination" and a "billion dollar export income earner" (Richard *et al.*, 2013). Sri Lanka is one of the most sought-after tourist destinations and was placed first in the world's best destinations list for 2019 by one of the world's leading travel authorities, Lonely Planet, in its "Best in Travel 2019" Sri Lankan hotel industry can be considered as one of the key drivers in economic growth and tourist arrivals have doubled since the end of the ethnic conflict in 2009 (Sandaruwani

and Gnanapala, 2016). Since the hotel industry and tourism are closely related and collaborated, the hotel industry plays an important role in the economic growth of Sri Lanka.

It is revealed that most small hotels depend on landfills for waste management and they have negative thoughts regarding establishing sustainable practices at their premises (Radwan, Jones and Minoli, 2012). Due to environmental awareness programs, the current situation has completely changed, and the topic is in the centre of attention and the due attention is properly given. It has proved that whenever higher the scale of the hotel, higher the waste generation (S.T. Pham Phu, M.G. Hoang, T. Fujiwara, 2018). Furthermore, the authors state that the mean value of waste generation by a guest is around 2.28kg per day.

Waste generation in Sri Lanka

Solid waste generation has become a critical issue in Sri Lanka, considerably growing in the past few decades with the growth of population. The recent incident in Meetothotamulla is providing clear evidence for the demanding issue of waste generation and the need for increased efforts on findings solutions for the waste crisis. Although much research has been conducted focusing on this area, the severity remains the same and is getting worse annually. There are nine provinces in Sri Lanka and waste generation varies based on population rates (Vidanaarachchi, Yuen, & Pilapitiya, 2006). The highest reported area in the Western province, which reports a waste generation of 0.80kg per day by a single person and 1284 Mt per day from the whole area (Sandaruwani & Gnanapala, 2016). Sri Lanka generates approximately 3424 Mt per day (Authority, 2003)

Introduction to match making concept

Switching from the current linear economy to the Circular Economy has attracted the attention of many communities around the world (Lewandowski, 2016). Fast-growing demand has been identified as a crucial threat to the CE concept. As we try to keep virgin materials in the value chain, that effort might add impurities to the value chain of the economy. As for a crucial step, the characteristics of accumulated waste should be discussed (Bracquene E., Duflou J. R., 2019). When shifting into the Circular Economy, it always emphasizes the importance of exchanging waste or by-products between few industries. When considering the fact of exchanging waste; it is essential to understand and estimate the amount of waste and their categories. To achieve this purpose, it is important to have a good understanding of the industries in a certain geographical area.

RESEARCH METHOD

The selection of the research approach is one of the most crucial steps of research. Literature suggested using the qualitative approach due to the lack of applicability of sustainability concepts in the Sri Lankan context. The researcher followed a qualitative research approach with questionnaires and interview guidelines, being used as the data collection instruments, to collect the required data in a structured manner.

For this research, the researcher selected the technique of Case Studies. Basically, with the qualitative approach, the case study technique was selected to achieve the associated objectives of the research. Seven cases related to the hotel industry were selected based on the category (conventional and resort types) and the location. Furthermore, the background study and the literature review conducted indicate a timely relevance for waste management in the hospitality industry.

The researcher conducted a Pilot Study using Semi-structured interviews with experts from various industries both services and manufacturing. For the pilot study, construction, glass manufacturing, packaging, apparel, and hotel industry were chosen. Based on the answers and the results of the pilot study, the hotel industry was selected to carry the research forward.

Case studies were carried out both in urban areas and as well as rural areas of tourist attraction where trending hotel concepts are found. When carrying out case studies the location is a significant fact which directly affects the direction of the research. The research is based on a qualitative approach and case studies are playing a major role to achieve the associated objectives of the research. Seven case studies were carried out focusing on conventional hotels and resort type hotels.

As for the data collection techniques Semi-structured interviews were chosen since it helps gather specific information which can be compared. According to the qualitative approach that has adopted in this research, the need of gathering information that can be compared as well as flexible arose. Manual content analysis was selected as the appropriate data analysis technique for the collected qualitative data.

Profile of interviewees for the Pilot Study

Five interviews were carried out with the experts in various industries and they were selected based on their qualifications and industrial experiences. The interviews were aimed on the practicality of concepts and the waste management processes were particularly discussed. Furthermore, the

Circular Economy concept and application extent of sustainability concepts and adaption of the 6R concept in the Sri Lankan context were discussed during the interviews. Experts from various industries who participated in the Pilot study are summarized in Table 1.

Table 1: Profile of the interviewees for Pilot Study

Interview ID	Industry	Profession	Experience
PS 1	Glass Manufacturing	Engineer	14 years
PS 2	Packaging	Engineer	10 years
PS 3	Hotel	Engineer	39 years
PS 4	Apparel	Engineer	4 years
PS 5	Construction	Engineer	13 years

The guideline (which is attached to Appendix) of the Pilot survey is consists of two main sections: the intention of gathering the information on interviewees such as their experiences and qualifications and substantiating the findings on the literature survey and deciding the path of the research.

Profile of interviewees for Detailed Study

The location of the hotel, reputation, and the experiences of interviewees were considered in the Detailed Study. Attention was given to interviewees who are having the exposure of foreign practices since they understand both the Sri Lankan context and foreign countries. When selecting the hotels, hotels in Colombo urban area, resort category hotels which are away from the city as well as hotels in remote areas which are operating as non-resorts were chosen.

According to the researcher, location plays an important role in adopting sustainable practices (based on Pilot Study results). It was assessed the attitudes of interviewees whether they are willing to adopt such practices, innovative ideas, and what could be the solutions to mitigate the barriers which are unique to the industry such as HACCP standards.

Table 2: Profile of the interviewees for Detailed Study

Interviewee ID	Field	Profession/ position	Experience (Years)
A	Engineering	Ass. Chief Engineer	18
B	Engineering	Chief Engineer	27
C	Engineering	Chief Engineer	22
D	Engineering	Ass. Director of Engineer	02
E	Engineering	Chief Engineer	27
F	Engineering	Ass. Chief Engineer	16
G	Engineering	Chief Engineer	10

FINDINGS AND ANALYSIS OF DETAILED STUDY

Basic waste categories and strategies

Generally, most of the respondents from hotels responded that they have two major categories of waste: Dry garbage and Wet garbage. It was revealed that hotel A (respondent) categorizes garbage into three main categories: wet garbage, dry garbage and landscaping waste. As for wet garbage, food waste is considered. For the dry garbage paper, glass, cardboard, and plastic (in a very small quantity) can be considered.

Respondents from city hotels which are located in Colombo (B, C, D, and E) stated a similar category. Respondent E stated that their main waste categories are wet garbage, dry garbage, and E-wastes. Wet garbage includes food wastes from the kitchen, restaurant areas, and dry garbage consists of paper, plastic, glass. For E- wastes, they have a practice of handing over to the supplier or getting the support from vendors who are registered in Central Environment Authority. According to the respondents around the Colombo area, food waste is given to poultry purposes. Respondents B, C, D and E highlighted that they get mutual benefits from the vendors who come to collect food waste, which means they can get discounts from the piggery farms when the hotels get meat from them. Respondent E expressed that they are handing food waste over to a farm. Until they collect them, food waste is kept in cooled rooms to stop getting spoiled. As a benefit of handing them over to poultry purpose, they get discounts when they buy meat from those farms. This example explains that they are using waste as a way of earning. In simple terms, waste is not thrown away from the cycle, it circulates within the economy.

Respondent G stated that food waste is usually kept in cooled rooms of the hotel until a vendor comes to collect them with the purpose of not letting them get spoiled. Furthermore, he stated that they let the vendors take their food waste freely, due to the standards they maintain. Because that particular hotel chain has implemented regulations to buy meat only from guaranteed suppliers, all the hotels from in that particular hotel chain are maintaining procedures to handle carefully due to the HACCP standards. Respondent A also stated a similar idea: that they give their food wastes freely, because they want to maintain a good relationship with villagers when carrying out their hotel operations. The hotel is located in the middle of a village, where they need the support of villagers.

Considering the loopholes regarding food waste, all the respondents answered similarly. Respondent E stated that they provide free food for staff including permanent staff and daily paid workers. There is a canteen area where food is arranged as a buffet. Any of the workers can serve as much as he/she needs. According to the respondent, the problem is that the employees take this opportunity for granted. They throw away more than half of the plate and do not even care about that. According to the respondents, it is basically about the attitudes and it takes time for a change. Respondent G stated that they have introduced a fine-paying system. If someone is throwing their food away, that particular person has to pay a fine. Not only have that, the particular hotel launched many awareness programs to change attitudes towards throwing the food away. These instances prove that the attitudes also affect for the waste generation. It is always better to take action to avoid the generation, instead of finding solutions to how to dump them.

When it comes to the garden waste, respondent A stated that their particular hotel is cultivating paddy and some other vegetables in order to promote "Agro Tourism" which is admired by many tourists. The hotel has built a "Gemi Gedara" where the residents can cook food for their parties with cultivated vegetables. The hotel has arranged a process to use composted garden waste for cultivation. This particular example shows that they are utilizing their garden waste in a way that contributes to the operation of the hotel. Moreover, respondents B, D, and G are using garden waste for composting purposes while other hotels hand them over to the Municipal Council of the area. Most of the respondents stated that they are maintaining a STP (Sewage Treatment Plant) and the water from STP are used for gardening purposes.

As for the dry garbage, respondent G indicated that they have a separated waste management park, which categorizes even the smallest type of waste and taking the quantities to analyse the content of wastes. According to the respondent, they categorize dry garbage into 13 other categories such as bottle lids, cigarette buds, empty pens, papers (written), newspapers, plastic bottles, glass bottles, etc. If they find that any of these wastes can be used for other usages, they do not hand them over to vendors. If not, vendors are allowed to take them away. Considering about the dry garbage, almost all the respondents stated that they hand over their waste to vendors except the D, who is handing them over to Municipal Council. His opinion is that the suppliers should take the responsibility of their products. All other waste can be dumped in such a way which is not harmful to the environment. But it is difficult to assure the safety of dumping E-waste. Furthermore, he emphasized the importance of having a legal framework regarding E waste. B and D are having an agreement with an electrical equipment company to take the E wastes while others hand them over to the Municipal Council.

Respondent A has taken a unique step, which is having an agreement with a bottled water company, to provide specially customized glass bottles to use instead of plastic bottles. He stated that their ultimate target was to reduce plastic consumption and to make these premises a zone free from plastic by the end of 2019. According to him, with this initiative, plastic consumption was significantly reduced. Moreover, all hotels have banned plastic straws and shifted to using paper straws which are offered at the request of a guest. A and E are rejecting the products of suppliers who are not contributing to the 6R concept. For example, they are not buying water bottles from a company because they are not recycling their bottles.

Respondent G stated that they have a paper recycling plant that they operate daily. Furthermore, he revealed that their recycled papers are sold to a higher price than a normal paper. Since that particular

area is mostly covered with forest, they can find elephant dung everywhere. The particular hotel uses it as a raw material when recycling the papers and remanufacturing new papers. This has become a source of profit for them. With this, it indicated they are reusing wasted paper and earn profits from waste. Moreover, G stated about a different type of waste; charcoal, which is a waste from the gasifier. It is distributed freely for agricultural purposes.

Table 3: Basic waste categories and strategies

Types of wastes	Source	Reference
Food waste	7	45
Paper	7	39
Plastic	7	32
Glass	6	28
Other	2	15

Barriers to implementing a waste exchanging process

In the perspective of barriers, most of the hotels do not see waste as an asset that can be sold, used in other processes, and earned. Respondent D stated that their main concern is to get rid of waste as soon as possible. In that perspective, they do not care whether the waste can be sold or not. The particular hotel is looking for solutions to get rid of waste and remove from the premises at the very first moment. The lack of knowledge of novel practices related to waste has become the major reason for this attitude. In such matters, attitudes play an important role as a barrier. The main plus point of all the hotels is that they are concerned about adapting sustainability practices. Almost all the hotels have found a vendor or a solution to remove waste from the premises without being a burden to the environment. When having discussions with interviewees, almost all of them pointed out the barriers of adopting sustainability practices as well as the plus points of such practices. Limited space has become a great challenge for city hotels in the perspective of implementing a waste exchanging process. It is needed to store categorized wastes until vendors come to collect and an extra employee should be assigned to perform the task smoothly. In terms of cost perspective, this extra employment

is also considered as a barrier. The main barrier faced by hotels which are located in non-urban areas is to, difficulties in finding potential vendor for each waste category. Not like in Colombo, many areas in Sri Lanka is not industrialized enough to find possible industries in order to exchange waste within the companies.

Match making process and cost implications

For this match making process, all the respondents were questioned about the available industries within a radius of 25 kilometres. The basic idea was to identify the availability whether the potential industries which can exchange waste with. Almost all the hotels have at least two vendors/ industries that can make a possible match with the hotels. After identifying the vendors, it should be discussed the mutual benefits for both parties. If one party is in need of waste to use as input their product, they can look for whether they have any waste which can be exchanged. If not, a fair value can be discussed. Arranging the transportation method, assigning an employee to run the process smoothly, space allocation to waste storage until the other party collects the waste and an exact day should be fixed to collect waste weekly or agreed time duration.

In perspective of costs, most of the hotels identified transportation as a cost item. This transportation cost is a major challenge for hotels in non-urban areas. They are located far away from Colombo and for some possible matches; the vendor has to come a long way. This might negatively affect to those particular hotels, since the vendors might not be agreed or tend to bargain the value which is lower than the fair value. But this situation can be mitigated, if the particular hotel is offering a unique type of waste/input.

The other major cost item is labour cost. Most of the hotels are trying to cut down the labour cost and this process might be needed to assign a worker for this exact process handling. But this can be mitigated, if the profit is greater than the cost they bear.

Possible matches between other industries / vendors

Respondent A stated that particular hotel is located in the middle of a village and we are located remotely from the city. In this area, there are few retail shops and a few restaurants. As for the strategy of managing waste, all waste is giving freely for the vendors who live nearby. They take them and sell it to other parties or use it for poultry purposes. As for the strategy, what they practice is, not

throwing away or sends for dumping the waste. Although the hotel does not get any payment back, waste management is properly carried out with the support of nearby vendors.

B, C, D, and E respondents are from the hotels which are located in the middle of the Colombo area. Most of the time, they deal with the Municipal Council and registered vendors regarding the E-waste. As a mutual benefit, these hotels get discounts for food waste from piggery farms. Respondent E stated that they are maintaining a particular agreement with the farm for several years, which is a fair deal from our perspective. Since it is difficult to find a large amount of food for piggery farms in city areas, they are willing to provide some discounts. With that particular example, it is clear that city hotels are having this opportunity when it is compared with hotels in remote areas.

F and G hotels are located away from the city area. Respondent F stated that a fair amount of waste is given to the Municipal Council meanwhile the remained waste is given freely to the vendors. It is difficult to find vendors who are willing to pay for waste since the hotel is located in an area that is away from the city.

Especially, G has adapted a lot of sustainability practices, to an extent which other hotels have not envisaged. When it is questioned about the other industries around the hotel, the respondent stated that there are no other industries within the radius of 25 kilometers. As a result of that, their waste exchanging program is slightly different from city hotels. Food waste is given freely to poultry purposes while charcoal is also given for agricultural purposes. Most of the waste is sent for recycling and they reconsider whether there is any possibility of reusing them again. Furthermore, they have found a vendor to buy excess Aloe Vera of the premises. Respondent G stated that they have the benefit of location. Since this is located in the dry zone, Aloe Vera can be grown easily and with no extra effort. The excess can be sold without any bargains, for a very good price." Following that instance, it is clear that waste exchanging possibility can be varied from one hotel to another based on the location.

CONCLUSION

The objectives of the literature review are to understand the concept of Circular Economy, analyzing the current waste generation of Sri Lankan context, importance of hotel industry and how it has become a major waste generator, 6R concept and match making concept.

The next step was to understand how this broad Circular Economy concept can be implemented in hotel industry. Through the discussion, the concept is divided into sub areas and gradually elaborated.

Recognizing basic waste categories of a hotel, how these categories are handled and process of match making with other industries are discussed.

Match making process is complicated as it was revealed in the literature review. Rather than the conceptual and theoretical ideas, it is quite difficult to practically carry out. There should be possible industries or facilities which need waste of hotels as input for their products or services. Although there is a need for standards and regulations, it can be considered as barriers when accepting.

As for the final step, the possible barriers in implementing such a waste exchanging system have recognized. It has identified, based on the location and category of the hotel, the barriers can be differed. Finally, major cost items are recognized in implementing such a waste exchanging program.

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APPENDIX

Pilot study interview protocol

1. Based on your experience what are the most commonly followed sustainable practices in Sri Lanka?
2. Sustainable practices have gained widespread attention globally. Are you aware of novel sustainable practices which are adopted by other countries, but are not yet adopted in Sri Lanka?
3. Indicate your experience with regard to the practice of the following sustainable principles within your field of expertise/within your industry?

Principle	Description	Example	Your experience
Rethink/ reinvent	Consider and question consumption habits.	self-aware of their effect on environment	
Refuse	Make choice to not to generate wastes.	Using a cloth bag for shopping.	

Reduce	Make decisions that decrease the amount of waste	Buying reusable /refillable items. Ex: Cloth bag for	
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Principle	Description	Example	Your experience
	generated.	shopping purposes and using a coffee mug instead of wax paper cup. Buying products with less packaging.	
Reduce/repair	Expand the shelf-lives of products.	Using used pickle jars as containers instead of buying new ones.	
Recycle	Reclaim the raw materials	Paper recycling and manufacturing new papers.	

4. According to your opinion, what are the advantages and disadvantages of adopting sustainable practices?

5. Are you aware of the concept of CE? And how would you define the concept of CE?

6. Based on your understanding, what are the key features and elements of circular economy concept?

7. Are you aware about the 6R concept? How would you define it?

8. Based on your point of view, what is the level of applicability of the 6R principles to your industry?

9. How can the principles of CE be effectively used for improving the efficiency of an organization?
10. “Usually the Circular Economy concept is adapted in Textile, Construction and Logistic industries”. In your point of view are there any other industries which can adapt the concept successfully and if so how?
11. Based on your experience, do you think that the above 6R principles could be used during operation and maintenance of a built facility?
12. What are the activities that can be followed under the 6R principles during the operation and maintenance phase of a facility?

Activity	Maintenance / Operation
Reduce	
Reuse	
Refuse	
Recycle	
Replace/ Rebuy	
Redesign/ Rethink	

13. What are the enablers for implementing the concepts of CE for the value enhancement within Sri Lankan industries?
14. What are the possible favorable outcomes of implementing the concept of CE within Sri Lankan industries?

Detailed study interview protocol

1. What are the basic categories of wastes in the hotel industry and what strategies are used to handle them?

2. Please explain about the existing waste management system of the hotel. What are the major costs for waste management system?
3. What are the other industries within a radius of 25 kilometers from your facility?
4. As you think, any of your waste type can be an input for the product of another industry, which is located around your facility?
5. Is there any possibility of using waste generated from your hotel as an input for other industries? If so, how can that be achieved and what are the barriers for implementing such practices?
6. What are your suggestions for improving the waste management system of your hotel? What are the expected cost items for carrying out such an improvement?
7. In your point of view, what are the benefits of changing the waste management system to a one which exchange wastes with other industries?
8. What are the cost implications of implementing such waste exchange programs? Will it be a cost reduction or will it increase the costs? Could you provide a rough estimate of the costs that would be incurred in implementing waste exchange practices?
9. What are the barriers for adapting new practices of waste management to the hotel sector?
10. Based on your experience what are the most commonly followed sustainable practices in the hotel industry?
11. Sustainable practices have gained widespread attention globally. Are you aware of novel sustainable practices which are adopted by the hotel industry in other countries, but are not yet adopted within the Sri Lankan hotel industry?
12. Indicate your experience with regard to the practice of the following sustainable principles within your field of expertise/within hotel industry.

Principle	Description	Your experience
Rethink/ Reinvent	Consider and question consumption habits.	
Refuse	Make choice to not to generate	

Principle	Description	Your experience
	wastes.	
Reuse	Make decisions that decrease the amount of waste generated.	
Reduce/repair	Expand the shelf-lives of products.	
Recycle	Reclaim the raw materials	

13. According to your opinion, what are the advantages and disadvantages of adopting sustainable practices for the hotel industry?

14. Based on your point of view, what is the level of applicability of the 6R principles to the hotel industry?