

CHAPTER I INTRODUCTION

I.1 Background

Water is a compound in which the result of the bond of the hydrogen element (H_2) which is in contact with the oxygen element (O) in this case forms H_2O . Water is a very important chemical compound for the life of the living beings that exist on this earth. Water that can be used by humans to consume is fresh water. Most of the water is available in the sea in the form of salt water, so it is necessary to manipulate the cycle or hydrology so that fresh water can be available quite a lot. Population growth and clean water need are increasing from the current conditions. But on the other hand the water supply is very limited. One of them is Pondok Permai Lestari Housing Panenjoan village, Bandung Regency, with many new settlements and the population of 614 peoples (Source: Imas, 2018), so the need for clean water will continue to increase.

Pondok Permai Lestari Housing is one of the lower middle class housing that located in Panenjoan village, Cicalengka, East Bandung. Pondok Permai Lestari Housing has a housing area of approximately 8 hectares. In Pondok Permai Lestari Housing Panenjoan village, there is no flow of water flowing because there is no PDAM coming into this village. Water facilities used by the community are only dug wells and drilled wells with a water depth of 10 – 20 m. Sometimes, water is available and sometimes there is no water, especially during the dry season. The quality of the water was yellow and smelly (the water source is still not good). To overcome the water quality, people use filters so that water quality becomes better. And if it does not get water, people will buy water refills.

Table I.1 Geographical Location, Topography, Existence of Area and Height of Sea Level [Meters] According to Villages in Cicalengka District 2017 (Bandung, 2018)

Code	Village/Urban village	The geographical location of the village/urban village		
		Region topography	Existence of territory	Height of sea level (meters)
(1)	(2)	(3)	(4)	(5)
1	Nagrog	Slope/Ridge	Outside the forest area	815
2	Narawita	Slope/Ridge	Outside the forest area	812
3	Margaasih	Slope/Ridge	Outside the forest area	715
4	Cicalengka Wetan	Altitude	Outside the forest area	745
5	Cikuya	Altitude	Outside the forest area	702
6	Waluya	Altitude	Outside the forest area	741
7	Panenjoan	Altitude	Outside the forest area	714
8	Tenjolaya	Altitude	Outside the forest area	729
9	Cicalengka Kulon	Altitude	Outside the forest area	730
10	Babakanpeuteuy	Slope/Ridge	Outside the forest area	766
11	Dampit	Slope/Ridge	Edge / around forest area	850
12	Tanjungwangi	Slope/Ridge	Edge / around forest area	1105

According to the Bandung Regency Government, geographically, Bandung Regency is located at coordinates 107°14' – 107°56' East Longitude 6°49' – 7°18' South Latitude. In addition, Bandung Regency is included in the highlands with slope between 0 – 8%, 8 – 15% to above 45% (Bandung, 2016). It can be concluded that Cicalengka is a high altitude region, with a height above 700 – 1000 meters above sea level, high humidity and soil moisture and has uneven contour and soil surface.

There are still many people that have not been able to understand in the utilization of natural resources, one of them on this housing. In addition, when it rains, a lot of rain water is down and wasted. Caused by the Bandung Regency has been dense with roofs of the houses and close to industrial areas that does not absorb into the soil, so the water that goes down in vain.

Table I.2 Rainfall Data for 2013 - 2017 in Cicalengka

Month	Total Rain (mm)				
	Year				
	2013	2014	2015	2016	2017
Jan	374	155	351	267	189
Feb	252	141	593	540	129
Mar	389	615	369	616	432
Apr	503	557	357	220	268
May	280	45	89	50,5	*
Jun	187	228	85	87	138
Jul	148	118	0	200	18
Aug	12	13	0	35	-
Sep	13	-	0	312	52
Oct	14	59	0	318	140
Nov	193	227	356	233	523
Dec	546	858	558	267	207
Total	2911	3016	2758	3146	2096
Average	243	274	230	262	210

Information:

- : There is no rain
- x : The tool is broken
- * : The data has not been entered

Table I.3 Number of Rainfall [mm], Amount of Rainy Day per Month, Daily Average Temperature [°C] According to Villages in Cicalengka District 2017

Code	Village/Urban village	The geographical location of the village/urban village		
		Amount of rainfall (mm)	Number of rainy days per month	Daily average temperature (°C)
(1)	(2)	(3)	(4)	(5)
1	Nagrog	850	15	23
2	Narawita	900	23	26
3	Margaasih	1400	20	26
4	Cicalengka Wetan	800	19	24
5	Cikuya	1500	21	25
6	Waluya	1500	20	24
7	Panenjoan	1200	19	23
8	Tenjolaya	1500	20	24
9	Cicalengka Kulon	1500	20	25
10	Babakanpeuteuy	900	20	23
11	Dampit	2000	20	22
12	Tanjungwangi	2000	20	22

If we look at the Table I.2 dan Table I.3 above, the average rainfall in Cicalengka and if seen from the villages in Cicalengka, has normal medium rainfall (100 – 300 mm). With high soil conditions and medium rainfall, the falling rain water is not absorbed by the soil, consequently the water will flow to a place that has low soil conditions, resulting in frequent floods such as Dayeuhkolot and its surroundings. Therefore, the community can optimize the rainwater that falls by using it for their daily needs. There are ways to optimize it, one of them is rainwater harvesting.

Rainwater harvesting is a technology used to collect and store rainwater from absorptions using simple techniques such as pots, tanks and reservoirs as well as more complex techniques such as underground check dams (Abdulla & Al-Shareef, 2009). The concept of rainwater harvesting is one of the concepts of collecting rainwater collected in a tank so that the collected water can be used as raw water (Elgara, et al., 2016). They found that choosing to harvest rainwater was a very suitable method for providing water to communities in Band Aceh (Song, et al., 2010). In South Kalimantan there are also threats related to scarcity of clean water, especially in the Banjarmasin area, so they plan the adoption of rainwater harvesting technology to meet the raw water needs that will be carried out in the design of the Great Mosque of Banjarbaru South Kalimantan (Lestari & Pamuji, 2017). Harvesting and rainwater storing has been part of human civilization since ancient times (Jain, et al., 2015). Rainwater harvesting can save water resources that are wasted when water cannot be accommodated by drainage channels, rivers, weirs, lake and so on (Maharjono, et al., 2017). With this community can use the opportunity to accommodate rain water that they can use for the future. Besides being useful for clean water supply, this technique can reduce with flood-prone and also can reduce the demand for wells bore and wells that could damage the soil surface as landslides can reduce the surface of the soil. In addition, using rainwater harvesting could reduce spending costs to pay the bills. In producing clean water, there are several stages in processing the rain water into clean water. Before doing to the process, first assemble the rainwater harvesting equipment. In the assembly process requires precise accuracy and short assembly time. Usually depends on the design of the product itself, if the design

of the product is less precise, it can reduce the benefits of the product and efficient in the design. Therefore, this research will develop rainwater harvesting using the Design for Assembly (DFA) approach with the aim of improving fast assembly time and creating an easy to assemble design.

I.2 Problem Formulation

Based on the background of the problem with, then the formulation of the problem to be discussed in this research is the study of designing rainwater harvesting tool using the Design for Assembly (DFA) approach with Boothroyd and Dewhurst methods to produce designs with fast assembly time.

I.3 Research Purposes

The purpose of this research conducted by the writer is as follows:

1. Find out the system of the use rainwater harvesting
2. Fulfill the need for clean water in Pondok Permai Lestari Housing, Panenjoan village using rainwater harvesting tool
3. Produce the rainwater harvesting tool with short assembly time

I.4 Research Scope

Before doing the research of this final project, the writer first identified the problem limitation of several things as follows:

1. This research will be conducted at Pondok Permai Lestari Housing in Panenjoan village
2. This study does not discuss about the cost of assembly
3. This research will not be implemented the results of the proposal design

I.5 Research Benefits

There are benefits of this final project research are:

1. Can be useful for writers in applying the science of product design and Design for Assembly (DFA)
2. The alternative in saving clean water needs
3. Develop insights and knowledge for the needy
4. Applying science product development in the manufacture of a rainwater harvesting tool

I.6 Writing System

In the preparation and production of this final project reports, systematic writing are used is as follows:

CHAPTER I INTRODUCTION

In this introductory chapter consists of the background of the problem, the formulation of the problem, research purposes, limitations of research, benefit of research and also writing system.

CHAPTER II THEORETICAL BASIS

In this chapter, it contains relevant theories of the topics to be discussed and also the theoretical basis that helps further decomposition and discussion about the problems encountered in this research.

CHAPTER III RESEARCH METHODS

This chapter describes the flowchart diagram which discussed about the making of the report on beginning to end which is equipped with the details.

CHAPTER IV DATA COLLECTION AND PROCESSING

This chapter describes the data needed by the researches that suit the problem and then the data already obtained treated in accordance with the methode used.

CHAPTER V ANALYSIS

In this chapter describes the analysis of the data is processed into a corrective action based on the result of the analysis.

CHAPTER VI CONCLUSION AND SUGGESTION

This chapter describes the conclusions of the results of research conducted, as well as provide suggestions for further research.