HAAGA-HELIA
University of Applied Sciences

Drip! Drip! Hurray! - Urban Gardening at Haaga Campus

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Thesis

Experience and Wellness Management

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Abstract

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This is a research based thesis which explains Urban Gardening and how to setup this garden at Haaga- Helia University of Applied Sciences, Haaga. The purpose of this thesis is to highlight the importance of sustainability and encouraging green way of living by starting a pilot project within the university building.

Information were collected qualitatively. Interviews, Visits and Information through books and internet were the methods used while doing research. These researches is based while implementing it to the actual finding, which was to design a garden. The report consists of three parts: problem, solution and benefits, where Urban Gardening is a solution to many problems being faced today.

Feasibility studies were performed to gather a basic idea of how much could a project cost if started in a small scale. Similarly, challenges and benefits are other areas discussed in detail while writing this report.

Professional help is very important in future while setting up roof gardens if want to expand this project. Readers are recommended to learn about roof properties, municipality rules and regulations, information on different vegetation that are suitable to that particular environment, before starting this kind of projects.

Keywords
Sustainability, Image, Branding, Roof Top Gardening, Intensive Roof Gardening, Urban Gardening

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1 Introduction/Research Plan

Urban Gardening is defined as a garden located in the town or a city that helps in growing different varieties of food by using different resources found in and around that urban locality. (Mougeot 2000). These are mainly built in order to encourage people to utilize waste lands within the city and promote healthy livings which also will lead to an economically sustainable society. Similarly, Rooftop Gardening is an urban gardening practiced in the roof of any buildings to fulfil the same.

Helsinki is one of the largest and crowded cities in Finland. It is the capital city with population of 605,523 (Population Register Center of Finland. Retrieved 16 January 2013). It is located in the southern Finland, which is a neighbour to Tallin (Estonia), Stockholm (Sweden) and St. Petersburg (Russia). These are located 50, 250 and 190 miles respectively. It has a humid continental climate that is influenced by Baltic sea and Gulf Stream. The temperature fluctuates from -5 to -20 ◦C between December to February and mostly covered with snow. Because of this, vegetation in the open area is very difficult. Also, since the city is highly populated, open areas are very difficult to find. Which is why, urban gardening and Rooftop gardening are being very popular in the city. As the trend is being flourished and also to contribute a little to this sustainable approach, Haaga- Helia campus is also starting a Pilot project.

To improve a sustainable education system, to upgrade the energy efficiency and to promote healthy living has become a new trend of this new era. People would eat healthy, live healthy and breathe healthy. But, as the time passed by, urbanization and industrialization took over human brains which only thought about the recent developments and gifted leftovers for the future generation. So, in order to leave the earth as it was, many small communities as well as big companies are trying to bring sustainability to trend so that people would try to save, reuse, recycle or promote healthy lifestyle also earning some profits.

Urbanziation and industrialization is a problem that people born at this era has to face, the result of these problems are severe. People haven't been breathing fresh air, water and soil pollution are reaching its heights. The crowd in city areas are increasing rapidly, which leaves people with no land or limited lands to practice vegetation or go for a walk for fresh air. Keeping this issues in mind, a solution(s) has to be discovered in order to lead a healthy life. So, one of the solutions could be a roof garden or urban garden in the given piece of area. Unused lands and roofs can be considered to start a walk to the healthy living. In other word, practicing the sustainability is a solution to the problem stated above. Sustainability hence can be defined as the process in which the earth continues in doing what it was designed to do forever. For example: providing a quality life along with fresh food, water and air.

This research is based on the core value of sustainability. The research is about a small approach towards how can Haaga-Helia University of Applied Sciences contribute to this trend of a Green living. The campus is located in Pajuniityntie, Helsinki, Finland. The research includes a design around the Campus area, also the feasibility, if the project will be conducted and focuses more on a smaller area as an Urban Gardening where the vegetation will be practised for the student's use.

The benefits of such practices are huge and benefits everyone connected to this project. Some of the general benefits can be that the growth in such practices when rganized in a big scale can provide job opportunities, this will widen people's knowledge on Urban Agriculture and how it can be redeveloped. Similsrly, health and wellness are most important benefits these projects can give. Last but not the least, when looking the big picture this helps in global investment that could be economically or through education provided about sustainability. (Urban Farming Organization, MI, USA)

1.1 Research Method

The research methods used in the thesis are:

- Interviews
- Visits
- Research through books and internet

After the collection of useful information the datas will be analysed qualitatively. The case study will define how?, why? and what? of these methods used.

Interviews are one of the methods used when collecting information for this research based thesis. Interviews were carried out in electronic forms through e-mails and directly via meeting with responsible personnel. In the e-mail, questions related to Roof top gardens and their experience through were mentioned. Whereas, in the meeting the whole gardening ideas were visible and was easier to get more information than from the answers through e-mails.

Interview type	Key characteristics
Structured interview	− The interview was based on a questionnaire that has been prepared beforehand.
Thematic interview	− More specific questions were asked when needed.
Open interview	− Some of the topics were freely discussed as per the need of information.

Table(1): Type of Interview practiced

The table(1) above explains the types of interview involved when doing this research. In order to carry out these interviews, contact information should be searched through internet. Also, some information can be found through personal contacts like friends, teachers, etc. It might be very difficult to get responses soon while some may answer promptly. Overall, this method is very useful when doing any research.

Visits to different gardens is another method of data collection. These visits must be conducted in order to validate the findings gotten from internet and website of some gardens in the city. From these visits, it will be easier to get a visual result of this research which can make the goal easy to reach and keep motivating.

Books and Internet are the most useful source of information. Since these roof gardens are such topic which keeps evolving, internet are the reliable source which keeps updating the data and provides with all sorts of information needed. Some course books related to Image/ Brands and Sustainability can be useful to describe all the theories needed for doing this research.

The result of this research practiced will be a whole report. But the report will consist of theoretical frameworks which will give the background information about the research to be practiced. Later, these theories will be applied in order to create a design of a garden which shall be put in practice in future. All of the report is done based on the Haaga-Helia Guidelines for writing thesis.

The aim of this thesis was to study why gardenings were needed and how to setup these gardens. These were then used to design a garden that will fulfil all the necessary elements to make a sustainable place to study. Also, other ideas were to provide Haaga-Helia with an Image which will create an awareness among other universities that will not only strengthen the Brand of Haaga- Helia but also will be an example for other Universities that are interested in following this approach.

1.2 Sustainable Education System

"Education is the most powerful weapon you can use to change the world." Nelson Mandela.

Fien (1993) explains Sustainable Education System to be one of the basic rights of each and every human being to be educated along with other basic rights regardless of sex, age, gender, language, ethnicity, etc. Also, the system implies that after each and everyone gets their basic rights to study, they apply the study to enhance the economy and make a better society. For this education system to flourish, there are certain needs that has to be fulfilled.

According to Swart & Pettipher, 2005, "The culture and organisation of schools need to change in the first place in order to create sustainable systems and structures which develop and support flexible and adaptable approaches to learning." From this, we can relate that, this kind of projects will develop a different approach to create a good learning environment. (Swart & Pettipher, 2005. pp 3-21)

In Finland, sustainable education has been in practice since the late 90s. The Finnish Ministry of Education once called upon all the universities and polytechincs in Finland to promote sustainable development in their respective work practices. The ministry suggested that by the end of 1990s almost all universities had to practice focusing on energy and others such as waste managements, and commuting. Universities at that time, adopted the Environmental management procedures provided by ISO 14001. (Loukola, Isoaho & Lindström, 2002.)

Education is necessity but Sustainable Education is the need. Sustainable education is not any particular course or project, rather it is an Umbrella for many forms of education that already exists or evolving in the future. Haaga- Helia Green Campus Project therefore is another form added in the Umbrella of Haaga- Helia sustainability Education.

1.3 Brand/ Image

According to the American Marketing Association, Brand is defined as, " a name, term, sign, symbol or any other features that identifies one seller's product or service as distinct from other sellers."

From the above definition, we can say that bringing a new project to a campus can create a brand for Haaga-Helia Campus. This can give uniqueness as well as give a new tag which will give recognition to the school as a "Green Campus".

Haaga-Helia has been granted the Green Office labeling rights in Finland. Green Office is an environmental management system for offices. It is a lable provided by WWF Finland. Workplaces follows the foot step provided by the Green office in order to achieve savings of resources and to slow down the changes in climate.

Green office's programmes helps in reducing carbon dioxide emissions and ecological footprints in offices. These programmes are suitable for large and small scales offices. Also private and public sectors also comes under this programme. Green Office believes that even a small action makes a difference when it comes to environmental protection. (WWF, Finland)

As the Green Office has given an image to the University, Rooftops will be another identity that will help flourish sustainable education system at Haaga.

With the renown brands, there are many positive sides. The figure below explains how a brand can be helpful for the University.

Fig(1). Impacts on brand

The fig.(1) explains many aspects of brands. When a company gets recognized by some brands, customer loyalty is easily achieved. People will believe in the product because of its brands. Similarly, products are recognized. The market demand will grow respectively. Other products launched because of the previous brands gives reputation to it. Similarly, corporate values are improved and stakeholders are confident to commit with us. Supply chain management and market growth are another impacts that brands can have upon any products.

Hence, having a rooftop garden will provide the University with an image and recognition.

2 Sustainable Society

The earth offers enough for everyone's need not for everyone's greed
- Mahatma Gandhi

A society is considered sustainable when there is a balance between Society, Environment and Economy. That balance can be created after certain level of requirement is fulfilled. The diagram below shows the realtion between these three sectors and explains the sustainability clearly.

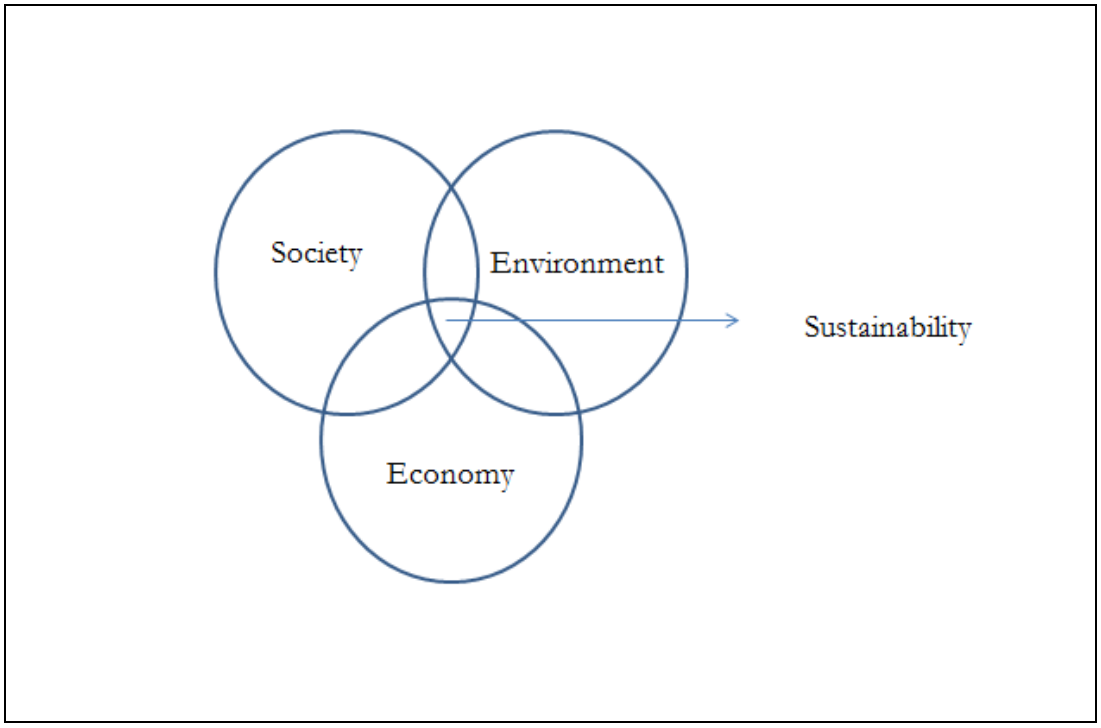


Fig.(2) Sustainability

The diagram, fig. (2) is illustrated below. Here, Human wellbeing refers to the Society, Environmental wellbeing refers to the Environment and Economic Wellbeing refers to the Economy. Human Wellbeing is the state of living where all the basic needs are fulfilled. The basic need includes food, house and clothes. According to Abraham Maslow, the basic human needs is categorized in five different levels in a pyramid. The base of the pyramid is the lowest requirement of the basic need and the requirement increases as it reaches the top of the pyramid.

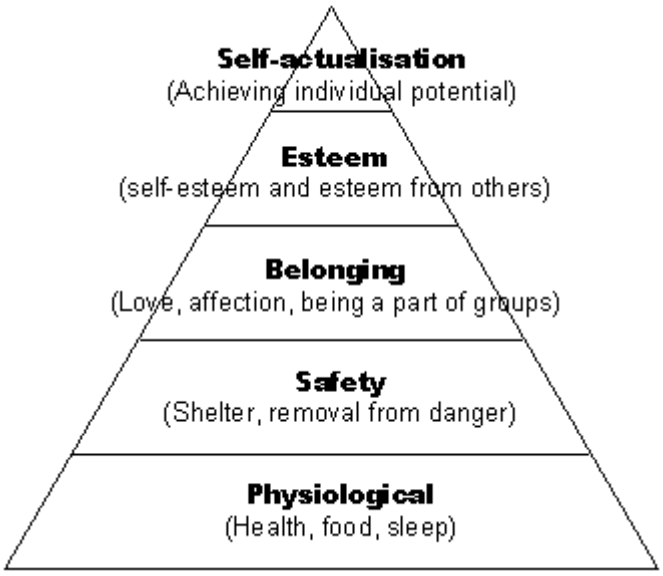


Fig.(3) Maslow Pyramid of Needs

In the fig.(3), the most basic level includes physiological needs which are sleeping, eating, clothing, water,etc.

Safety needs are in the upper level in the pyramid. These include security of body, health, work, etc.

Love and belonging is the other level. Every human being desires love affection from their family, their life partners and friends. So, this is another necessity for human wellbeing.

Esteem is another necessity. Respect for others and from others are another necessity in order to keep the life going on.

Self Actualization is top in the pyramid of Maslow. This level of the pyramid says that man must be what he can be. Creativity, spontaneity, morality falls under this section.

Personal Development and Well-balanced society are another requirements of human well being. If these above needs are fulfilled, there is a sustainable society. (Fig.(2))

In fig.(2), Environmental wellbeing is another necessity for a sustainability. Environmental well being is all about a Healthy Environment, Climate and Energy and Natural Resources.

It is well achieved when one values the resources and is well known about its limits. Also, if the one is aware about recycling and practices them, they are environmentally well and contributes in the sustainability. Healthy environment as suggested above is very important for the environmental wellbeing. Hence, keeping the healthy company and utilizing the resources so that no harm is caused are very helpful. (Hawkins, David.E, 2006)

Economic wellbeing (fig.(2)) talks about Economy and Preparation for the future. Profit, wages and other contributions made by people, businesses, etc. in the field of economy towards the society determines the economic wellbeing. These inputs later on reflects the output in the future. So, a healthy economic wellbeing leads to a sustainable society.

Overall, all these three human, environmental and economic wellbeing interrelated when it comes to achieving a sustainable society. Hence, defining sustainable society as a society that meets basic human needs in a healthy environment where every human being has the opportunity to develop themselves in freedom. (Geurt van de kerk 2008, Arthur R. Manuel 2008)

The Maslow Pyramid and sustainability can be interrelated. As the sustainability suggests the meeting of basic human needs with healthy environment and economic development. Whereas, Maslow explains that people can only develop themselves when they meet their basic needs. Thus, sustainable society is a result of fulfilment of basic human needs. If people do not have their needs fulfilled, they cannot think of improving the society or taking things to the next level.

2.1 Principles of Sustainable Society

The motto of Sustainable society is to care for the earth. In order to take care of earth we need to follow few principles. These are mentioned below:

- Respecting each other within the community as well as taking care of the community where you live
- There has to be increase in the quality of life.
- As Earth is the provider of everything, conserving its vitality is our responsibility. So, the diversity should be respected and taken care of.
- Renewable resources has to be practised more.
- Personal attitude regarding the society should be positive
- Small communities should be formed in order to take care of their own surroundings
- The word should be spread within the nation
- After the nation is now the turn to work with one another; worldwide alliance.

(IUCN, UNEP, and WWF, 1991)

Sustainable society also deals with standards of human needs satisfaction, which definitely will help increase the quality of life. The principle suggests that the basic objectives of human needs has to be fulfilled as without it no one can think of other objectives whether it be towards their own group or the society in a small or big picture. Basic objective involves Love, Recreation, Education, Shelter, Health, Physiological needs, cultural values, etc. Whereas, secondary objective includes all the actions needed to fulfil the primary objective. The secondary objective, hence can be conserving the environment, and leading towards caring of earth. (Bartelmus, 1994)

Hence, once the basic needs are fulfilled, people will start to take care of earth as an individual and as a group. In order to do so, they can follow the principles listed above in this chapter.

2.2 Making Healthy Choices

It is very much necessary for body and mind to remain healthy in order to lead a healthy life. A nice green garden can make one healthy mentally while planting healthy vegetables and practicing eating healthy helps in keeping our body fit.

So, while making this roof top garden, the main focus is on how to make healthy choices. This will not only make the people practicing gardening happy, but it will also teach the whole school on what could be done to remain healthy and practice it while they are in the school. There are few points that should be considered in order to make a healthy choice.

Ecological gardening consists of facts such as using recycled products, saving water, saving energy, creating energy, avoiding the use of new products while choosing an alternatives. For example, in this project the use of used vehicle tyres can replace new containers for planting. Similarly, chemical fertilizers are to be replaced with self made compost manures or natural pesticides to keep harmful insects away. This way, healthy vegetables can be grown in a natural way.

Putting more focus on edible plants is the strategy. Moreover, diversifying the plants so that one can consume different vitamins or minerals from one garden. Medicinal plants are another priority. This will not only help in keeping oneself healthy, but also will increase level of knowledge in different types of medicinal plants grown in Finland and their benefits.

When planting anything, pollution always comes as a big problem. Because of pollution plants cannot grow to the amount it is supposed to. Also, people have to suffer with many diseases after eating foods grown in polluted environments. So, gardening in city is one of the risks. But roof top gardening has come to become one of the alternatives for healthy eating.

Urban lands usually are mixed with many industrial contamination. Also, soil are found to be contaminated with several heavy metals where when a plant is grown becomes

unhealthy as it will absorb the metals while growing up. Hence, rooftop gardening is safe when it comes to the risks of soil pollution. Moreover, the natural fertilizers if used will make it even healthier.

Rain water is the pure form of water. It might not be the purest form as it passes through dusts and gases once it hits the atmosphere. But it is cleaner as it is collected before it hits the ground. Hence, using the rain water after the collection, decreases the risk caused by water pollution in our foods. The atmosphere where the plant is grown another major risk for growing plants in city area. (Armar-Klemesu, Margaret 1999 and Chaney, Rufus L., Susan B. Sterrett and Howard W. Mielke 1984)

3 Going Green in the City

Helsinki is the capital of Finland, most crowded city in the country. Urbanization is not an option but a compulsion. People residing in the city, finds this life very hectic as there is a very rare chance to feel the nature. So, in order to enjoy the country side within the city, many people have started their own green environment either in the roof or balconies or any un used places. Moreover, the forgotten places or the ones that are left barren due to some causes are utilized to grow edible foods. These have helped in reducing the ecological footprints in the houses or in the industries and a healthy community to live in.

There have been many practices within the Helsinki City in recent years. A Finnish Environmental organization called Dodo has been very active in the city. They have performed many projects in order to keep the city healthy and purified since 1995. Here are some of the practices that have been carried out to make the city *Go Green*.

Turn Table urban farm and restaurant is a new approach to make the city green. This was started in 2009 which was the first guerrilla restaurant in Helsinki. In this place which is located in the very urban area of the city, vegetables are produced, prepared and served on the spot. The idea is to promote healthy and fresh eating habits. (Joop De Boer, 2012)

Fig. (4)Pasila Railway Garden

The association Slow Food Helsinki has recently started a green roof in Ruolahti area in the Kaapeli factory. Chives, rosemary, mint, potatoes, Jerusalem artichokes, salads, dill, french tarragon, onions, etc. are some of the plantings which were done by the members of the association. The windy weather is one of the many challenges for the gardening.

(F. Trotti, 2012)

Fig.(5) Kaapeli factory

This is a very new project which is on the way to be launched. This is a very new step in Helsinki. The project plan consists of three areas; roof gardening, green rooftop area and a fruit tree area which will be planted in the ground level. There is estimated to be 150 boxes for gardening which can be rented and used as needed.

(F. Trotti, 2012)

Fig.(6) Lasipalatsi Garden

BagField was another project which was carried by Dodo in May 2010. People filled he farming bags with soil and planted the seeds and seedlings. This project was an experiment.

(Hella Hernberg, 2010)

Fig.(7) Kalasatama Bag Garden

Those were some of the projects that were held or will be held in the near future. Hence, to settle the environmental problem in the urban areas, to have the pleasure of fresh food and best approach to enjoy the country side, the city is made green everyday.

3.1 Green Campus

As it is always said, School is the first and best place to start learning. So, in order to educate people about the importance of nature and make the future generation follow the foot path, it has to start from the school. Which is why the Green campus idea is approaching the world. Green campus is a campus where students are educated to save energy, reuse and recycle the ones that can be done and also to respect the environment to create a sustainable place to learn. (Underwood, Anne, 2007, Vol. 150, Issue 8/9)

There are countless universities in the world now which practices this approach. Going green and eating healthy is not merely a stunt to impress others but every colleges and universities are getting serious everyday.

Benchmarking is the process that evaluates and compares the performances of different aspects within the same sector that helps to enhance the performance and improve in the near future. Past projects gives the new ones a guideline on how to achieve certain goals and also teaches how to improve them. The concept of Roof top gardening is not new, but the practice had been started only from few decades now. Even the practice had been done before, it is very common now a days.

There are various sectors that practices the green approach. Universities around the world are practising them, some on small scale while some on very large scales. There are various ways to determine the greenness. Setting and infrastructure, energy and climate change, waste, water, transportation and education are some of the ways that any universities or sectors can be evaluated and compared with each other.

Stanford University

Standford University has changed its dining hall eco friendly. It has been able to replace the plastic fork and knives with cutlery made of potato starch and salad bowls made of sugarcane. Students after the meal, throw all their utensils to the compost bins which after certain processes will be used in the farm to produce food for students.

The Australian National University

The Australian National University (ANU) is one of the greenest universities in the world. Some of the initiatives of ANU in making its campus green are:

a) The projects which helps in maintaining the water consumption, looks after greenhouse gas emissions and also works in waste management are funded by the Green Loan Fund which is established in the university.
b) It collects all the food and other organic wastes from kitchen and other parts of university to recycle and convert into nutrient rich compost.
c) 25% of its total electricity consumption is provided by the green energy sources.

(The Australian National University, Aurstralia)

Kumpulan Campus

The Science Campus of University Of Helsinki has started two different projects. The green house was built in Decemeber 2011 and the first seed was planted on March 2012. (University Of Helsinki, Helsinki, Finland)

Fig.(8) Green House Kumpulan Campus

University of Bradford

University of Bradford has four core objectives when it comes to sustainability. Those core objectives are:

- Working towards sustainable education
- Working towards a healthy environment
- Working towards social wellbeing
- Working towards a thriving economy

As a reward the university has won the recognition for sustainable campus and also is one of the World's leading Ecoversities. (University of Bradford, USA)

College Of Environmental Science and Forestry

This is a University in New York, USA. The university has a students group called Green Campus Initiative (GCI). This group is responsible for making the university more greener and sustainable.

GCI groups have been working on following projects to help make a better campus environment:

- Have been working on aerated composting in order to help the campus's waste management operations.
- Bike friendly campus; this includes more bike parking lanes, bike loans, etc.
- Recycling
- GCI Garden
- Clothing Swap and free store; this gives possibilities to students once in a while to bring their clothes or other stuffs and swap with some others.

(College Of Environmental Science and Forestry, New York, USA)

4 Rooftop Gardening

Rooftop Gardening is not considered as a modern concept. It is believed that they have a long history. The ancient Mesopotamins are regarded as the first known culture who developed this type of gardening around 600 BC. The plantation started with decorative plants which they would plant in their terrace as most of them had terraces. Romans and Egyptians were also the other cultures who practiced rooftop gardenings. Egyptians used to complete their buildings with the roof gardens. They also used to have water wheels in order to irrigate their gardens. (Jon, 2012)

In the modern time, rooftop gardens are very popular among the city population. People in the city area crave for greenery and fresh fruits and vegetables. There are various irrigation systems and roof tops practiced at the moment. The irrigation could be manual or through some systems so that watering could be done automatically. When talking about rooftop gardens, drainage system should be considered. This is one of the biggest risks one can have when building the roof gardens. Details on irrigation systems is be discussed later.

Benefits Of Roof Gardens

1) Ecological Benefits

   It is very rare that one gets a chance to return what environment has given to us. By practicing roof gardens, in the urban areas, one can restore the lost ecological values. Roof gardens and ecological benefits are directly related to each other, more the merrier.

   One of the first ecological benefits is that the plants absorbs pollutants that rainwater brings with it. This way the heavy metals and nutrients are absorbed by soil instead of wasting away. Similarly, Greenroofs are very beneficial in reducing air temperatures. These also increases humidity levels in the surrounding areas.

Greenroofs can work as a filter. They can filter dust particles and airborne toxins. Green Roofs For Healthy Cities states that, "One square meter of grass roof can remove approximately 0.2 kg of airborne particles from the air every year." Green roofs also provides habitats for various species.

2) Economic Benefits

The use of wasted space can be one of the benefits. As it can be costly when needing a garden at ground level, unused roof tops can save that cost. Similarly, the building is beautified which can increase the number of people interested in the building.

Uses of recycles materials is another benefit. As people use more recycles materials, disposing of the material is saved. There could be job opportunities (local people could get job easily) for the locals if these types of farming are done in a large or medium scales. Also, being green can increase brand value.

As the food is produced within the community, one can buy food from the locals. The result is transportation costs and time are saved. Also, one can enjoy the fresh food.

3) Aesthetic Benefits

Like ecological and economic, there are also aesthetic benefits of roof gardens. With the green surrounding, it is easier to forget the crowd of the city. The greenery brings the countryside memories or feelings alive. Similarly, fresh air can give a positive energy. Also, the visual image of these roof gardens provide various opportunities for any individual/company with endless design possibilities.

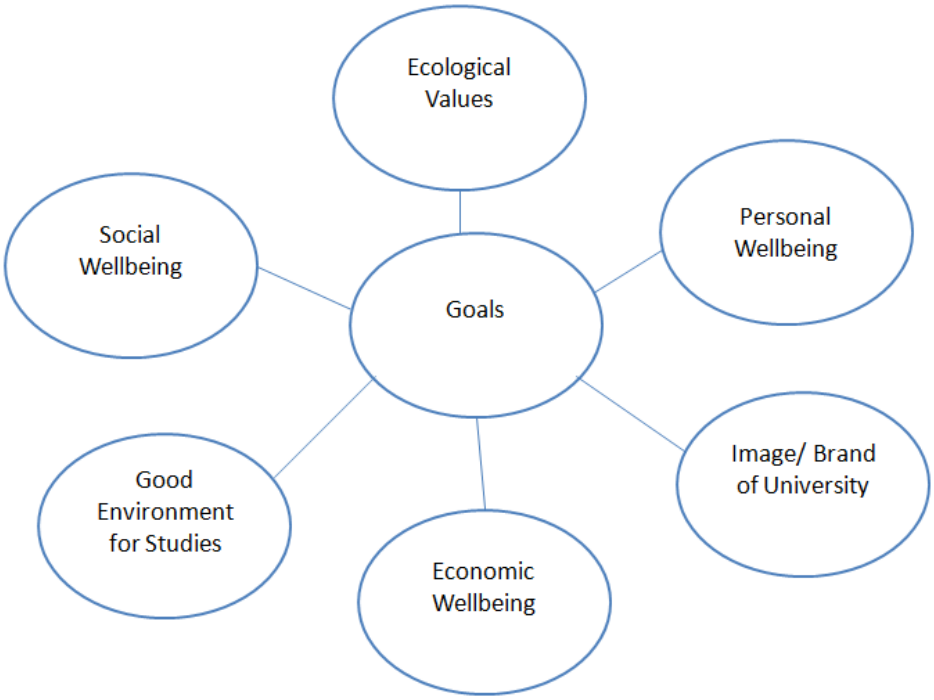
4) Psychological Benefits

It is reported that the quality of life can be enhanced with the increase in green surroundings. Doing the rooftop gardens helps in communication between each other within a society. It brings a bond between a farmer and a consumer. This

is very much needed in an urban society as people are going farther away from each other with the virtuality that technology has bought.

Roles and Goals of Roof Top Gardening

The goal of the roof top gardening that is to be created is mostly Educational. As a part of studies, it is mainly focused on Sustainability.



Fig(9). Goals of Rooftop Gardening

The figure(9) above explains the goals of rooftop gardens. It explains about the benefits that any organization or individual can get through it. All of these benefits are explained above on heading Benefits of Rooftop Gardens.

4.1 Collection of Information

Before starting any projects, it is very much necessary to collect information regarding issues that may come after once the project has started. Collection of information comes under the planning phase.

Capacity

Roof top vegetation depends upon the capacity that particular roof can hold. As this is a pilot project, there will be very small amount of vegetation practiced. Hence, the capacity of the roof is not an obstacle or a risk factor in performing this task.

Security

Security is very much needed when performing such type of activities. Since the vegetation is done on the roof, there are high chances that the plants may fall down when there is a strong wind. Also, the chances of clogging and excess flow of water from the roof are also possible. In order to be on safe side with all the risks, Haaga Campus should provide some security in this matter.

4.2 Setting Up the Garden

There are several procedures involved when building a Rooftop Garden. One has to be very careful since chosing a site to build a garden to what to plant in the garden.
The process/ procedure on how to build a Rooftop Garden is explained below.

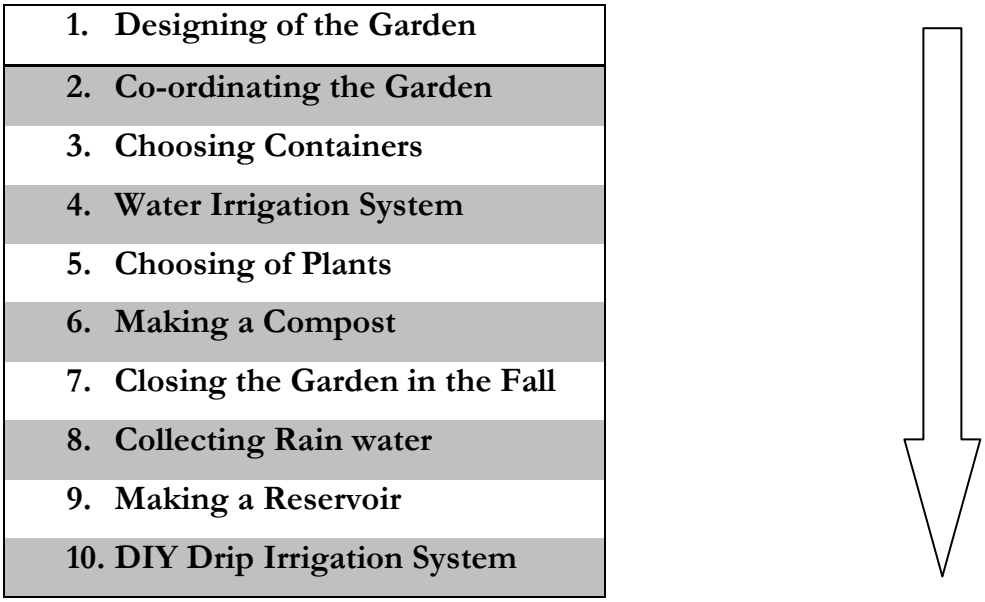


Fig.(10) Setting Up the Garden

The fig.(10) explains the procedures of setting up the garden. The first and foremost thing before starting any projects, planning is very necessary. A very good design of the garden in this case is the basics before starting running it. As this is just a pilot project and in a small scale DIY designs can be used. The design can be created by onself without so much of professional help. Some helps may be needed later when setting up the garden.

Below is the diagram, Fig.(11) that explains how should the plants be grown so that it wouldn't affect the roofs. There has to be seven different layers before planting any plants.

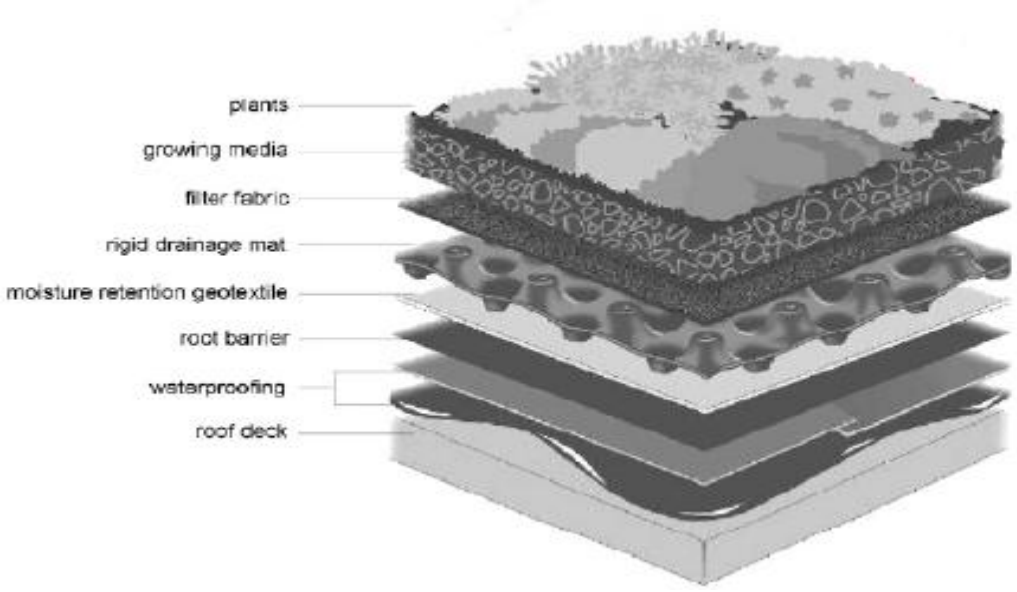


Fig. (11) Structure of the layer

Another important thing will be co-ordinating the garden. What types of plants to be planted, which kinds can be planted together, what type of soil to be used, basic information on gardening, etc. are very much needed while doing this. Hence, co-ordination is very necessary.

Containers must be chosen in such a way that there are possibilities to find some used stuffs which will encourage the re-use and also lowers the cost. For e.g. used car tyres which cannot be further used can be a good container. But also, some farming bags can be used. These bags are nature friendly as well as cheaper to purchase.
This is the most important thing to remember before doing any types of gardenings. There are various types of water irrigation system when searched in the internet. Some are very costly while some can be done with near to no cost. When choosing the irrigation system, the drainage system, water connections, the condition of roofs, etc. should be carefully studied.

When choosing a plant, some studies should be made about the regional vegetations. This means what kind of plants can grow in that environment. Also, one should know about the seeds and seedlings and how to plant them. Basically, surfacial knowledge is necessary while choosing a plant.

Some place has to be separated in order to prepare a compost manure. In this case, organic wastes from the caffeli can be used to making compost. As the weather of Helsinki is not very suitable for outside vegetations during fall and winter seasons, the garden should be closed. A small green house can be created in the roof just to make a little effort in saving these plants in the future.

In order to save water, we can collect rain water and reserve them for the watering purpose. A reservoir is needed to collect the rain water and pass them to the plants. Drip Irrigation system is the method of watering a plant in such a way that very little water is used beneficially. With this system, water drips very slowly and reaches to the root of the plants. This is also very good if the plants has to be watered in the day time, as the water goes directly to the root, plants do not dry out.
(Guide to Setting Up Your Own Edible Rooftop Garden ,2008)

4.3 Choosing the Rooftop Vegetation

There are various factors that should be considered when doing a vegetation in roof. Firstly, the natural soil are heavy, so in order to prevent the roof from different kinds of depletion, light weight growing media is preferred. The light weight consists of high quality compost and other recycled materials. Main reason behind choosing these material is to allow air and water to pass, to provide nutrients which are appropriate to the plants and to keep plants from drying due to the wind. (Richard M . Daley, Mayor)

Secondly, rooftops are regarded as a hostile environment for plants as they are affected by climate change, wind, heat, rain and shadows. So, to prevent the plants, extra caution should be applied for example: a double layered containers could be used during the winters.

Different types of vegetations suitable for the rooftop

- Tomatoes, as they can survive extreme heat and also that they can grow very well in containers.
- Peppers are another heat tolerant vegetables which also can grow in containers.
- Cucumbers are the best vegetables that could grow in the roof. They only need a support to grow.
- Carrots, lettuce and radishes are some of the shallow-rooted vegetables that can grow even in the small containers being another best option for the rooftop vegetation.
- Basil, rosemary, oregano and thyme are other edible products that can be grown.
- Pine trees, Apple trees and other decorative flowers according to the season.

(Alison Sperry, 2010; Nikki Phipps; Belinda Jensen, 2012)

5 Haaga as a part of Haaga-Helia

Roof Top Garden is a garden that is set up in the roof of any buildings. Mostly people living in the city area practices these kind of gardening. This is being practiced very widely world wide and Universities and colleges are the main carrier of these practices. Keeping this in mind, Haaga-Helia Campus in Haaga is also trying to follow this approach to introduce a new episode in the trend of Green Campus but in a very small scale. Rooftops Gardening as a Pilot approach.

There will be three different rooftops and also gardening will be practiced in small containers in the outer yard of the building. The gardens will contain different vegetation that will be used later for students. Small herbs will be planted near the cafeteria, this will make it easy for students to use them while having lunch.

First rooftop will be at the entrance of the school. This will give a fantastic view to the school when anyone enters. Not only that but will be a place for vegetables and berries.

Second will be near Hotel Haaga entrance. This place is not very easy to reach, so this end will have bushes and small trees planted on it. This will not only give a nice view from outside of the school but also from inside when walking through the bridge.

And the third one is on the way out of the Parking. This part of the rooftop will not be discussed in detail. But this part will also have trees and decorative plants.

One where no one can reach will have a tree vegetation for the decorative purpose. While the one roof will have a small area of edible plants. The other will also consist of small trees and plants. Whereas, the small containers will grow herbs in it.

6 Gardens at Haaga

Roof gardening at Haaga will be an Intensive roof gardening. Intensive gardens are very elaborated gardens such as for roofs. This type of gardens are very detailed and requires professional help while designing the roof, checking the drainage, implementing the irrigation plants. This is very expensive to launch, but since Haaga Roof Gardens are a pilot project and on very small scale, only little professional help will be expected. Also, these gardens will be from students to students, so most of the work needed will be carried out by students after gaining some knowledge on how to's about roof top gardenings.

In chapter 4, various steps on how to conduct a roof top is described in detail. The same steps of setting up the gardens will be practiced to create a garden at Haaga. It is also mentioned previously about the places where this gardenings will be practiced.

Below are pictures of these areas of the school.

Fig.(12) In the Entrance

Fig.(13) Near Hotel Haaga

Fig.(14) At the end of Valopiha

6.1 Designing the Garden

The first part of setting up of gardens is the design of the garden. In order to design these gardens and online application called Garden Planner 3 has been used. This application allowed to make own design from choosing a plant to irrigation system to use. For using this tool, one can just download the practice version of this software. After downloading, it is able to make garden as required. One can add any kind of plants they want to, which eases the process. Since, there are three different part of the school where this gardening is to be practiced, three different type of designs are prepared. All three gardens consist of different types of vegetations. Also, this has been kept in consideration while preparing this design for the gardens.

The garden can be designed according to the number of the boxes. The whole area can be used. But also some fences needs to be built in order to avoid any types of risk that may occur because of the roof tops gardening. The risk could be falling of plant because of the wind.

In the entrance to the University

As this part of the university is easy to reach, some edible plants can be planted in here. Plants to be grown in here are:

- Potatoes
- Sugar Beets
- Tomatoes
- Berries (Strawberries, Raspberries, Blueberries, etc.)
- Peas
- carrots
- Onions
- Cabbages
- Decortional Flowers

(Alison Sperry, 2010; Nikki Phipps; Belinda Jensen, 2012)

Below is the rough design that gives idea on what should be placed where.

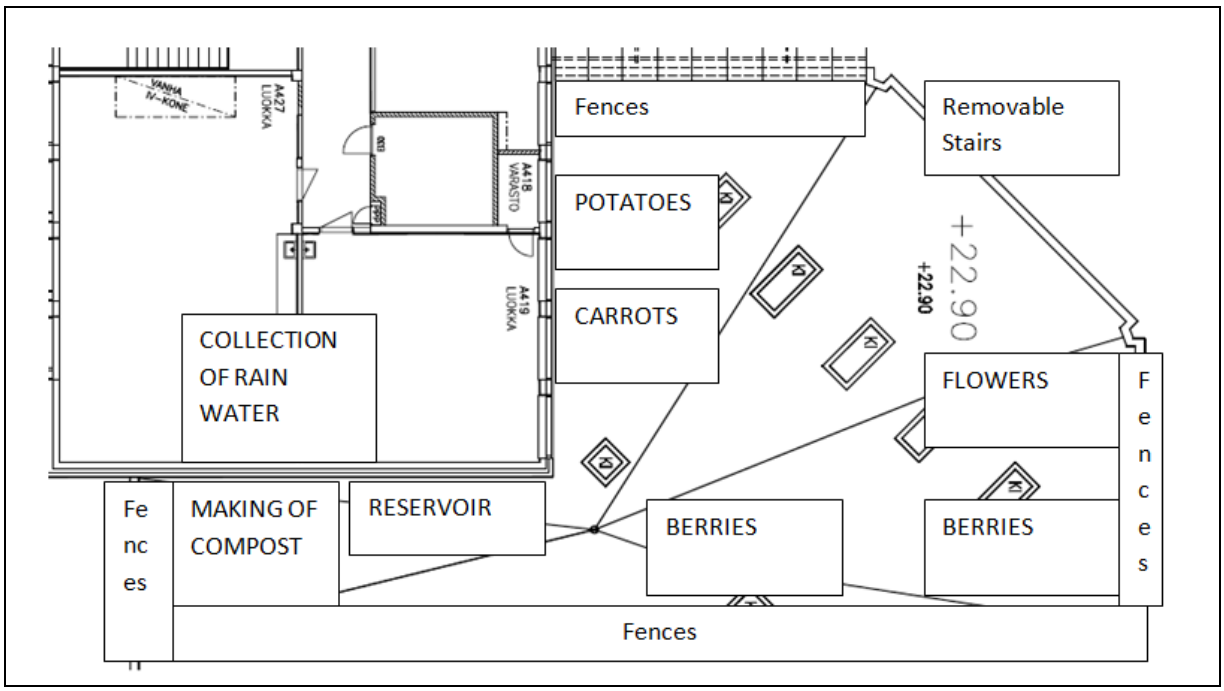


Fig.(15) Rough Desing of the Garden

This is how the roof will look like after the grdening is practiced.

Fig.(16) Final Design of the Roof Top Garden

At the end of Valopiha

This area of the campus is very much used by the students, so in order to save some space, the design can be made in two ways. One with all the boxes to be used on the floor while the other way can be in the bunk/ shelf style.

Below is the design with rough idea of what can be grown.

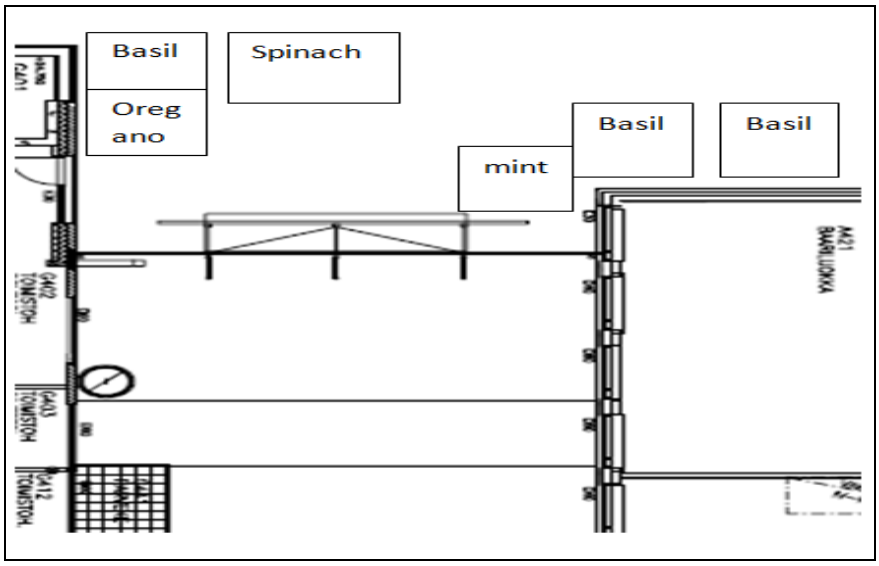


Fig.(17) Rough Design of Valopiha garden

This is how the garden will look like after the grdening is practiced.

Fig.(18) Final Design of the Valopiha Garden

The other design like a shelf can be done as in the picture below:

Fig.(19) Shelves for Gardening

Fig. (20) Garden at Valopiha

Near the Hotel Haaga

At this end of the school, small trees and bushes are to be planted. This part of the roof is very difficult to reach, so the plantation should be done is such a way that the vegetation can survive in very little water and less care. Trees to be planted are Apple, Spruce and Pine with flowers for decorative purposes.

Below is one design at this part.

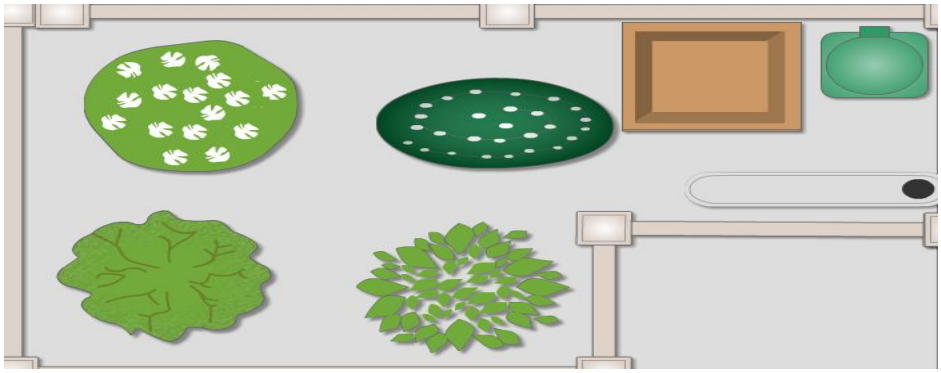


Fig. (21) Garden Design

Fig.(22) Pine Trees

Fig.(23) Apple Tree

6.2 Co-ordinating the Garden

There are many questions that has to be answered when it comes to co-ordinating the garden. Below are some of the basic but very important questions that are taken into consideration.

1) What type of boxes are needed to plant these vegtables?
   Used vehicle tyres can be taken into consideration in order to plant the climbers. This way we can re-use it and in the other hand save some money. When using these tyres, we can make them bigger according to the growth of the plant. Keep adding as they grow up. Another example could be farm bags. These are easy cheaper and very nature friendly.

   In this case, wooden boxes with wheels will be used while planting these herbs. Doing this we can benefit in several ways. As during winter season, nothing can be grown outside, these boxes can be transferred inside and taken care of. This

way students can use the plants all around the year. This boxes can be place near the Valopiha.

2) How many of them are required?
   As the beginners, to start with, 15 of them with 5 different types of vegetables will be used for the roof tops. Whereas for the one near cafeteria, eight wooden boxes will be used. The wooden boxes can be of different sizes.

3) What type of soil is needed?
   The plants should be planted according the type of soil it needs. When filling the pots with the soil it has to be tapped regularly in order to avoid holes that could be created.

4) When to water them?
   It is often said, not to water a plant in the middle of the day. The most effective time of the day to water any plants is 3 hours after and 3 hours before the sun rise and sun set.

5) Who will be responsible for this?
   Some one has to be given the responsibilty to look after the plants once everyday. This work can be given to the students as an extra credit. Or some student group can be formed to take the sustainable education to another level and keep the process going to make our campus a " Green Campus".

When co-ordinating the garden, it is very much necessary to acknowledge the planting instructions. As a basic gardener, an online tool "Kitchen Garden Planner" can be followed. This website consists of all the information regarding what plants to be planted on what time and how long it takes to grow. It gives us a base for vegetation. For example, if wanted to plant cilantro, it gives the following information:

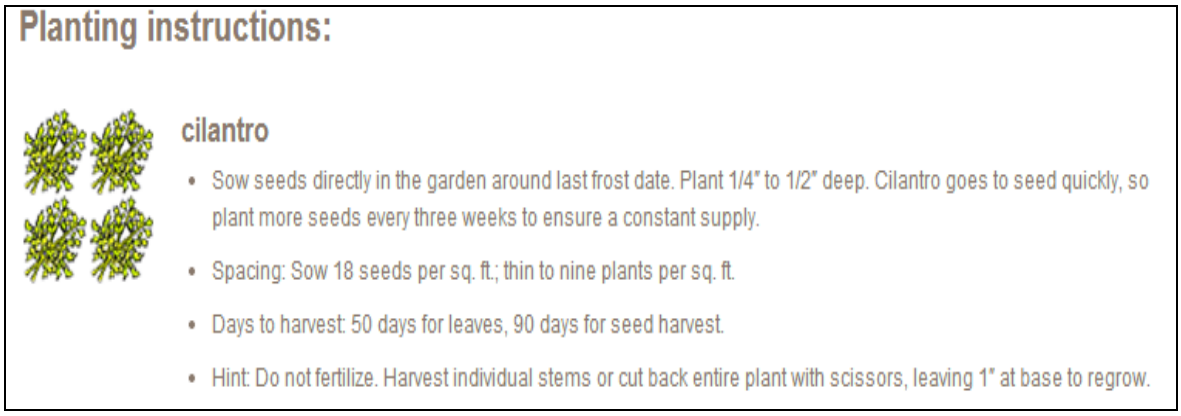


Fig. (24) Planting instruction of Cilantro

In fig. (24) It explains what type of plant is cilantro and also about spacing between the seeds. Similarly, it explains about the harvesting days and the fertilizers if could be used. (Website Gardeners.com)

Simialrly, with the help of this website, one can plan the whole garden. The website provides with the space, where plants can be chosen. and it provides the information accordingly. Below is the print screen of how it can be done.

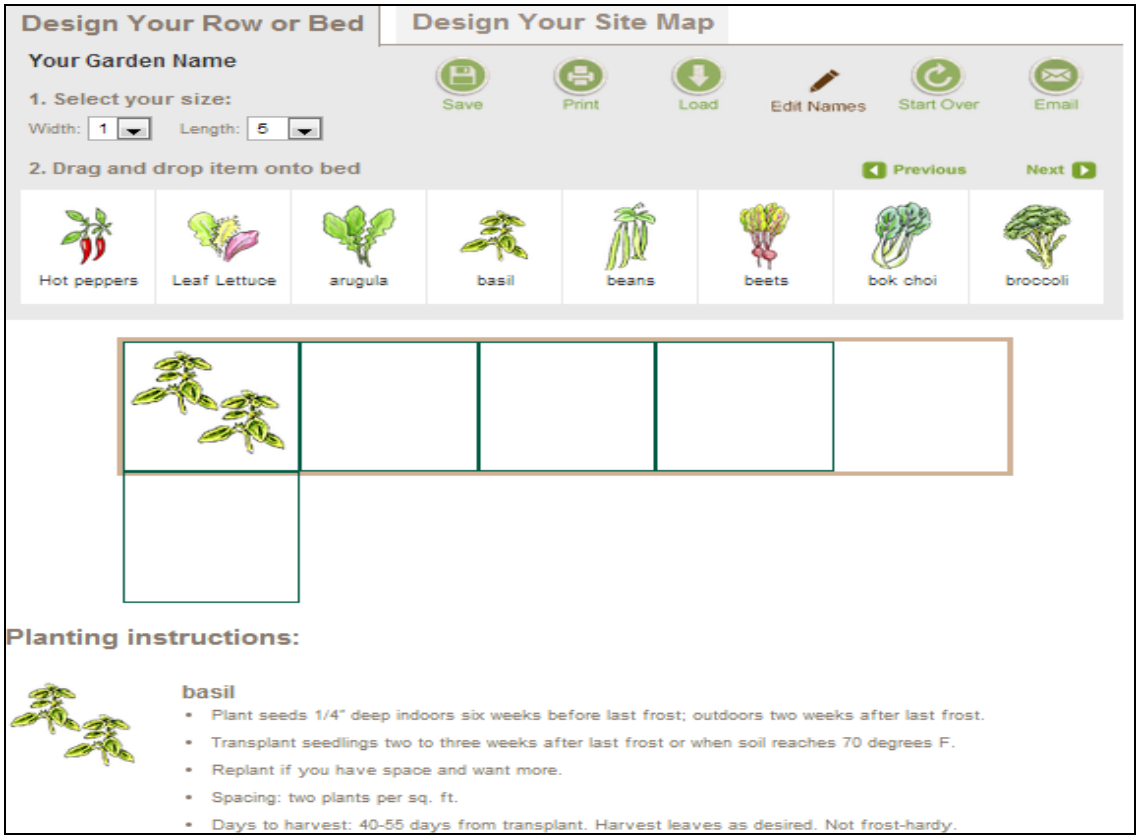


Fig. (25) Designing the Row or Bed

6.3 Choosing the Irrigation system

Irrigation plays a vital role in any type of vegetations. There are various types of irrigation system that can be used for the roof top gardens. For this project, Drip Irrigation system or Manual watering can be chosen, as this is a pilot project which starts from the basics of gardening. Later the same method but advanced ways can be used.

Drip Irrigation System made from plastic bottles can be used in order to water the plants. These can be created by oneself without any professional help. (Hank, Provident Living Organization)

Following is one way to create the Drip Irrigation System:

Step 1: Chooing a Plastic Bottle

First step will be choosing a plastic bottle to use for the irrigation purpose. Two litres or more bottles are effective while doing it. Used plastic bottles can replace the other kits to be used for the Drip Irrigation System. This way expenses can be saved.

Step 2: Making few holes

After choosing a plastic bottles, few holes has to be made. The best way is to make two drip holes in the bottom of the bottle while two on the lower sides. These holes after the bottle is closed with its lid slows the water flow and only the necessary water is feed by the plants.

Step 3: Placing them next to the plant and filling them with water

Place the bottles next to the plant by digging the hole in the same container where the plant is planted in the up right position.

Now the bottle should be filled with water and the lid can be closed or opened as per the flow of water required.

Step 5: Re-filling water

Re-filling of water in the bottle can be done manually or by attaching them to the source of water that contains a timer. In this case, water is filled manually, two times a day. Collected rain water in the container can compliment this system. A container

should be placed in a higher level than where the vegetation is done. This way water can pass easily.

This is one of the most steady water supply method and the water is supplied directly to the root of the plant. Since, the water passes directly to the root, plants can be watered also during the day time when sun is scorching. This system can save time (when the bottles are attached to main water source that has a self timer) and money (As there are no expenses in making one). Also, plants will adapt to grow well in the minimal amount of water supplied to them. This means less use of water. Similarly, erosions are minimized.

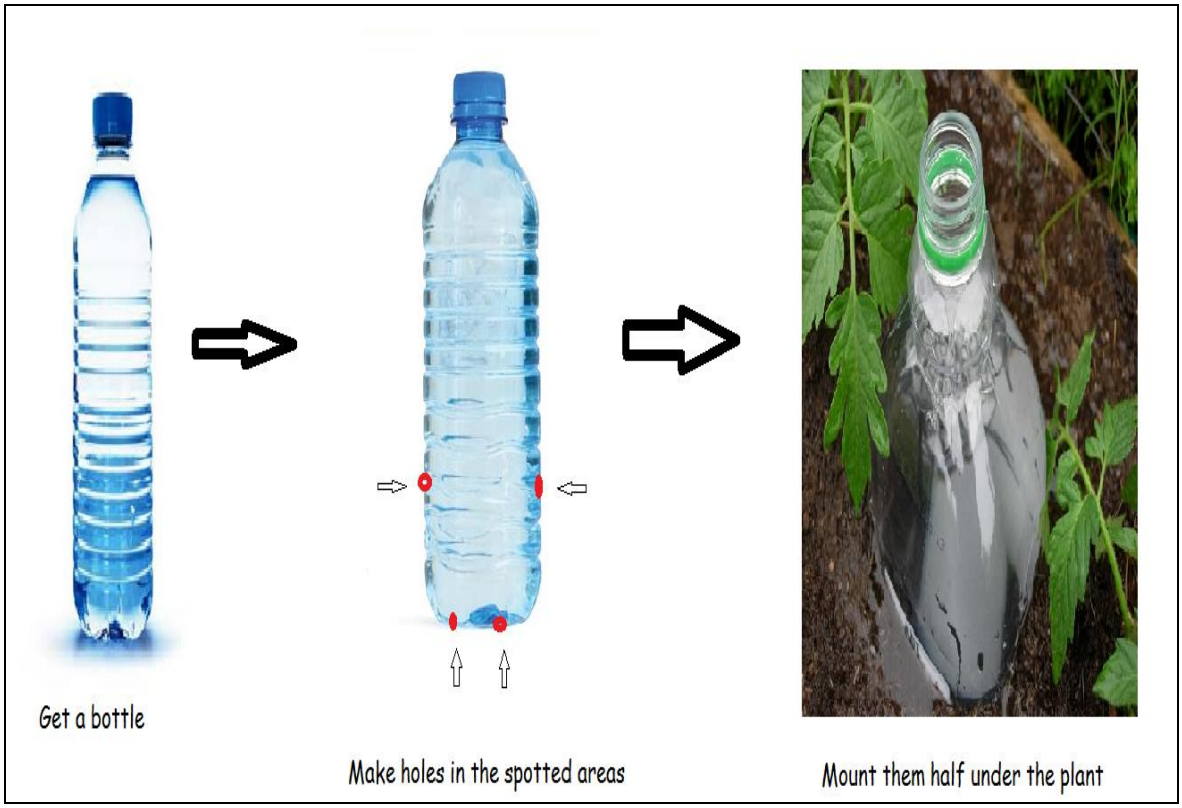


Fig.(26) Drip Irrigation System

6.4 Rules and Regulations from the Municipality

Helsinki city seems to be very supportive of every acts that involves environmental care and flourishment. There are several activities that the city does in order to update and educate people about sustainability and environment. Environmental Education is provided in the form of activities and education in Harkka Island Centre. These education involves promotion of sustainable lifestyle and forces people to think about future.

Activities planned are for people of all ages where they experience their own acivity or get to know from other people's experiences. These education also strengthens the relationship between naure and people which will make them responsible to make their own environmental decisions. Harkka Island nature centre opens every year from May until September which consist of one-kilometre long nature trail. The island offers exhibitions, courses, events and guided nature hikes. (City of Helsinki)

City of Helsinki provides services for Environmental Inspectors, Health Inspectors, Food Inspectors, Veterinarians, Environmental Advisers and Researchers. In order to deal with any kind of environmental issues, Environmental Advisers are provided to discuss about it. As per the roof gardens, it is suggested to notify Environment Centre of the municipality before doing any kind of such activities. (City of Helsinki)

7 Feasibility

In this chapter, the feasibility of the project will be studied in very brief. Most of the cost allocated are based on figures made by researches. The main idea of this chapter is to give a general knowledge on how costly performing such projects would be. This will be an outline of costs for an intensive roof top gardens Study will be taken in order to calculate costs of construction, general plumbings and electrical equipments. Cost estimation of all three gardens will be performed in this chapter.

Also, general cost of plants can be added as a different table at the end of the task. This can be added to the construction cost in order to get the total estimated cost. Similarly, there are other costs that has to be calculated such as transportation, construction of the garden (Labor Costs), Gardening tools, tool box, etc. But these prices can be kept under miscellaneous when doing actual budgeting.

Below are the tables with cost estimation for the construction of the roof gardens and a garden.

Estimated Construction Cost for Intensive Green Roof (Rooftop Garden) Near the Entrance				
Item	Quantity	Unit of Measure	Unit Price	Total Cost
Intensive Green Roof: base	22	Square Metres	€ 23	€ 506
Fences	75	Metres	€ 10	€ 750
Rain barrels	2		€ 200	€ 400
Compost bins	1		€ 100	€ 100
Wooden Boxes (for plantation)	20		€ 60	€ 1 200
Storage/tool shed	10	Square Metres	€ 250	€ 2 500
Plumbing (general and irrigation)	5	Metres	€ 10	€ 50
Electrical (inlcudes general and emergency electrical)				€ 0
Light bulbs	2		€ 4	€ 8
Wires	5	Metres	€ 5	€ 25
Plugs	1		€ 10	€ 10
TOTAL ESTIMATED CONSTRUCTION COSTS (estimate assumes no additional structural upgrades to roof)				€ 5 549

Estimated Construction Cost for Intensive Green Roof (Rooftop Garden) Near Hotel Haaga				
Item	Quantity	Unit of Measure	Unit Price	Total Cost
Intensive Green Roof: base	50	Square Metres	€ 23	€ 1 150
Fences	100	Metres	€ 10	€ 1 000
Rain barrels	2		€ 200	€ 400
Compost bins	1		€ 100	€ 100
Wooden Boxes (for plantation)	20		€ 60	€ 1 200
Storage/tool shed	10	Square Metres	€ 250	€ 2 500
Plumbing (general and irrigation)	5	Metres	€ 10	€ 50
Electrical (inlcudes general and emergency electrical)				€ 0
Light bulbs	2		€ 4	€ 8
Wires	5	Metres	€ 5	€ 25
Plugs	1		€ 10	€ 10
TOTAL ESTIMATED CONSTRUCTION COSTS (estimate assumes no additional structural upgrades to roof)				€ 6 443

Estimated Construction Cost for Garden Near Valopiha				
Item	Quantity	Unit of Measure	Unit Price	Total Cost
Rain barrels	2		€ 200	€ 400
Compost bins	1		€ 100	€ 100
Wooden Boxes (for plantation)	20		€ 60	€ 1 200
Wooden Planks	12	7 Square metres each	€ 10	€ 120
Ropes / Holding wires for the wooden planks	100	Metres	€ 4	€ 400
Storage/tool shed	10	Square Metres	€ 250	€ 2 500
Plumbing (general and irrigation)	5	Metres	€ 10	€ 50
Electrical (inlcudes general and emergency electrical)				€ 0
Wires	5	Metres	€ 5	€ 25
Plugs	1		€ 10	€ 10
TOTAL ESTIMATED CONSTRUCTION COSTS (estimate assumes no additional structural upgrades to roof)				€ 4 805

Total Price	€ 16 797

Tables above suggest estimated price for the construction of this project. The first table gives a brief estimation on the cost for the roof garden at the entrance of the school making total cost of € 5.549. Similarly, the second table explains in brief the cost estimation of roof garden near hotel Haaga. The total cost at this part is estimated to be €6.443. At last for the garden near Valopiha. Total cost estimated here is € 4.805. This makes the total cost to be €16.797.

(Decimals are represented in Finnish System)

8 Discussions

8.1 Benefits

Wellbeing refers to the state where all social, economic and personal needs are fulfilled and everyone is contented. Doing roof gardenings can help achieve all three needs in a small or big ways.

Social wellbeing is another outcome of these types of projects. As this cannot be done alone, people are more interested in involving more people. This way there is a new community which will not only help in flourishing ideas needed for the gardening but also increase the inter social skills.

Community/ Collective Gardening

As also described above, community or collective gardening is one of the positive factors in increasing social wellbeing. People are more helpful and tend to know different cultures and behaviours in different people. One way to increase knowledge as well. Because of collective gardening, different techniques can be learnt to protect/plant/grow plants. This will lead in a successful gardening.

Creating a group

A new group can be formed withing a campus area which will be responsible for all the green matters that will help in flourishing the sustainability within or outside of the University. This group will organize various events and increase the horizon of sustainability.

Personal Wellbeing

Rooftop Gardening also helps in developing personal wellbeing. When a garden is created, one can go and spend some time in the garden. They can learn new skills on how to make more out of the little space that they have. They can have a different type of satisfaction which will help more to develop themselves. Moreover, many personal benefits as quiet and green feeling, healthy lifestyle.

Economic Wellbeing

Economic well being is another positive factor of the gardening. It might not be the cheapest, but the result it gives is worth investing. If all the necessary process is done by oneself, this will save a lot of professional expenses though. For eg. creating your own desing, building the irrigation system by oneself, etc.

8.2 Challenges of the Roof Top Gardening

Roof gardens provide aesthetic importance to any buildings, the designs made is very important. So design of the building is one of the very challenging factors when building a roof gardens. Many things has to be considered when making a design. The slope of the roofs, how much weight the roofs can handle, if any insulation is provided. In the case of Haaga-Helia roofs, only small amount of vegetation will be practiced in the roofs near the entrance and the hotel sides. But in future, if bigger approach is to be thought of, roofs has to be renovated likewise.

Irrigation is another element to be thought of with the roof gardens. Irrigation could be very challenging if not installed properly. Hence, it must be installed on the roof which will save time and shouldn't water the plants every day. Haaga-Helia at the moment doesn't have the irrigation supplies. But the irrigation method to be used will be very easy to install. More about irrigation is described in detail in the chapter 5.3.

Extreme temperature and high winds are other challenges that vegetation on roof can face. Also, the high winds are dangerous as plants can fall down and injure others. Heating is another problem as it can fade away the plants. Haaga roofs can suffer a lot from the high winds, specially the ones in the hotel side. Also, this side most be taken extra care of as there will be trees and bushes growing which are easy to cause severe damage if they fall.

Cloging of drainage is very common in these types of gardening. As roofs are usually not prepared for these types of gardens. The cloging is usaully caused by soils and

sands that comes from the vegetation. If water stayed longer, roofs can face damage and even serious damages can get done to the roof.

Growing of roots can damage the roof. So, these should be taken very good care of. It is better to prevent it by making a base to these vegetation over the roof which can control the growth of the roots to get to the roofs.

A little professional help might be needed when doing the vegetation. If the plants are not taken care of as the way they are needed to, rooftop gardening won't be a success. So, knowledge about the plants and plantation could be other challenge. (Miller, Clay. 2011)

9 Conclusion

Now is that period of age where conservation should be given more priority than the consumption. Though these gardenings would not solve food problems, unused places at the campus area can benefit from these. In the whole process of this research based thesis, it gave a very good knowledge regarding rooftop gardens and sustainability. Researchs were perfomed in order to get the end result which was to design the rooftop gardens at Haaga-Helia University Building. In order to achieve this result, background knowledge about sustainability and past projects of rooftop gardens were very helpful.

The outcome of this project as mentioned above was to prepare the design of gardens and also the feasibility of the project to give some general idea on costs. Sustainability was the main theory behind this project. Creating a place where all people can gather and increase social communication, where healthy food is grown that teaches students to make healthy choices and to teach them to save environment for another generation is the main motto of this project.

Though rooftop gardenings were practiced from very long ago, it was difficult to find books written for it. Mostly journals and articles were used to find all the information needed. Also, internet was another best place to find updated information on this gardening. Course books were used to gather the theories whereas various subjects studied during the degree program came in great use to get this result.

This thesis was written out of passion and curiosity to make an awareness among students at Haaga-Helia. It is written after achieving required academic qualification for all the topics involved while doing this research. This research definitely has been a great learning experience as it was a very unique opportunity to create a base for someone who would continue with this project in the future. Anyone who will continue to do this project will benefit from this researches made and all the resources used while doing this research are valid and reliable.

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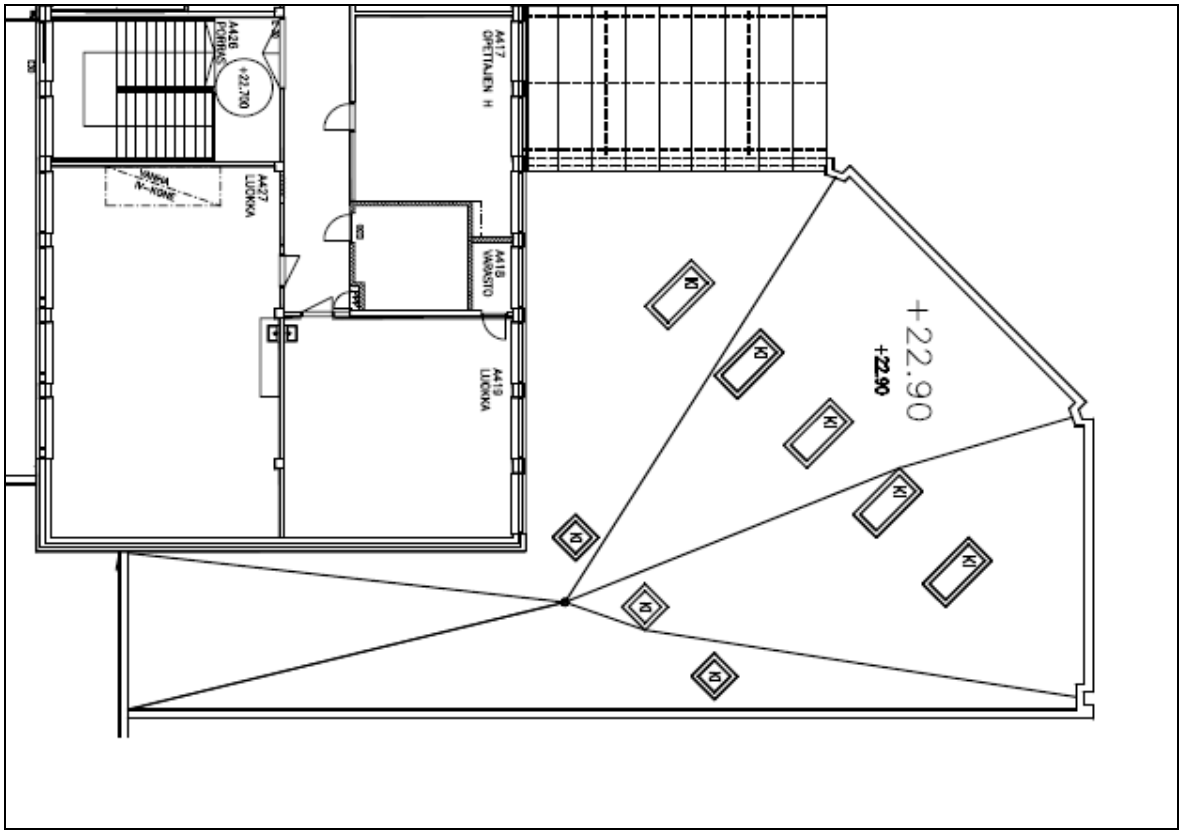
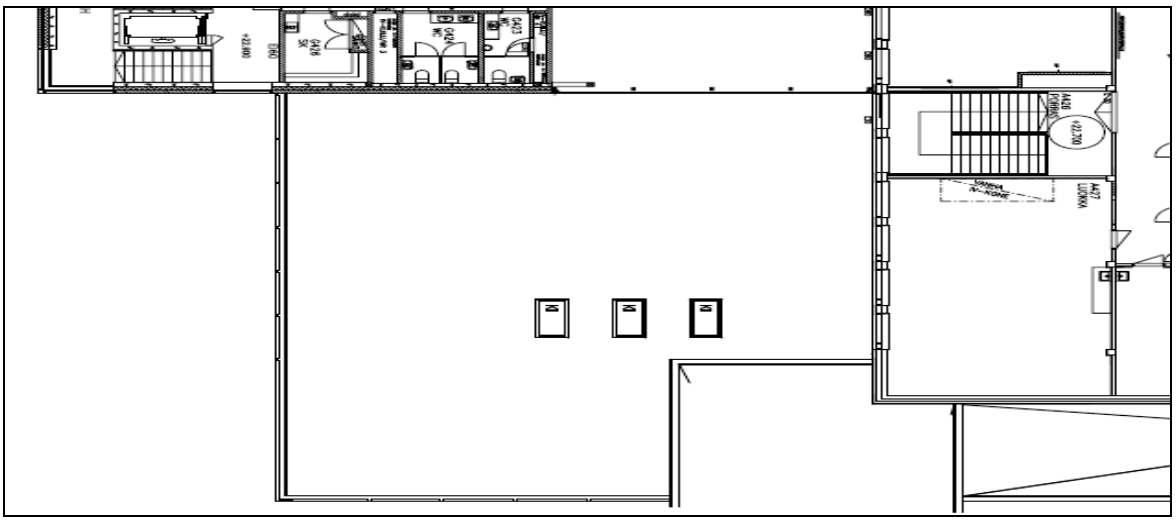
Attachments

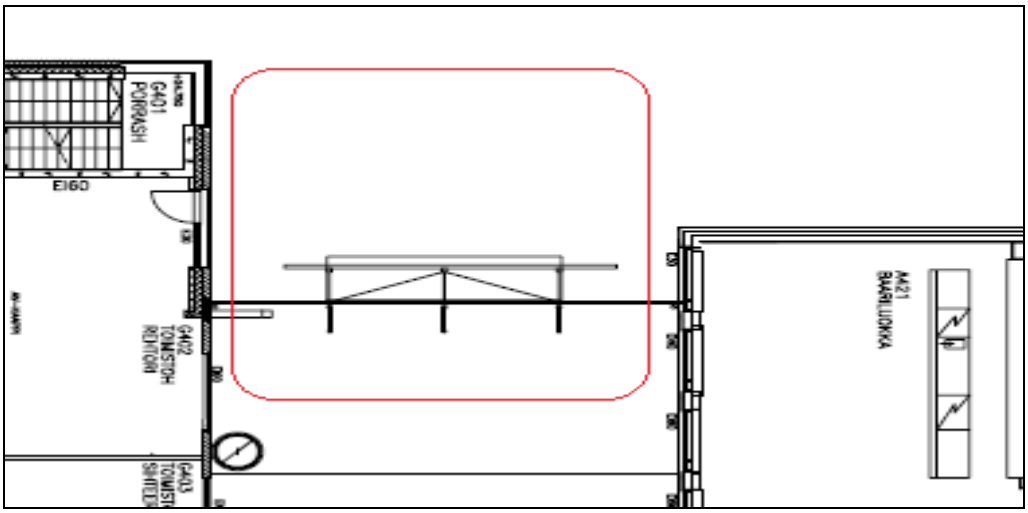
Attachment 1: Map of Haaga- Helia, Haaga Campus



Area at the Entrance



Near Hotel Haaga



At the end of Valopiha