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Environmental impacts of waste management in the  
hospitality industry:  
creating a waste management plan for Bergvik Kartano

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Environmental impacts of waste management in the hospitality industry: Creating a waste management plan for Bergvik Kartano

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Many hospitality industries find it difficult to control or manage solid wastes, such as food, containers, paper, cardboard and scrap metals, which are waste generated on a daily basis depending on the industry. Most hospitality industries tend to lag behind when it comes to the collection of waste. Only a fraction of the waste collected receives proper disposal. When waste is not collected sufficiently and the disposal is inappropriate the waste can accumulate and cause water, land and air pollution, which will be a danger to human health and the environment.

The objective of this thesis is to investigate the environmental impact of the waste management plan at Bergvik Kartano. This study seeks to identify the methods for storage of solid waste, and to determine the most effective solid waste management system. It also describes the sources and different types of solid waste and highlights briefly the health and environmental impact of solid waste.

The study was carried out primarily through a survey and interviews with the employees and managers of the Bergvik Kartano hotel. The empirical work of other scholars was also consulted. Secondary data was obtained from books, journals, annual reports and the internet. The study concludes that successful solid waste management in Bergvik Kartano depends on adequate financing and provision of sufficient waste bins or cans for the entire environment to be clean and healthy.

Key words environmental impacts of waste management in hospitality industry: creating a Waste Management Plan

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## 1 Introduction

In ancient time people generated all kinds of waste such as bones and other parts of animals they slaughter for their daily bread or the wood they cut to make their huts, farming tools, carriages. Due to the advancement of civilization, people are generating larger waste which are becoming more complex in nature. The availability of many consumer products and services in the market which was brought about by the beginning of industrial era has had great effect on the people's way of life compelling them to change. The manufacturing and usage of vast range of products as well as management of the resulting waste give rise to emission of greenhouse gases. This has led not only to the pollution of air and water but has affected the planet earth through global warming (Jayarama 2011, 1).

Concerns about sustainable development and environmentally sound policies have been growing considerably everywhere in the last decades. Waste production and management are among the issues that need to be seriously considered and dealt with. In many countries waste generation has been growing as a result of population and economic growth, besides unsustainable forms of consumption and production. While developed countries usually have large amounts of resources available for dealing with solid waste problems, in developing countries the situation is often aggravated by lack of funds (Riyad 2014).

Hospitality industries are no exception, most of the hospitality industries end up polluting the environment in which they operate and making the business environment unbearable for their customers to patronize them more often due to lack of sufficient fund and education concerning how to manage waste. The hospitality industry can become an important factor in the minimization of waste that is currently hauled off and disposed of at landfill sites. The industry can be active in the creation of recycling centre's and programs, using environmentally friendly cleaning supplies and techniques and sourcing locally produced goods and services that reduce transportation expenses (Riyad 2014).

Environmentally sound, waste management has to go beyond the mere safe disposal. It should include minimization actions, reuse and recycling activities, proper treatment and finally safe disposal. But its success is highly dependent on informed and participatory hospitality managers and their customers. Customer's participation is considered to be an important part of waste management strategies in a hospitality industry. Waste is no longer treated as the valueless garbage, waste is rather considered as a resource in the present time. Resource recovery is one of the prime objectives in sustainable waste management system. Different steps and activities which are part of waste management strategies are discussed, followed by a study that shows how Bergvik Kartano solid waste has been approaching waste management challenges in recent times (Unnisa & Rav 2013, 1, 2)

## 1.1 Study background

In most hospitality industries, waste is created at upwards of 1kg per guest per night a large amount when multiplied by the number of hospitality industry and guest around the world. However, many hospitality industries are responding to the waste challenge. Whether a hospitality industry is situated in the busy area of the city or in a remote and pristine beach location; there are numbers of environmental and social issues to battle with, not when the list of them is how to deal with the waste created by daily operations. Since, generally speaking waste has to be paid for twice - once in the form of packaging and again for disposal it makes great business sense when one- create less at initial stage. Apart from cost of waste disposal, there are other problems for hospitality industries (Waste management world 2014).

Modern days hospitality industry is mostly built on vast land scale, the front view is mostly apportioned a larger space but this depend on the Owners and shareholders choice. The interior of the building, which consist of the most important areas widely used by the customers, is also very large. The surrounding, the reception, lobby, kitchen with restaurant and banqueting facilities used to be large too. Occupying mostly all the land scale with the building and wide front view leaves very little space at the back of the building for storing and separating waste. When building hospitality industry, space ought to be make available for proper collection and separation of waste and this will be achieved when health and safety is put into consideration. It is widely known that in hospitality industry most of the waste is generated from food, drink, and kitchen waste, while other areas like toilets, office, and cleaning department of the hospitality industry generate maximum waste. Waste is not only created in guest rooms but also in public areas such as gardens anything from engine oils, pesticides, paints and preservatives to grass and hedge trimmings and office toner cartridges, paper and cardboard waste regular refurbishment adds TVs, carpets, towels, linen and other things (Waste management world 2014).

This particular study was conducted in the Bergvik Kartano hospitality industry one of the most visited Christian oldest hospitality industries in Finland where people of all races come to relax and celebrate togetherness and oneness. The study area is located in Kruusila Area of Salon City. The area was selected because Solid waste management is a major problem to the industry. Bergvik Kartano hospitality industry is one of the most popular Christian hospitality industries in Salo Area. Solid waste generation is a well known problem not only because huge amounts of litter worldwide are aesthetically unattractive, but also because disposal of certain materials can cause significant harm to environment and human health. The large scale or vast land space has been a big problem for Bergvik Kartano, this makes it difficult to create waste disposing bins or cans in every nook and cranny of the hospitality environment lead-

ing to waste been littered all over the surroundings and making it difficult for the customers to dispose the waste in the right order and also make it difficult for Bergvik Kartano to manage the waste with low cost. Waste are not separated in any means, it is been stored in one waste can, not minding that most of the waste can be recycle and reuse. Strong foul smell comes out from the waste because all the wastes are dumped together including kitchen wastes. So Solid waste management has been a long term unsolved problem in Bergvik Kartano hospitality industry (Inga 2013, 1).

The purpose of this thesis is to examine the solid waste management system in Bergvik Kartano hospitality industry in order to create a conducive, convenient and health friendly solid waste management system. Within this context the objectives of this thesis are to describe and explain the current waste management system and practices in Bergvik Kartano hospitality industry, to identify the factors that influence solid waste management in the Bergvik Kartano, and to create and propose recommendations for development of sustainable solid waste management system.

## 1.2 Presentation of Bergvik Kartano

The company is owned by an organization called Vapaa evankeliumisäätiö. The organization was founded by the previous owner of the manor and action center Riitta Pätiälä-Saarisalo and when she died 2002 the organization got the place through her will. The organization now started company called Bergvik kartano oy that is taking care of the accommodation and catering services. Bergvik Kartano is offering peaceful place for meetings, training, camps, retreat and family celebrations, birthdays, wedding and other festivities are organized smoothly in the company. Wedding deliveries takes place in Bergvik own chapel, with seating for 100 people. Festive meal is usually serve in the dining room and Kumranin celebration of a cup of coffee can be enjoyed in the Manor. Bergvik Kartano house surrounded by a beautiful garden, Hermon is ideal for special occasions. The banquet floor has three reception rooms, two smaller rooms, a traditional living room, and a seasonal porch with room for 60 people.

Bergvik Kartano provides accommodation for churches, companies, and private people who seek relaxation and place for conferences and prayer meetings. People from various counties round the world higher the services of the hospitality industry. The company is located just 14km from Salo center towards Helsinki and about hour drive to both Helsinki and Turku. Activity center Kumran is the mansions former barn, the upstairs has been renovated for year-round accommodation. The building has a spacious dining room, for approximately 100 people and catering kitchen. The activity center has about 15 accommodation Rooms for about 30 people. Other buildings offer accommodation for approximately 70 people but all the accommodation houses is not in use year round. Among the buildings, there is also a chapel. Bergvik

Kartano has also three cabins which are rented out mainly for summer time. There are four saunas for visitors one in the manor, two by the lake and one with one of the cabins. There are two nature trails in Bergvik Kartano where people can go and enjoy the nature also enjoy what the nature has to offer for us. The hospitality industry is located at Kruusila area of Salo city.

The picture below shows the kartano paarakennus building which has about 5 rooms that will accommodate 10-15 people. In the entire surrounding of this building it can be seen that there is no waste collection bin outside, not any at the walk ways to the building.



Figure 1 Kartano paarakennus

The picture below is known as Keittio ruokasalikumran which is the kitchen and the dining hall of Bergvik Kartano. The dining halls can contain 100 people, the building has about 6 rooms which has the capacity to contain 15-18 people. Here is the only area in which outdoor waste collection bin can be seen. Behind this very building, there is a large waste collection container in which all the waste collected in the entire Bergvik Kartano both indoor and outdoor waste are thrown.





Figure 2 keittio, ruokasalikumran

Below is another picture of a new building that is just erected in Bergvik Kartano, in this building there are about 3 rooms and each rooms contains 5 people. The building is mainly for families that are on holidays. The building has its own kitchen and dining room, the good thing about this building is that the people can prepare their own food when ever they want without waiting or ordering the catering service of the hospitality industry. The building also has no waste collection bin that is placed outside it.



Figure 3 Uusi majoitusrakennus

The picture below is the parking lot which is called varasto in the finish language. Here in the parking lot, it can be seen that there is no waste bin and the parking lot contains precicely 15 cars.



Figure 4. Varasto

Below are the pictures of the library and a cottage, the library is often visited by the customers of Bergvik Kartano and the cottage is rent out for family use and it has its own kitchen so

the customers do not need to visit the dining hall of Bergvik Kartano if there is no special need for that. As it can also be seen from the picture there is no waste collection bin outside the library or the cottage not even on the walk way to the cottage.



Figure 5. Luentosali kirjasto ja majoitusrakennus antiokia

Below is the walk way that lead to the Bergvik Kartano lake and the walk way is between two fields where people relax during the visit to Bergvik. Sports activity like Volley ball is played here on the field and at the far end of the field is a grill, beside the lake is a sauna. Judging from the picture there is no waste collection bin in sight on the walk way, the entire field and lake side has no waste collection bin where one can drop trash.



Figure 6. Tie ja kenttä

### 1.3 Research approach

In this research Bergvik Kartano is used as a case study. The research objectives were met by collection of both primary and secondary data. Primary data were collected through interviews and literature review while secondary data was used (wherever available) to enhance further the understanding and verify the quality of information gathered.

The researcher collected primary data and secondary data at the same time. The researcher used the method of participatory research, structured interview, and participant observation for data collection. The researcher also review some published materials like, journals, text books and also internet publications, reports is also looked into, informant interview was also used, policies that are applicable and laws concerning the research purposes are also reviewed in the cause of the research. An open-ended interview with different workers is the method used for this research, which gives a lot of space for the research to gather a variety of views on the solid waste problem. Secondary was used to cross check the findings wherever necessary and available (Upendara 2008).

This research is based on correcting and educating the hospitality industry and the public to learn how to manage and control waste, knowing the health consequences of untreated waste in the environment. This research aims at creating a conducive environment for customers and work friendly environment for the workers and to create low cost waste disposing cans

for Bergvik Kartano hospitality industry. Considering the different types of waste that are produced in the hospitality industries, this study is limited solely to solid waste management in Bergvik Kartano hospitality industry and its environments.

The chapter about waste management in Bergvik is founded on interview, field trip and observation made during the case study period, the researcher observed that the industry has only one big container for collecting waste and he took a picture of it. He also took note of the field side, the lake, and the halls, also the cottages and the walkway, which has no waste bins of any kind and he also took pictures of the buildings. In addition, literature review on the map of the area and management of Bergvik Kartano and paper document was reviewed. The case study method was used for the analysis of the environmental impact of solid waste Management (creating new waste plan and bin for Bergvik Kartano). The case study area was selected based on access to relevant information and its characteristics which fits into the topic of this thesis. The study area is located in Western Finland precisely in the City of Salo.

The documentation used on this thesis includes policy documents of Finland government and the European Union, documents that see to waste management in Finland. Decrees and Acts documents that govern waste management.

Interview were used as a way of collecting and gathering information, although the main reason for using interview is to obtain various and different views and perspectives about waste management issues in the area of the case study. The key persons in the areas are the workers of Bergvik Kartano. The interview was conducted during the field visit in March 2014. The interview was based on open-ended questions. Direct observation was carried out in the month of September 2013, January and March 2014. The observations occur during field trip to the industry. The areas observed are, the field, the cottages, the kitchen, the hall, and church, dining hall, the sauna area, the office and the waste dumping area. Besides taking note at the trip, the author also take some photographs of the areas for illustrations and record purposes.

## 2 Waste management

Waste management is the collection, transportation, processing or disposal, and managing and monitoring of waste materials. The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce its effect on health, the environment, or aesthetics. The management of wastes treats all materials as a single class, whether solid, liquid, gaseous or radioactive substances, and tries to reduce the harmful environmental impacts of each through different methods. Managing solid waste tends to be one of the major challenges in the world today. Inadequate collection, recycling or treatment, and un-

controlled disposal of solid waste in dumps lead to severe hazards, such as health risks and environmental pollution. Low collection coverage, unavailable transport services, and lack of suitable treatment and disposal facilities are responsible for unsatisfactory solid waste management, leading to water, land, air pollution, and for putting people and the environment at risk. This situation is especially serious in low and mid income countries (Unnisa & Rav 2013).

Municipal solid waste management (MSWM) is currently undergoing major changes due to high recovery rate target being set by the European Union and national Governments. These higher rates have been set as one measure to achieve the sustainable development required by Agenda 21 of United Nation conference on Environment and Development (UNCED) in 1992. Increasing the recovery rates for Municipal solid waste effects on waste management systems, particularly the composition of waste stream, cost and emissions from treatment and disposal activities (Unnisa & Rav 2013).

Waste is any garbage or refuse or other discarded material including solid, liquid, semi-solid, or contained gaseous material arising from domestic, community, industrial, commercial, agricultural or human operations. The sludge from a wastewater treatment plant, water supply treatment plant, or air pollution control facility is also considered as waste. Waste can also be seen as used materials that are no longer needed or usable which the user intends to discard. It is very important and obligatory to minimize or reduce the pollution of air and water, the hazardous effect on human health and to maintain a clean environment. Healthy living requires a safe and sustainable environment. To manage waste, it requires processes like collection, resource recovery and recycling, transportation, and processing or disposal. Of all these, the most important one is processing/disposal of waste. The urbanized areas are concerned with the problem of developing cost-effective environmentally acceptable disposal methods of solid waste (Jayarama 2011, 3).

## 2.1 Types of waste

There are many sources from which the solid waste comes from. All living things create different kinds of wastes. In natural systems, trees, animals and other organisms contribute to waste. Human creates waste as they alter natural system through extraction, processing and use of natural resources. From the study of various corporations it is clear that each person create 44 tons of waste per year. Each person generates 90,000 pounds of waste in a life-time.

The sources are as follow (Jayarama 2011, 4). Municipal which are waste that are generated in environments such waste came from Street sweeping, sewage treatment plant waste, waste from school and other institution, Domestic which are waste generated from various homes and the wastes are garbage, rubbish and occasional large waste from house,

Commercial which are wastes generated from different stores and offices, Industrial which are waste generated from manufacturing plants, Mining which are wastes generated from coal mining, strip-mining. Agriculture which is wastes that came from farms, grasslands and gardens.

Solid wastes are in various forms which are gathered in different areas of life and in different environments, this does not exclude Bergvik Kartano because it is also an industry where wastes are also generated. In Bergvik Kartano we can say that the wastes which are discussed below are also generated even in small or large quantity except slaughter house waste which is not generated in total sense because the meats are bought in a smaller quantity. And are handled by preserving the meat in the refrigerator, thereby using the meat within a short period of purchase in order to prevent decay which may lead to waste.

Domestic or Household waste: "In various homes and hospitality industries waste are generated everyday by household activities which includes cleaning, cooking, interior decoration, repairs and used products/ materials such as metal containers, plastics, empty glass, broken clothes, newspapers, old books, old furnishings. Each country has its own definition of household waste, and the meaning can vary from place to place. The European Environment Agency (EEA,n. d.) Define household waste as solid waste composed of garbage and rubbish, which normally originates from houses. The United States Environmental protection Agency ( EPA 1997) define it as solid waste, composed of garbage and rubbish, which normally originates in a private home or apartment house may contain a significant amount of toxic or hazardous waste (Jayarama 2011,4).

In general, household waste contains everything not only valuables and often reusable materials, such as mention above, but also contains an ever-increasing amount of hazardous waste such as mercury from batteries, cadmium from fluorescent tubes, toxic chemicals from solvents and disinfectants, these wastes needs to be separated from other waste before disposing them to landfills. As a hospitality industry Bergvik Kartano make use of batteries, disinfectants and fluorescent so they need to be very careful when disposing them because they are hazardous and dangerous to health (Jayarama 2011, 4).

Hospitality Industry waste are waste generated in various hospitality industry (hotel, guest house). These wastes are in various forms or categories, the waste are generated in offices, Kitchen, storage, halls, rooms, and the outdoor areas. The wastes includes, paper, cardboards, cartoons, leftover food, plastic bottles, tissue, disinfectant bottles, cleaning materials, broken wares, dead leaves and plastic bags.

Commercial waste; These wastes are the waste which are gather, produced or generated in the offices, wholesale stores, shops, restaurants and hospitality industry, vegetables, fish and meat markets, warehouses and other commercial establishments.

Institutional wastes: These wastes are generated from institution such as schools, colleges, hospitals, research institutions. The waste from these institutions includes paper, cardboard, pencil, pen, and hazardous wastes but it does not end only there because other offices also make use of papers and cardboard and considering the fact that Bergvik Kartano has office where all the paper work is done they also generate these kind of waste and it is a recyclable waste which is needed to be separated for other uses.

Municipal waste are waste generated due to municipal services such as street sweeping and dead animal's market waste and abandoned vehicles or parts; also includes the already mentioned domestic waste, institutional wastes, and commercial wastes.

Types of municipal waste Biodegradable waste which are food and kitchen waste, green waste, paper. Recyclable material which is paper, glass, bottles, cans. Inert waste is construction and demolition waste that can be rocks, debris. Composite wastes are waste clothing, Tetra Packs, waste plastics such as toys. Domestic hazardous wastes are medication, e-waste, paints, chemicals, light bulbs, fluorescent tubes, fertilizer and pesticide containers, batteries.

Garbage include animal and vegetable waste due to various activities like storage, preparation and sale, cooking and serving; all these wastes are biodegradable (Jayarama 2011, 4).

This types of waste is also generated in Bergvik Kartano, let's take a look at the kitchen where the food is prepared and the storage where the foods are being stored, left over's or spoilt beef or fish or vegetables or even remnant food from these part of the Bergvik Kartano hospitality industry is more important to be taken care of because it decomposes very fast and stinks a lot and the smell when it circulates in the air and when inhaled can put ones health at risk, and considering the fact that the industry house a lot of visitors it is a very important area to take care of so that people will have a health danger free stay when they visit the industry.

The industry makes use of Sauna, which they heat with woods and papers, and this generates ashes. These ashes comprises of Residues from burning of woods, charcoal and coke for cooking and heating in house, institutions and small industries. Ashes consist of fine powder, cinders and clinker often mixed with small pieces of metal and class (Jayarama 2011, 5).

Rubbish these are one of the wastes that is also produced in various household, commercial establishment, hospitality industries, and institutions (Jayarama 2011, 5).



Bulky Wastes these appliances which people are no longer in need of and cannot keep them in their various homes; they dump them at the waste bins or the dump sites. The household appliances are cookers, refrigerators and washing machines as well as furniture, crates, vehicle parts, wood, trees, tires. The bulky metallic wastes are solid as scrap metal but some portion is deposited as sanitary landfills” (Jayarama 2011, 5).

Street wastes like trees are being planted on every side of the road, when driving to Bergvik Kartano it can be will seen that there are trees everywhere outside and dead leaves drop from the trees and litter the ground. These wastes are majorly the wastes that are littered all over the street which makes our environment to look unclean and which has impending health risk stored in wait for the residents. Street wastes includes paper, cardboard, plastic, dirt, dust, leaves and other vegetable matter collected from streets, walkways, alleys, parks and vacant plot (Jayarama 2011, 5).

Dead animals includes animals that die naturally or killed by accident, main looking at the forest that surround Bergvik Kartano industry there are every tendency that some animals die in the woods and the stench will spread beyond the woods to the open space where people have their leisure. It does not include carcass and animal parts from slaughterhouses as these are considered as industrial wastes (Jayarama 2011, 6).

Construction and demolition wastes is generated during renovation which is done partially round the year and new construction in Bergvik Kartano, some quantities of the major components of the construction materials such as bricks, cement, steel, rubble cement plaster, timber, stone, plastic and iron pipes are left out as wastes during construction as well as demolition and some of these waste like cement is acidic and is very dangerous to health so it need to be taken proper care of by disposing them in a proper way to prevent future health hazard (Jayarama 2011, 6).

In wider sense of the term, the municipal solid waste (MSW) covers decomposable wastes such as food and vegetable waste (cooking waste), and non-decomposable wastes such as metals (aluminum, steel), glass (clear, colored), paper (newsprint, cardboard), and synthetic polymers (synthetic rubbers, polyethylene terephthalate, polyvinyl chloride), similarly the industrial waste is made up of a broad variety of non-hazardous materials that result from the production of goods and products. Commercial and institutional, or industrial waste is often a significant portion of municipal solid waste, even in small cities and suburbs (Jayarama 2011, 7, 8).

Some of the wastes referred to as special wastes include (i) cement kiln dust, (ii) Mining waste. (iii) Oil and gas drilling mud's and oil production brines, (iv) Phosphate rock mining,

beneficiation, and processing waste, (v) Uranium waste and (vi) utility waste ( i.e. fossil fuel combustion waste). These are generated in large volumes and are believed to cause less risk to human health and the environment than the waste specified as hazardous waste (Jayarama 2011, 8).

Medical waste or Hospital Waste can be defined as any solid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals. This can also be referred to as the waste materials generated at health care facilities, such as hospitals, clinics, physician's offices, dental practices, blood banks and veterinary hospitals-clinics, as well as medical research facilities and laboratories but in Bergvik Kartano there are no clinics or hospitals but they make use of first aid materials which need a proper disposal after use and also remnants of prescribed drugs or expired drugs are needed to be exposed properly or to be taken to a pharmacist for a proper disposal. Examples of these wastes are as follows blood-soaked bandages, gloves, discarded needles used to give shots or draw blood, cultures, stocks, swabs used to inoculate culture, removed body organs (e.g., tonsils, appendices, limbs), and discarded lancets (Jayarama 2011, 8).

The effect of Poor management of Medical waste on health, Mostly occurred health hazards are linked particularly with poor management of medical wastes like injury from sharps to staff and waste handlers associated with health care establishments, Hospital Acquired Infection (HAI) of patients due to spread of infection, and occupational risk associated with hazardous chemicals, drugs, unauthorized repackaging and sale of disposable items and unused/date expired drugs. This waste is highly infectious and can be a serious threat to humanity if not managed properly. Research result concluded and roughly estimated that out of 4kg of waste generated in a hospital at least 1kg would be infected (Jayarama 2011, 8).

Hazardous waste: This waste is the waste that is dangerous and harmful to human health and the environment, this waste can be in form of liquids, solids, gases or sludge. The discarded commercial products like cleaning fluids and pesticides, or the products of manufacturing processes can also be hazardous (Jayarama 2011, 8).

Electronic waste can be described as spare parts of electronic or complete part of electronics that are no longer in use or which has exceed its life span, this electronic and telecommunication equipment are consumer electronics, specifically, computers, laptops, television sets, DVD players, mobile phones. Which are to be disposed. United Nation (UN) estimates that between 20 and 50 million tons of e-waste is generated world-wide every year and approximately 12 million tons of this comes from Asian countries. Although much of e-waste comes from developed countries, considerable quantities also originated from within India. As of March 2009, approximately 400,000 tons Of e-waste was produced in India, 19,000 tons of this came from Mumbai, the largest e-waste generator in the country (Jayarama 2011, 9).

E-waste is the fastest growing segment of Municipal Solid Waste stream. E-waste equals 1% of solid waste on average in developed countries which grew to 2% by 2010. In developing countries, like India, E-waste forms 0.01% to 1% of the total solid waste. Globally, computer sales continue to grow at 10% rates annually. Sales of DVD players are doubling year over year. Yet the lifecycle of these products are shortening, shrinking to 10 years for a television set to 2 or 3 years for computer. As a result, a high percentage of electronics are ending up in the waste stream releasing dangerous toxins into the environment. These are a division of WEEE (Waste Electrical and Electronic Equipment). The categories under WEEE are large household appliances, small household appliances, IT and telecommunication equipment, consumer equipment, lighting equipment, electrical and electronic tools, medical devices, monitoring and control instruments and so on (Jayarama 2011, 9).

Effect of E-waste on Human Health, several equipment's is made of components, some of which contain toxic substances. In a situation where proper processing and disposal methods are not followed, these substances affect human health as well as the environment. For instance, cathode ray tubes contain large amounts of carcinogens such as lead, barium, phosphor and other heavy metals. If they are broken or disposed in an uncontrolled manner without taking safety precautions, it can result in harmful effects for the workers, and pollute the soil, air and ground water by releasing toxins. Special care is needed during recycling and land filling of e-waste as they are prone to hazards. In conclusion every industry makes use of these electronic in their industry for office work and for entertainment to their customers and Bergvik Kartano is included in the list of companies that make wide use of electronics and they make changes once in a while when the old electronics broke and needed to be replaced and the broken ones are disposed (Jayarama 2011, 9).

Degeneration Time for Solid Waste is the approximate times that different types of garbage takes to degenerate needed to be make known in every industry and companies so that they will be aware of the damage that unsorted or non-separated waste can do to the land and make correction. And also be able to educate others that are not aware of the degenerating time for some solid waste which is widely generated in every area of life. Here are the wastes and the degeneration time,

## Degeneration time for organic waste

Organic waste	Degeneration time
Vegetable, fruit peels, leftover foods.	A week or two
paper	10-30 days
Cotton cloth	2-5 months
wood	10-15 years
Woolen items	1 year
Tin, aluminum and other metal items such as cans	100-500 years
Plastic bags	One million years
Glass bottles	Undetermined

Table 1. Degeneration time for organic waste

## 2.2 Health and environmental impacts of waste

When waste is not properly disposed and treated it causes a lot of health and environmental dangers which could lead to death and diseases to be more rampant in the society. The large amounts or number of collocations in MSW creates health and environmental problems. Health impacts include dangers to toxic chemicals through air, water and soil media, exposure to infection and biological contaminants, stress related to odor, noise, pests and visual amenity, risk of fires, explosions, and subsidence, and spills, accidents and transport emissions. The occupational hazards associated with waste handling according to UNEP Report (1996) are, infections which are an act or state of being infected with germs, of disease as through the medium of infected insect, water, air. There are various means which infection can get into one's body or the environment. Skin and blood infections resulting from direct contact with waste, and from infected wounds, Eye and respiratory infections resulting from exposure to infected dust, especially during landfill operations, Different diseases that result from the bites of animals feeding on the waste, and intestinal infections that are transmitted by flies feeding on the waste. When waste is not taken care of as it supposed to be, there is 100% assurance that the water, air and land surrounding the dump area which holds the waste will be infected with disease causing germs that will eventually pollute the environment and cause health and environmental hazards (Jayarama 2011, 11,12).

Chronic diseases, workers at Incineration plants are at risk of chronic respiratory diseases, including cancers resulting from exposure to dust and hazardous compounds (Jayarama 2011, 12).

Accidents means an unfortunate happening that occurs unintentionally and usually leads to harm or injury it can even lead to death if it is severe. Accidents do occur in various hospitality industries, in waste collection and waste disposal area. Bone and muscle disorders resulting from the handling of heavy containers, infecting wounds resulting from contact with sharp objects. Accidents also occur in various waste collection and disposing sites. Poisoning and chemical burns resulting from contact with small amounts of hazardous chemical waste mixed with general waste, burns and other injuries resulting from occupational accidents at waste disposal sites or from methane gas explosion at landfill sites. Some common parasites and pathogens connected with solid waste are given in Table 2 (Jayarama 2011, 12).

(Ref: CPREEC).

Organisms	Time and Temperature for destruction
S. Typhosa	No growth beyond 46 °C, death in 30 minutes at 55-60 °C and 20 minutes at 60 °C, destroyed in a short time in compost environment.
Salmonella sp.	In 1 hour at 55 °C and in 15-20 minutes at 60 °C
Shigella sp.	In 1 hour at 55 °C.
E. Coli	In 1 hour at 55 °C and in 15-20 minutes at 60 °C
E. histolytica cysts	In few minutes at 45 °C. and in few seconds at 55 °C
Taenia saginata	In a few minutes at 55 °C
Trichinella spiralis larvae	Quickly killed at 55 °C, instantly at 60 °C
Br. Abortus or Br. Suis	In 3 minutes at 62-63 °C and in 1 hour at 55 °C
Micrococcus pyogenes var. Aureus	In 10 minutes at 54 °C
Streptococcus pyogenes	In 10 minutes at 54 °C
Mycobacterium tuberculosis var. Hominis	In 15-20 minutes at 66 °C. or after momentary heating at 67 °C.
Corynebacterium diptheriae	In 45 minutes at 55 °C.
Necator americanus	In 50 minutes at 45 °C.
A Lumbricoides eggs	In 1 hour at 50 °C.

Table 2. Common parasites and pathogens associated with waste (Source: <http://urbanindia.nic.in/publicinfo/swm/chap14.pdf>).

The above table shows the various parasites and pathogens that associate with wastes and this parasite can destroy faster at different degrees and time. As an industry, Bergvik is generating a lot of waste and the above parasites and pathogens will not overlook the fact that people will be in danger of its attack on health and environment when it finds a safe haven in

the waste that is not properly handled and are Untreated. Untreated waste is a hiding place or if properly put is a house for all the above listed parasites and pathogens that are very dangerous for the human health and for the environment. Wastes have the tendency of polluting the water we drink, the air we breathe and the soil in which we cultivate our food crops, it can cause our land to be barren when too much of these parasites and pathogens goes into the soil and our water will be undrinkable when this waste is not properly treated.

There is a lake at Bergvik Kartano, it can be seen that people enjoy swimming or exercising their body with water. The lake is a source of attraction to every customer and workers of the industry. If the lake happens to be polluted by untreated wastes housing the above parasites and pathogens, those that swim in the lake will be in danger of infection on their bodies or if mistakenly swallow the water from the lake it might land the person in the hospital due to unknown sickness or infection that he or she probably got from the water (Jayarama 2011, 12).

### 2.3 Environmental impacts

The environmental influence of waste can be pollution and global warming. From industries that deals with various chemicals and whose wastes are channeled into the stream or rivers and without treatment of such waste, various harmful chemical wastes from photochemical oxidant creation, biotic resource depletion, acidification, eutrophication, and eco toxicity goes into water. The communities, industries, and individuals have, therefore, found several ways to reduce and better manage solid waste through a combination of practices not only to extract reusable components but to generate energy in the form of heat or electricity. These practices include source reduction, recycling, and processing/disposal through different technologies such as composting, combustion/incineration, gasification, anaerobic digestion, land-fill and so on (Jayarama 2011, 13).

Managing waste is now getting easier than before, there are several factors that influence successful management of the solid waste, and the vital ones are awareness creation among people about the benefits of proper waste disposal in communities that are not well aware of these facts, emphasis on waste reduction, long range self-sustainability as well as technical feasibility, institutional arrangements, for example, ensuring market for products, involving community as well as other stakeholders in the waste management program (Jayarama 2011, 13).

Global Warming is caused by lack of proper management of wastes in various localization and environment and mainly from industry and manufacturing companies. Wastes from electronic, farmland, animals, chemical wastes from industries, household waste, and mechanical wastes are basic contributors of global warming, heat from generating plants cannot be left behind

and also heats and smokes from vehicles exhaust contributes to it. This is a subject of local, regional, national and international concern, due to its severe impacts on the humans and the environment in several ways. These impacts are currently witnessed, and are projected to affect the future generations as well. Global Warming is described by as the enhancement of the greenhouse gases and increase in average surface temperature of earth and oceans. The presence of greenhouse gases in the atmosphere from 'natural' and 'human-made' sources is essential because they trap heat and keep the planet earth warm enough for the life to survive. The effect known as 'natural' greenhouse effect sustains life that includes humans, animals, insects, birds, all ecosystems on the planet. It has been observed, however, that there have been significant fluctuations in the concentration of greenhouse gases in the atmosphere over the millennium (Jayarama 2011, 13, 14).

#### 2.4 Effect of solid waste on human and the environment

Solid waste changes the properties of air, soil and water. Pollution of ground water, this takes place when leach-ate from refuse dump is absorbed by the surface or ground water.

Dumping of agricultural solid waste may pollute streams and water ways.

Solid wastes produce foul smell, breeds, insects and organism besides aesthetic value of the land. Municipal workers are found to be infected due to intentional parasites. Large quantities of chemicals are quickly pushed into Drains Rivers causing immense damage to man health and ecology. Mining solid waste is most dangerous especially for the mines workers. They suffer from toxic reactions in the physiological process of human body. Bronchitis, throat blocking, lung cancer, headache diseases. Large quantities of solid waste are subjected to uncontrolled, unscientific and incomplete combustion which in turns results in release of number of pollutants in the atmosphere which cause air pollution (Jayarama 2011, 13, 14).

Advantages of waste management; the major advantages of a planned approach to waste management are. Reducing pollution and the consequences such as global warming, keeping the environment in which human resides clean and green, recovering 'resources' which can be recycled into useful products for reuse and processing of wastes into useful clean energy - heat and electric power (Jayarama 2011, 13,14).

The methods used to gather all the solid waste to a dumping site or a can involve the following, Simple emptying method, exchange method, curbside collection, non-systematic collection, vacuums waste collection and Informal collection.

In waste management there are three major processes involve in managing solid waste. These includes Reducing waste, Reuse and Recycling, these three if properly applied in all areas of solid waste management will minimize the excess waste in our society.

In Bergvik Kartano, if the quantity of food needed are purchased and used without remnant or left over's then we can say the industry is practicing waste reduction, In the process of reducing waste, consumers needs to purchase reusable items, by doing that waste will be reduced in our environment and the items that are no longer needed when recycled into another usable item can also reduce waste. If the people involved in the production and management of waste can follow the 3R accordingly then our environment will be void of health and environmental danger that we face on everyday life (Jayarama 2011, 13, 14).

Waste minimization can be described as the method or means of making sure that the quantity of waste generated by individuals or the general society is reduced. As mention above, the fewer quantities of needed goods purchased will lead to small production of waste (Adele, 24).

### 3 Waste legislation

In nearly all economic activities and environment waste are either generated or created. Waste are classified as all objects or substances that are no longer needed and which the holder or owner tends to discard or put away, or rather thrown away or legally obliged to discard according to European waste legislation. In other words and ways waste is also regarded as useful material if properly separated and recycled. In other cases waste can also be considered an inefficient use of raw materials and, therefore, a loss of resources. Moreover, some waste can contain dangerous and harmful substances or have some hazardous properties and, therefore, they have the tendency to pollute the environment and cause health hazards. Also the recovery and processing of waste can produce emission. (Finish environment institute 2011a) Waste management means the collection, transportation, utilization and treatment of waste including the observation of these activities and aftercare of the treatment places (2008/98/EC).

Municipal solid waste (MSW) means all the waste fractions (e.g. Kitchen waste, packaging materials, glassware and tin cans) which are usually handled in the municipal waste management system. MSW is generated or rather said, produced in households, trade, industries, construction and public and private institutes. Some part of MSW is composted, recycled or otherwise recovered as material, some of the waste is incinerated or gasified and the rest is use for land filling. While waste reduction is the primary objective of any waste legislation, when considering the saving non-renewable resources, the recovery of waste as material or energy is of particular importance (Finish environment institute 2011a and b).



### 3.1 The waste framework directive

Raw material (end-of-waste criteria), and what is the difference between waste and by-products. The WFD presents basic waste management principles as it requires that waste need to be managed without endangering human health and harming the environment. EU Member States should follow the waste management hierarchy (figure 1) (European Commission 2012a).

Directive 2008/98/EC, the Waste Framework directive (WFD) presents the basic concepts and definitions related to waste management (e.g. definitions of waste, recycling and recovering). It also defines when the waste is not waste but becomes a secondary



Figure 7 Waste hierarchy (European Commission 2012a)

Source: Waste Framework Directive (2008/98/EC)

The waste hierarchy above show that prevention is the first in the priority order, then follow by preparing for the re-use, recycling, others are recovery and disposal. Prevention in waste management as shown in the waste hierarchy above is when using less material in design and manufacture, keeping products for longer, re-using, and using less hazardous materials.

Preparing for re-use in waste management is checking, cleaning, preparing, refurbishing, whole items, or spare parts to be able to use them any other time. Recycling in waste management as shown in waste hierarchy is turning waste or items which are about to be discarded into a new substance or product including composting. Recovery in the hierarchy above includes anaerobic digestion, incineration with energy recovery, gasification and pyrolysis which produce energy (such as fuel, heat and power) and other materials from waste; some backfilling. Disposal of waste in waste hierarchy is carried out by using the waste for Land filling and incineration without energy recovery (European Commission 2012a).

The Directive introduces the “polluter pays principle” and the “extended producer responsibility” It incorporates provisions on hazardous waste and waste oils (old Directives on hazardous waste and waste oils being repealed with the effect from 12 December 2010), and includes two new recycling and recovery targets to be achieved by 2020:50% preparing for reuse and recycling of certain waste materials from households and other origins similar to households, and 70% preparing for re-use, recycling and other recovery of construction and demolition waste. The Directive requires that Member States Adopt waste management plans and waste prevention program (European Commission 2012a).

#### Directive Conference on the New Waste Framework Directive

The Academy of European Law in cooperation with DG Environment of the European Commission has organized a conference on the Waste Framework Directive which was held on 1-2 October 2009 in Brussels. The aim of the conference was to bring together stakeholders from Member States, the European Commission, the European Parliament, the European Court of Justice, lawyers and academics in order to analyze the innovations of the directive and to organize a European platform for discussion on models for transportation within the Member States and implementation strategies (European Commission 2012a).

### 3.2 Finnish waste legislation

Finnish waste legislation and Act was amended in 2012. The sole reason for the Finnish Act is to avoid and prevent health and environmental harm and hazard that could be caused or rather that is caused by waste. Waste Act was bent on reducing the quantity of harmfulness of waste, to ensure the promotion of sustainable use of natural resources and also to make sure there is a waste management that is functional in order for people to be able to rely solely on it, in doing that littering will be avoided and eradicated.

The entire aim of the waste legislation is to give a good and standard support to sustainable development by promoting reasonable use of natural resources and by preventing the harms and dangers for human health and environment caused by waste (Inga 2013, 14).

The Finnish legislation cut across all waste but radioactive waste which is covered by a different law. As true as it sounds, Finnish waste legislation is govern or rather based on EU legislation. The Finnish waste legislation consists of more harder and stricter standards and limits than that of EU in general. The legislation covers more waste than the EU legislation.

Waste in Finland as of 2005 to 2006 is 414, 466, 466, 465, 474, and 488 tons. The increase in growth rate of waste quantities adds pressure on waste treatment facilities. It also makes it more difficult to increase recycle rates and to decrease land filling, which has previously been the prevailing disposal method in many countries (Finlex 2014).

The Finnish waste legislation and Act covers or rather apply to waste, waste management and littering as well as to products and activities generating waste (Finish waste act 646/2011, 195/2012). It also cut across all kinds of transportation of waste within the country and it has a solid hold on the carrier and the holder of waste. The municipality has the duty of organizing the waste which must not be hazardous and they must organize the treatment of hazardous waste if the waste is in small quantity according to the Finnish waste Act on obligation of a municipality to organize waste. It is the duty of the owner of waste to find out how waste is carried and to ascertain the authenticity or the registration of the carrier of the waste. In this case the owner of waste will have to ensure that the collector of waste has permit granted in accordance with the Environmental Protection Act. Provided that the collector is not registered the holder of waste must not hand over waste or hazardous waste to the waste collector. The holder or owner of waste that needs to check the validity of the permit need to check with the regional environmental center remarked in the permit and the permits need to be shown on request, Finnish environment institute 2011e (finlex 2014).

Finnish waste Act also covers waste reception point in which the property holder has to make arrangement for a reception point for the collection of waste which has to be covered by waste transport from property and it can be in conjunction with several other properties. The Act covers where the waste has to be delivered, and it is the responsibilities of the municipality to make provision for a delivery center for the waste collected from every home. Record keeping of all waste management services and the obligation of a carrier to provide information or to account for all the additional waste management handled in the municipality is demanded in the Act (Finlex 2014).

Various products and producers are added in the waste Act. This means that the producer has to organize or make arrangement for waste management for each product that is produced. It is the producer responsibility to organize and pay for collection of waste, processing of waste, recycling and utilization and waste management of their products that are not in use. It is mandatory for the producer to keep records and provide information on every product produced and sent into the market. The new waste law that came into effect in 2012 makes it mandatory that the producer takes full responsibility of all products. The Finnish legislation and Act does not left behind the area of vehicles that are due for pounding or those that are sent destruction. The Act is widely used in all waste generated in everyday life and in all area of production of waste, it also includes in this Act the charges to be paid for every waste generated in a municipal areas Finnish waste Act 646/2011, 195/2012 (Finlex 2014).

### 3.3 General waste policy principle

Finish waste policy also reflects the main waste management principles introduced in the EU waste strategy and strategy on the prevention and recycling of waste and they are prevention, the polluter pays, Producer Responsibility, the Precautionary Principle, the proximity Principle, the self-sufficiency Principle.

In Finland, the general objectives of waste policy are as outlined in the EU waste hierarchy, the priority is given for prevention and reduction and only secondly for the recovery of energy and materials from the waste (Waste policies, 2013). Reduction of the greenhouse gas emissions from land filled waste is one of the main objectives too. The main legal documents and laws Finish waste legislation consists of are Act and its amendments, waste decrees, guidelines of the Ministry of Environment in the form of decrees and decisions, the National Waste Plans and regulations set at the local Municipal level. The EPR (Extended Producers Responsibility) Principle in waste management was introduced by issuing decrees and decisions based on the corresponding EU legislation for the following, waste streams which are as follows, end-of-life vehicles (ELV), tires, waste electric and electronic equipment (WEEE), waste paper and packaging and packaging waste. In addition to the regulations listed above, there are some taxes and fees for packaging applied too. The tax has to be paid for beverages, beer and other alcoholic drinks, depending on the type of packaging used. There is also a tax on disposable beverage packages, however, with exemption from tax for reusable packaging. This taxation system meant to encourage the re-use of drink containers and has been quite effective since 1970s (EU Commission, 2001).

### 3.4 New waste plan

Finland has enough time to improve waste management so a move was made in the year 2008 in Finland; the Government of Finland thought it wise to adopt a new National Waste plan which was approved by the government up till 2016. Waste management and waste prevention was looked into. The Finland waste policy is focused towards prevention of waste and reducing the bad and dangerous effects of waste on man and the environment.

The main objectives and principles of the new Waste Plan are as follows towards a recycling society, The National Waste Plan for 2009, 2016.

Minimization or prevention of waste that are generated from consumer goods by improved material efficiency in production and consumption, introduction of promotion of recycling to reduce waste, reducing hazardous chemicals that are associated with waste or embedded in

waste, cutting down harmful effects on the climate caused by waste management, preventing risks or reducing risk to health and the environment from waste management, increasing the rate of development and clarifying the organization of waste management, giving proper education on waste management and how to manage waste, taking proper control in the transportation of waste or shipping of waste.

In order to stabilize the quantity of municipal solid waste at the level it was at the beginning of 2000, the target was channel for the waste to decrease in volume by the year 2016. The government has target to meet up by 2016 which includes recycling 50% of the municipal waste, recover or generate energy from 30% of the waste and then the remaining 20% will be used for filling the land (Finlex 2014).

### 3.5 New waste act

The new Waste Plan for 2016 sets objectives and targets in order to improve the situation of general waste management in Finland. The following, in 2012 the waste legislation was supplemented with the new Waste Act, the Government Decree on Waste (179/2012) and amendments to the Environmental Protection Act (647/2011) and Environmental Protection Decree (180/2012). This legal reform in the Finish waste sector should take place in the period of 2012-2014 (Finlex 2014).

For The Purpose Of the Finnish Legislation and Act Waste was defined as follows in Section 5 and section 6 of the Finnish waste Act 646/2011, 195/2012.

In accordance with the Finish Legislation and Act, waste is any material or substance or objects that the owner or holder discards, intend to discard or disposed or even required to dispose (waste Act 646/2011). A material, substance, items or object is not regarded as waste but a by-product, considering the fact that the result from a production process whose primary aim is not the production of that substance or items, and; further use of the material, item, object or substance is certain, the object or material can be used as it is in its original condition without any other processing than normal industrial practice, the material or substance or object is produced as an integral part of a production process; and the substance, item, material or object meets all condition of product requirements and the condition required for the environment and human health for specific use thereof and, when examined or assessed in totality, its use will not stand as a harm or pose any risk or pose no hazard to human health and the environment, waste Act 646/2011 (Finlex 2014).

The Act further defines other waste and all that is associated with waste management like hazardous waste, municipal waste, mixed waste, waste producer, waste holder, property

holder, waste carrier. In accordance with section 6 of waste Act 646/2011 which defines hazardous waste to be or means any waste items or substance, materials, products or properties that render it flammable or explosive, infectious, or hazardous or pose a risk to human health or the environment in any other ways, or with other corresponding properties which can be hazardous in nature (waste Act 646/2011). Municipal waste in the same context means all the waste that are generated in homes or any dwellings that are permanent, holiday homes, residential homes and other types, categories or forms of dwelling, including sludge in cases pools and septic tanks, as well as waste comparable in its nature to household waste generated by administrative, service, business and industrial activities(waste Act 646/2011); Also mixed municipal waste is the municipal waste left out or remaining after waste have been separately collected off specific segment or fraction at source.(Waste Act 646/2011).

The other categories that is associated with waste as defined in section 6 of waste Act 646/2011, are waste producer which means any one whose activities or engagements produces or generates waste or anyone who carries out pre-processing, mixing or other operations that the result leads to a change in the nature or composition of such waste.

Waste holder is also described here and it is the waste producers or generators of waste, property holder or owners of waste or anyone in possession of waste(waste Act 646/2011) .Property holder means the owner of a real property or the holder of the lease on the property(waste Act 646/2011). The waste carrier is not left out and a waste carrier is a person or individuals that is involved or whose responsibility it is to carry or convey waste or transport waste from one point to the other (waste Act 646/2011). Lastly for the purpose of the Waste legislation and Waste Act Waste management as defined in waste Act 646/2011, means the systematic ways of collecting waste and transporting waste from the point of collection to the disposing land or location and recovery of materials that are still re-usable or recyclable, and in these systematic ways monitoring and supervision and after care of the disposing site is looked into with care, waste Act 646/2011 (Finlex 2014).

#### 4 Waste management plan for Bergvik Kartano

##### 4.1 Salo municipality waste management Rouskis

Bergvik Kartano makes use of Rouskis Waste Management Company which is situated in Salo to dispose the waste generated in the industry. The center is located in a modern waste disposal area as well as non -hazardous waste landfill. The Company named Rouskis is owned by Salo, Paimio Pemar, Kimitoon Kemionsaari and Sauvo Sagu municipality Area.

Tasks performed by Rouskis Waste Management Company are stated as follows.

They take care of the municipality Waste Management legally on behalf of the owner municipalities. Their responsibility is to take care of the housing and public waste management in Salo area. Rouskis also serve businesses within Salo they develop the areas waste management system. They maintain a household utility waste collection in salo area, they also respond to municipal waste transport in Kimito Island. They accept the waste collection point, where the waste is recovered and are treated by them or sent for further processing. The company also advice on how to reduce the amount of waste generated and it's harmfulness and gives information to increase environmental awareness. They organize the hazardous waste collection in the home, farm- land and forest economies, and organize itinerant waste collection (Rouskis 2014).

They complement their place in the property and the holder of organized waste transport in Salo, Paimio and Sauvo. They maintain a register of all municipal waste management area of residential properties to monitor the waste management contracts. They take care of Korvenmäki Waste treatment center in Salo.

Types of Waste Collected	Price vat 0%	Price vat 24%
Bio waste	165,00/t	204,60/t
Cardboard	43,00/t	53,32/t
Glass	56,00/t	69,44/t
Metal (does not need weighing)	0,00/t	0,00/t
Mixed waste	165,00/t	204,60/t

Table 3. Waste Collection and Disposal Prices in Rouskis Waste Management Company

Considering the above listed prices of different waste that are collected by Rouskis , there is clear indication that mix waste and bio waste are at a higher cost than other wastes listed above. Bergvik Kartano spend about 2270.08 Euros to dispose waste in the year 2013 which means that every month it will cost the industry about 189.18 to dispose waste; this price is not fixing because it depends on how much waste the company generates per annum. It can be higher depending on the number of visitors or customers that patronize the industry and the amount of waste that is generated at any event held in the industry. Considering the fact that the industry is not a big one, the amount they spent to dispose waste is high because they do not manage their waste properly, they need to save more by separating waste in a proper way, put those waste where they belong, take those that needed to be sold back to the collection center and those that needed as fuel will be used there in the industry (Rouskis 2014).

#### 4.2 Current look of Bergvikin

The figure below shows the look of the hospitality industry, it shows the road that link from the outside to the hospitality industry, it also contains the chapel, office, dining hall with

kitchen in it and rooms for the visitors, Lecture hall, the cottages, the road that lead to the sauna and the lake, the parking lot, the fields, the barbecue house.

Looking at the figure we can deduce that there is no waste bin outside of the buildings, not any at the field or the roads that leads to the cottages or the fields or the halls. The environment has no bins just one general bin where all the waste generated from the cottages and the rest of the building goes into without separation or sorting. In the general bin, the kitchen waste which decompose faster than other forms of waste goes also into this same bin with other recyclable materials and this can cost more when disposing than when it is separated, also the smell that emits from the bin can cause health problem because it is placed directly behind the kitchen and closer to the parking lot and storage.



Figure 8. The current over view of Bergvik Kartano.

People from every parts of the world visit this hospitality industry for various reasons and they have to be comfortable not only indoors but also being comfortable outside their chosen cottages, this is very important and mandatory that is why every cottages, roads, fields and relaxation center has to have where they can quickly drop the waste they generate. For instance someone that goes out to relax and play on the field with his friends and family will go with refreshment and after eating, it will not be proper for them to walk all the way back to their cottage before they can dispose the trash that is with them.

In every park and recreational center there is always provision for bins or trash cans where kids and the adults that are with them can drop whatever trash they have after eating or drinking, so if these set of people find themselves in Bergvik Kartano it will be very difficult for them to hold on to the trash until they get to the cottage because they are not used to



that kind of stuff, so it will be very easier for them to drop the trash on the field or the walk ways which will cause dirt to be littered everywhere at the hospitality industry causing more work load and expenses for the industry. This means that getting the services of the cleaning company will cost more when they send about two to three people to clean the surroundings instead of one person that will only carry the bins and empty it into the bigger waste bins.

The distance between the cottages and the dining halls or the lecture halls or even the fields and the chapels makes it a mandatory or compulsory to put outside a waste bin or can so that cleanliness can bring good health and as this place is owned by Christian organization it is very important for cleanliness since the saying that cleanliness is next to Godliness.

In Finland the cost for disposing separated waste is more cheaper than disposing mix, these are those waste that are not separated like what is happening here in Bergvik Kartano. The industry will save more money from disposing waste that are already separated and also save more money when they have a good waste management system in the industry. They will also save money when they re-sell the recyclable bottles at the collection centers.

#### 4.3 Waste management in Bergvik Kartano

Waste Management in Bergvik Kartano is categorized in two different groups namely solid and liquid. Wastes are generated in the following areas, office, guest rooms, gardens, kitchen, restaurant and the toilets. And each source contains different types of waste. For example, there are a lot of compostable, which can be biologically decomposed, present in kitchen waste while more recyclables are present in waste from office and guest rooms. To enjoy sustainable environment and save the earth Bergvik Kartano will consider different things while they operate in their business. The waste from both kitchen and other waste in Bergvik Kartano are dumped in the same waste containers, which means it cannot be recycled.

Managing waste is one of the problems Bergvik Kartano is facing, separating waste into their different categories is another thorn in the flesh for the hospitality industry and finally poor management of solid waste is another head ache which the hospitality industry find very difficult to handle. Every area close to the cottages lacks collection cans or bins and the walk ways, fields and playground lacks waste collection bins. The waste management in Bergvik Kartano is not working in a way that waste can be managed. Putting adequate measures in the area of waste management in Bergvik Kartano is important and it will help the company to take good care of their environment, workers and customer's health. The company does not have waste collecting trash cans all over their environment. And Kitchen waste which are mainly comprises of food waste have to go into the same waste bins as all other waste there by creating a foul smell in the dumping area of the environment. In which we all know that

diseases can be transferred through air and when the air is contaminated it will be dangerous for the humans to inhale.



Figure 9. The general waste collection container of Bergvik Kartano.

The above container holds all the waste that is generated in Bergvik Kartano industry biodegradable waste to mixed waste excluding the cartoons that are used as source of fuel for heating.

After thorough interviews, field trips and study of the Bergvik Kartano environment, the researcher gathered a lot of information that will help the industry to properly manage waste in order to prevent future health and environmental hazards. The researcher found out that the industry have a long way to go in management of waste, separate waste collection bins are not provided, there are no trash cans outside where the visitors or customers can drop their various trash which they generate outside their various cottages or where ever they are at the time. The kitchen waste, office waste, toilet wastes, indoor and outdoor wastes all goes into one big waste collection container. But all these need to be properly separated in order to avoid paying more for mixed waste which cost 204.60 Euro per ton. The industry spend 189.18 Euro to dispose waste every month, and is a high price to pay for waste disposal every month considering the fact that the industry do have less visitors or customers in certain period of the year, or rather they don't have at all in some days or weeks. And when Bergvik Kartano customers patronize the industry in summer the price for disposing waste will go higher than what it is at the moment because more people go for relaxation and vacation during summer and waste will be generated in high quantity.

The general waste collection container is placed directly behind the kitchen and dining hall. The stench that emits from that area can cause disease and that is not proper and it is dangerous to human health and need to be moved to another location where the smell will not reach the area inhabited by humans or better still after moving the location, the proper man-

agement should be done and that is separation. At the moment there is no material recovery in Bergvik Kartano hospitality industry.

Healthy living is very important to humans but we cannot achieve that if the basic source of life is been polluted, when the air we breathe is contaminated and polluted, the water we drink turns to poison and the land which grow the food we eat is also polluted then what will be the essence of life which is full of pollution that can cause diseases, infection, health and environmental hazards.

Deduction based on the interview

Considering the fact that the interview is conducted on two workers, it is certain that if we were to interview 100 people the result or their answers will still point to the same direction of lack of proper waste management system. This interview took place at the Bergvik Kartano industry and the fact that the industry needs more work to be done on the waste management and how to sort and handle waste is clear indication that waste is poorly handled and can cause damage to health and environment.

Recycling in Bergvik Kartano is a big issue in these hospitality industries, why recycling is important Bergvik Kartano hospitality industry must protect all their workers, customers' health and environment. In Bergvik Kartano, recycling is not being practiced the way it supposed to be, all the waste were put together in one container in that case it can't be recycled. When we recycle we avoid disposal costs and save.



Figure 10. Important of Recycling (Source: Business Ethics. <http://business-ethics.com>)

Here are things that go into recycling. Glass, metal, food and beverage, containers, newspaper, office white paper, cardboard, scrap metals, batteries and wood. Anything that is not

usable in any industry which they decides to, or is required to throw away is waste (Deep Disclaimers).

#### 4.4 Recommendations

Below is the new waste plan recommended for the industry for future purposes.



Figure 11. The recommended look for Bergvik Kartano Hospitality Industry

Bergvik Kartano hospitality industry needs to change the look of their environment to suit what they represent and make the environment more comfortable for those that patronize the industry for leisure and relaxation. The need to create work friendly environment for their workers and Save more from the cost of disposing waste and that will only happen if they accept to make changes in the outlook of their environment.

The industry can avoid waste generation by following some of this practical ways. The industry can buy refillable or returnable products rather than buying products that can only be used once. They can replace paper towels by hot air dryers in toilets Use reusable tableware in the dining hall. Deliver short memos in small pieces of paper, use computer software that allow faxing from the computer Store files in computers, to avoid paper archives. Reduce paper use by using printing and copying machines that use both sides of the

paper and using used one-side printed paper for draft. They should go with fabric bag when shopping to avoid buying plastic bags. Buy products made from recyclable materials  
 Make use of beverages that are packaged in recyclable or returnable bottles. Avoid the use of dishes that are disposable instead buy dishes that are reusable. Buy eggs that are packed in a multi-way packaging.

Below are separated Waste Collection containers with description of types of wastes to drop in them. One of them is for Cartoons, Cardboard and Papers, one is for Glass and the last one is for Bio waste. These waste collection containers have the tendencies of swallowing up smell or odor that could come from the inside of the container containing Bio degradable waste, it is good and better to use them in an industry like Bergvik Kartano.



Figure12. Recommended waste bin, (Source: public domain).

Considering the fact that the industry might not be able to afford the above container or bin in figure 6, the bin below will be suitable for separation of waste and because it is mobile it makes it more movable from one place to another, the industry can go for these in place of the upper ones pending the time they will be able to buy the other type which I believe will last longer than the ones below although more expensive but it is more durable.



Figure 13. Recommended waste bin, (Source: Public Domain).

Here below is the recommended bin for the outside of Bergvik Kartano hospitality industry, They need the bin to be placed at the right places as shown in figure 5 so that the environment will be conducive for the workers and the customers who make use of the surroundings on daily basis. The Industry will need approximately 11 pieces of the bin in order to place them at the right places they are been needed. The environment is large and spacious that's the reason the industry will have to buy about 11 pieces of the bin below.



Figure 14. Recommended waste bin.

## 5 Conclusion

The purpose of this thesis was to identify the solid waste management problems and the needed solutions for the solid waste management in the case industry Bergvik. Base on the study, a result was gotten and a preferable way of collecting waste and management of waste in Bergvik and profound plan for waste collection was achieved. Due to the limitation of the study which is based on solid waste, it was not possible to take into study other aspect of waste in Bergvik. However, from the waste studied, it was possible to understand the impact and importance of waste management and the risk and hazard it could cause on health and the environment if not properly disposed.

From the result, it was discovered that Bergvik Kartano needs more waste collection containers or bins and there is also need for larger containers for waste separation. The industry also needs to understand the rudiment that goes with management of waste and that unsorted or non separated waste causes more expenses for the industry mean while they can get to dispose separate waste at a cheaper price. The industry need to follow some practical ways like buying refillable or returnable products rather than buying products that can only be used once x, y and z to avoid waste generation. The result shows that in some cases Bergvik industry can be nonconductive for the workers and the customers who will have to walk for some meters to drop the trash or have to drop it right where they might be sitting and this will lead

to more hours of cleaning for the workers. Also at the lake side which does not have waste collection cans or bins have the tendency of posing as risk to health and the environment if the lake got contaminated by common parasites and pathogens that are associated with waste.

Considering the fact that the general waste collection container at Bergvik is placed directly behind the kitchen, when moved from there to a far distance from the kitchen and the cottages or rather if it is possible to get more containers to aid separation of waste and mixed waste handled in a proper way, the stench will stop and the air we inhale or breath in will be void of infection therefore health and environment will be in good condition. The workers will enjoy conducive working environment void of health issues or risk to life. From the interview conducted, it was discovered that the workers have good knowledge of waste management and if they are given the opportunity and the resources needed for the collection, separation and disposal of waste, they will handle it like a professional and the industry will be more conducive than it is now. Bergvik Kartano only need to purchase about 11 pieces of small waste bin and 3 larger containers for the separation purposes when they are ready to handle the issue of solid waste management problem that the industry might be facing and will be facing in the future provided that there is an increase in business and customers patronage.

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## Appendices

### Appendix 1: Waste Legislation In Finland

- Environmental Protection Act (86/2000)
- Environmental Protection Decree (169/2000)

#### General waste legislation

- Waste Act (646/2011)
- Waste Decree (179/2012)

#### End-of-waste

- Council Regulation establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC of the European Parliament and of the Council (NO 333/2011)

#### Waste treatment and recovery

- Government Decree on waste incineration (151/2013)
- Government Decree concerning the recovery of certain wastes in earth construction (591/2006)

#### Legislation on specific waste types, products and activities

- Government Decree on end-of-life vehicles (581/2004)
- Government Decree on subsidies for the processing of end-of-life vehicles (582/2004)
- Government Decree controlling the use of certain hazardous substances in vehicles (572/2003)
- Government Decree on Waste Electrical and Electronic Equipment (852/2004)
- Government Decision on restricting the use of PCBs and PCTs (1071/1989)
- Government Decision on the prohibition of PCBs and equipment containing PCBs, and the processing of wastes containing PCBs (711/1998)
- Government Decision on ozone-depleting substances (262/1998)
- Council of State Decision on batteries and accumulators containing certain dangerous substances (105/1995)
- Government Decision on amalgam-containing wastewater and waste resulting from dental care (112/1997)
- Government Decision on the management of oily wastes (101/1997)
- Government Decision on the recovery and disposal of discarded tires (1246/1995)
- Government Decision on the collection and recovery of waste paper (883/1998)
- Government Decision on packaging and packaging waste (962/1997)

#### Waste shipments

- Regulation (EC No 1013/2006) of the European Parliament and of the Council on shipments of waste
- Government Decision on the part of the National Waste Plan concerning transfrontier waste shipments (495/1998)

#### Other legislation

- Waste Oil Charge Act (894/1986)
- Ministry Of Environment ([http://www.ym.fi/en-US/The\\_environment/Legislation\\_and\\_instructions/Waste\\_legislation](http://www.ym.fi/en-US/The_environment/Legislation_and_instructions/Waste_legislation))

## Appendix 2: Interview with Bergvik workers

How many years has your hospitality industry been operating this property?

What is your position in the hospitality industry?

How many employees does your property have?

How can you describe the size of the property?

Are you familiar with solid waste management?

Do you have solid waste management department in your industry?

What do you think of waste management and how is it taken care of in Bergvik?

If you would be visiting in Bergvik Kartano and would go for walk by the lake with some snacks, how long would you think you could hold the trash in your hand before throwing it on the ground if there weren't a trashcan close by?

Let's assume that the whole place is rent out for one week for big youth group and that there is no volunteer workers to use how many working hours you think it would take to take care of the cleaning of the environment?

When you go to throw trash to the big dump can behind the kitchen what do you think about it?

Appendix 3: Recommendation to Bergvik Kartano Using bergvik map

1. Kartano paarakennus, this Area will need one waste bin

2. Beet-sur: Luentosali, Kirjasto

3. Majoitusrakennus Antiokia

4. Aitta

The area numbered 2, 3, and 4 in Bergvik map will use one waste bin

5. Samaria: Varasto, location number 5 on the map will use one waste bin

6. Lampokeskus, this location will also use one waste bin

7. Patmos: Majoitus

8. Kappeli

The area numbered 7, 8 in bergvik map will use one waste bin

9. Uusi Majoitusrakennus, location number 9 on the map will use one waste bin

10. Varasto

11. Kumran: Keittio, Ruokasali, Majoitus

12. Toimisto, Majoitus

The area numbered 10, 11, and 12 in bergvik map will use one waste bin

13. Rantasauna Pieni location number 13 will make use of one waste bin

14. Rantasauna Iso

15. Varasto

Location 14, 15 will use one waste bin

16. Honkaniemi-Huvila

17. Rantamokki, this location does not need outer waste bin

18. Grillikatos ja Nuotiopaikka

19. Honkaniemen Sauna

Location 16,18,19 will use one waste bin

Bergvik is advised to write a guideline memo or pamphlet on the waste bins which are placed outside the buildings and place a copy of the guideline memo in every room and hall.