



**RIZAL TECHNOLOGICAL UNIVERSITY**  
College of Engineering and Industrial Technology



**ENERGY AND WATER SAVINGS BY MEANS OF  
GREEN ROOF SYSTEM**

**A Student Faculty Collaborative Research Presented  
to the Faculty of Civil Engineering  
Rizal Technological University  
Mandaluyong City**

**In Partial Fulfillment of the Requirements for  
The Degree of Bachelor of Science in Civil Engineering**

By:

Aguilar, Norlie Z.  
Castillo, Sugar J.  
Castro, Bernalyn C.  
Padilla, Paul Anthony N.  
Raza, King Philip O.  
Engr. Sherwin Dominguez (Collaborator)

Dr. Noel D. Binag  
Adviser

October 2017



### **ABSTRACT**

For over 100 years, green roof has been established and it becomes one of the key elements in the past few decades in urban area in ancient times green roofs consisted of cave like structures or sod roofs covered with earth and plants commonly used for agriculture, dwelling, and ceremonial purposes. These early shelters provided protection from the elements, good insulation during the winter months, and a cool location in the summer. Most of the researchers focused on efficiency and survival rates of plants and its cooling effect in building and structures.

Modern conveniences, these were neither waterproof nor was there any system to keep out unwanted burrowing wild life. The study aimed to determine of having a green roof. This system is easier and uses less energy, it can have lowered the temperature in a residential house or the unit below the green roof, with the use of thermometer that measures the temperature of the house or building and it can have proved that the green roof is effective in lessening energy consumption. In addition to that the green roof can filtered the rain water and it can be as watering plants, car washing, toilet flushing, etc. In microbiological testing of water, there are 3 parameters the total coliforms, fecal coliforms and HPC. The Total and Fecal Coliforms passed the standard



for drinking water, while the HPC failed to meet the standard of the of drinking water. Over all the result of the microbiological test still failed and it is not safe to drink.

The system can have changed the polluted air into fresh and relaxing air, reduced energy consumption for heating and cooling, storm water retention, and heat island mitigation are the main reasons for the use of its variety of benefits when it came to the environment and air pollution growing popularity of green roofs. Other benefits include habitat restoration, filtration of acid rain and air pollutants, noise pollution reduction, and the therapeutic effects found from being in the presence of nature. By lowering air conditioning demand, green roofs can decrease the production of associated air pollution and greenhouse gas emissions. Vegetation can also remove air pollutants and greenhouse gas emissions through dry deposition and carbon sequestration and storage.

Green roofs had play a critical role in improving the urban environment by enriching the biodiversity, delaying the storm peak to the drainage system, diminishing the runoff quantity, purifying the air pollutants as well as the runoff quality.



## **CHAPTER 1**

### **THE PROBLEM AND ITS BACKGROUND**

#### **Introduction**

Green roof also known as “living roof” and roof garden are some term often used when referring to a kind of roof that support vegetation, however there are significant difference between this two. While roof garden is installed for access and hobby of people, they are costly to build and required intensive maintenance. Compared to Green roof which are light weights due to its structure and cheaper to build as they are installed for environmental performance and visual improved. The origin of green roof had been traced back to the vernacular architecture of various regions and since ancient time like the stepped pyramid in Mesopotamia and hanging garden of Babylon built by Persian which cooled the hot land escape and provide greenery. While joined living plants in designing of roof structure is by no means a new idea, technologies about green roofing had rapidly advanced over the recent years as they has adopted more readily around the world.

#### **Background of the Study**

With the continuous changed in temperature because of the global warming it is said that the average temperature in the Manila is 30°C-34°C,



many household are experienced extreme high temperature that led to dehydration normal households can't afford air-condition poor households can't buy electric fan. In addition to that, the green roof system can filter rain water so that it can be used such as for drinking and household purposed.

People used various instrument to reduce the temperature in household, the common instrument for the fortunate people in air cooling system is air conditioner and the common used for the less fortunate is electric fan and fan.

As guided in the possible improvement for the roof system the researcher fulfilled a need to understand the important factors for the implementation of the green roof system. The research had incorporated the data that had been collected in the experiment that had been held in the Aguilar compound, Palatiw, Pasig city.

### **Theoretical / Conceptual Framework**

This study introduced, described and examined the current state of knowledge about green roof system. The theoretical or conceptual framework showed the process, input and output of the study.

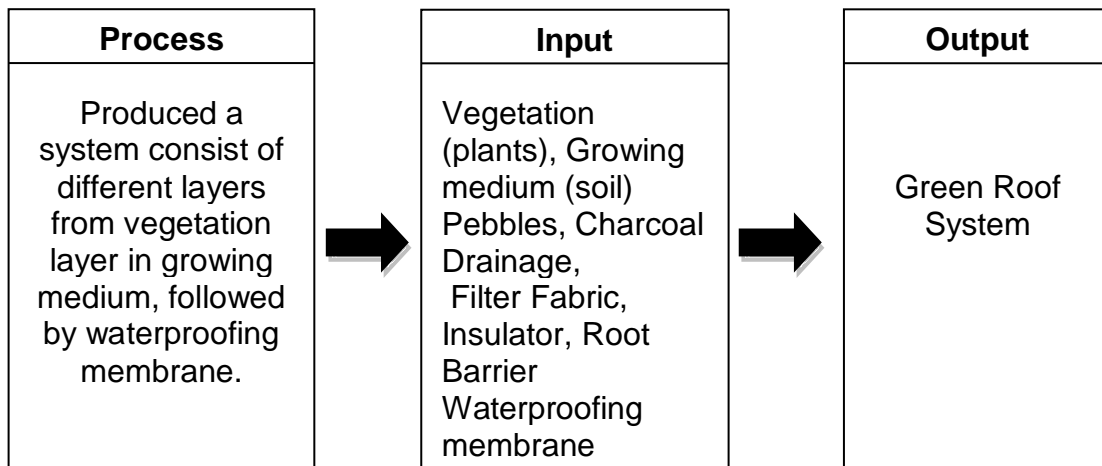


Figure1. **Research Paradigm**

It is a processed of different layers converted into Green Roof System in one of the researcher's house in Palatiw, Pasig City. The layers consist of vegetation layer, growing medium or soil, Pebbles, Charcoal, Drainage, Filter Fabric, Insulator, Root Barrier and waterproof. By being waterproofed, water leakage had been avoided. The membrane had been installed or constructed. And growing medium and vegetation had help for filtration of the rainwater. As to output, green roof system will be produce for controlling temperature of the house or building and filter water for usable purposes.

### **Assumptions of the Study**

The study is aimed to provide a green roof to maintain the normal temperature of residential house. In this study the material used are assumed