CHAPTER I
INTRODUCTION

This chapter contains the background, problem formulation, and scope ofthe problem.

1.1 Background

Liquefied Petroleum Gas (LPG) is a widely used source of energy among households and Micro, Small, and Medium-sized Enterprises (MSMEs). According to the Central Statistics Agency (Badan Pusat Statistik/BPS), approximately 82% of households in Indonesia used LPG in 2021, making it the most commonly used household fuel. This is followed by firewood (11%), kerosene (2%), electric stoves (0.7%), biogas (0.5%), briquettes or charcoal (0.08%), other 0.03%, and don't cook at home (3.69%).

In 2012, LPG consumption in Indonesia was recorded at around 4.8 million tons. This number steadily increased over the years, reaching its highest point in 2022 at approximately 8.2 million tons, marking a 70% increase in national LPG consumption over ten years (Katadata.co.id, 7 September 2023). This growing demand is also reflected at the regional level, particularly in West Sumatra

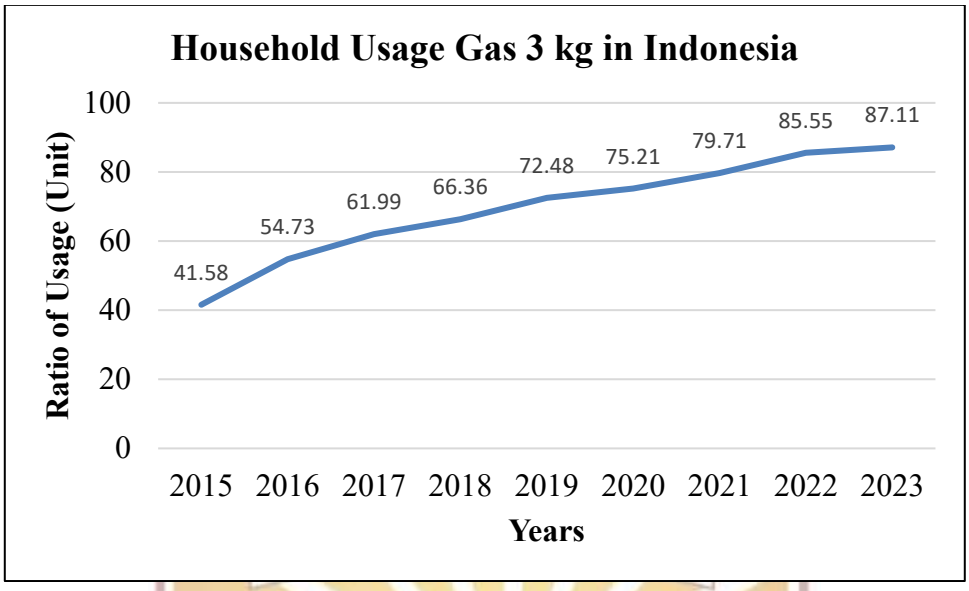

Figure 1.1 LPG Usage in Indonesia
(www.bps.go.id)

LPG usage in West Sumatra increased by 104.29% between 2015 and 2022. This significant growth in consumption must be addressed by ensuring the availability of LPG in the region. According to Tutuka Ariadji, the Director General of Oil and Gas at the Ministry of Energy and Mineral Resources, the issue does not lie on the supply side, but rather on the distribution side. In several areas, there have been shortages in the distribution of 3 kg LPG cylinders, which are commonly used by households (RuangEnergi.com, 7 September 2023).

Logistics and distribution are critical functions that facilitate the movement of goods and services from their point of origin to the point of consumption. These functions encompass various activities such as transportation, warehousing, inventory management, order processing, and packaging (Rushton et al., 1989). The primary goal of any distribution system is to ensure customer satisfaction, and the design of the distribution network, including the routing decisions, plays a vital role in determining both the travel distance and associated costs. Therefore, optimizing the routes within the distribution network is essential for improving operational effectiveness and efficiency, ultimately leading to reduced distribution costs.

According to Setiawan & Miru (2022), the LPG distribution process begins at the well, from which the gas is transported to the refinery. After refining, the LPG is sent to the SPBBE (LPG Bulk Filling and Transportation Station), where it is then filled into gas cylinders of various sizes (3 kg, 6 kg, 12 kg, and 50 kg). These cylinders are subsequently distributed to customers through retailer distributors. Once a customer uses the gas, the empty cylinders are collected by the distributor and returned to the SPBBE for refueling. After refilling, the cylinders are redistributed to customers. This process is illustrated in **Figure 1.2** below.

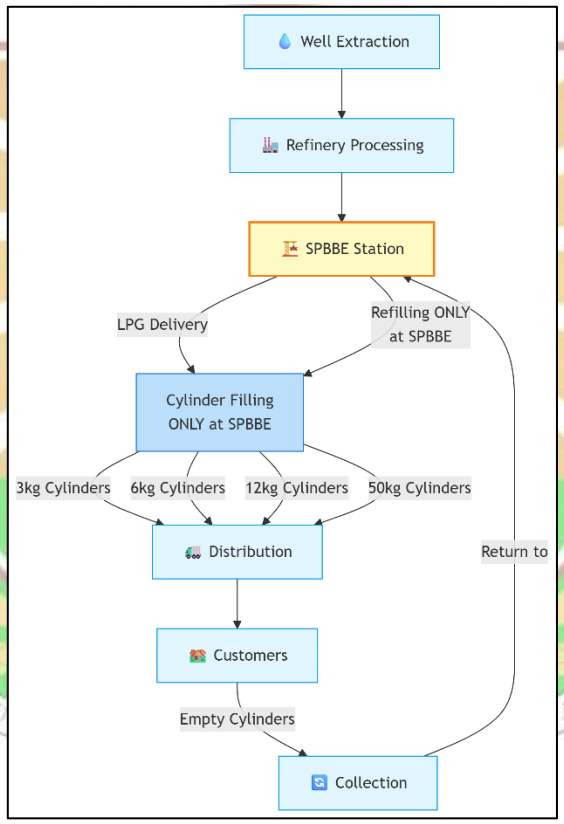

Figure 1.2 LPG Distribution Flow
(Subakdo dan Nugroho, 2016)

PT. Cahaya Bintang Enam is a gas distributor located in Batusangkar, specifically on Simpang Aur Lorong Street, Bulakan Nagari, Padang Magek, West Sumatra. Established in 2020, the company currently operates with twenty-five retail partners and a truck fleet capable of transporting up to 560 LPG cylinders. The distribution of retail locations is illustrated in **Figure 1.3.**

The company currently uses direct shipping model with a milk run transportation network, in which LPG cylinders are delivered directly to retail outlets without passing through a central warehouse. Each retailer receives an allocation based on the amount of strength received by PT. Distribution activities are carried out for 5 days for one distribution cycle, and the daily distribution routes are illustrated in **Figures 1.4 through Figures 1.9**.

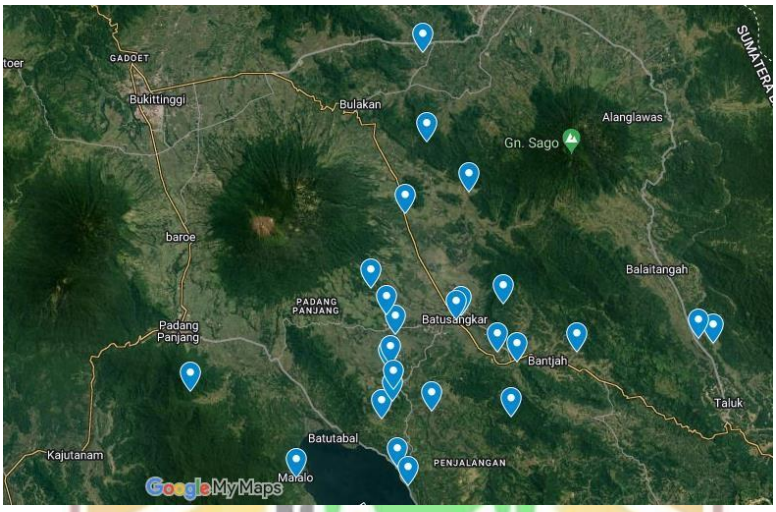

Figure 1.3 Location of The Retail

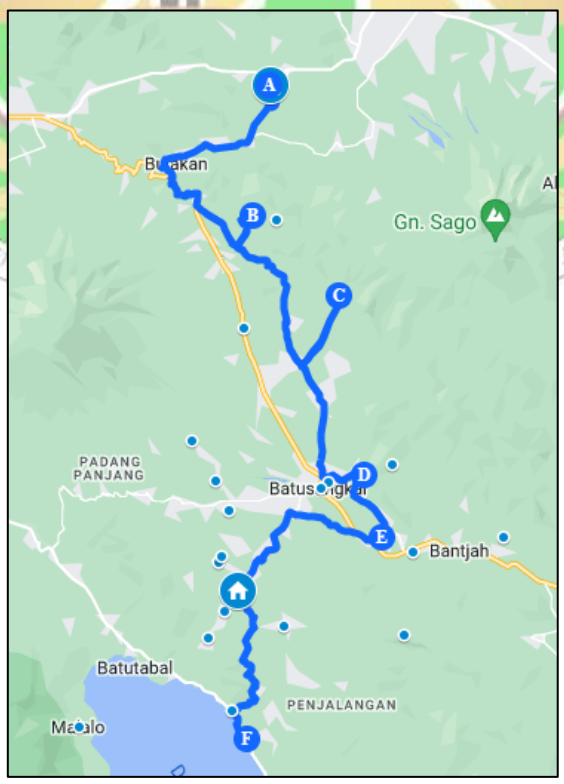

Figure 1.4 Distribution Network on Monday

Figure 1.4 shows the LPG distribution route on Monday, beginning at the SPBBE in Payakumbuh and proceeding through five delivery points: Hanna Raisya Geneva, Nadya Hadisti, Pangkalan Gas Bunga, Mukhlis, and Maju Jaya, before returning to the SPBBE.

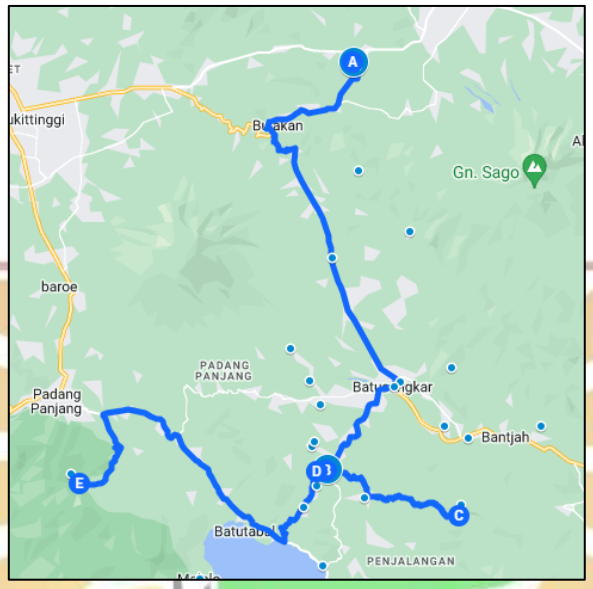

Figure 1.5 Distribution Network on Tuesday

Figure 1.5 illustrates the distribution network for Tuesday, starting at the SPBBE and continuing to Mulyadi DJ, Turawan Indah, and Warih Pusako, then returning to the SPBBE.

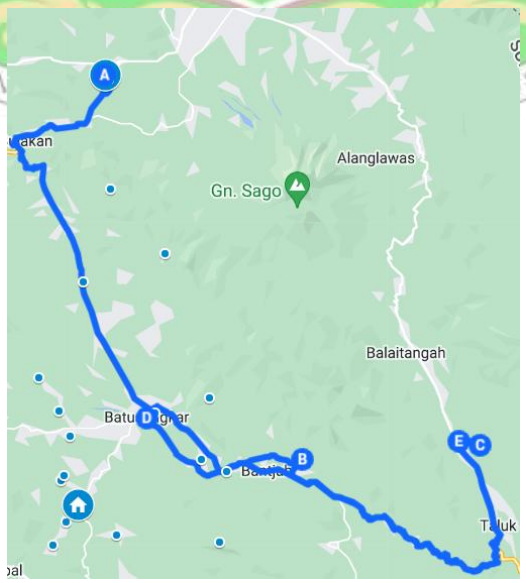

Figure 1.6 Distribution Network on Wednesday

Figure 1.6 presents the route for Wednesday, beginning at the SPBBE and covering four destinations: Nabila, Murdayastati, Nuria.M, and Hijrah, before heading back to the SPBBE.

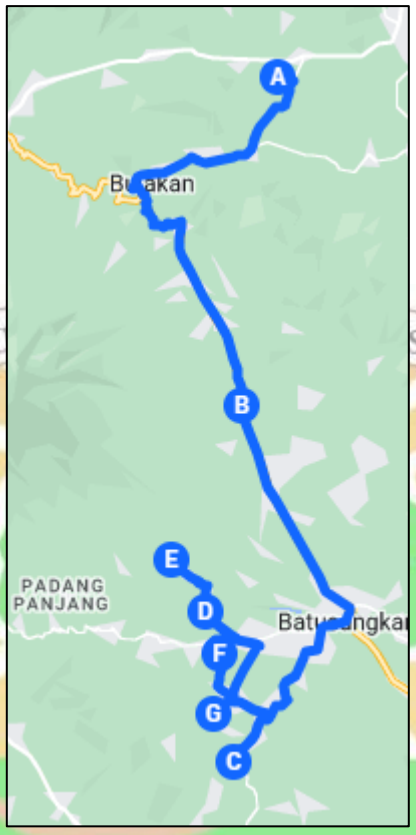

Figure 1.7 Distribution Network on Thursday

Figure 1.7 shows the delivery route for Thursday, starting from the SPBBE and proceeding through Aurora, Hendra Miko, MLQ, Rafania, and Sachila, before returning to the SPBBE.

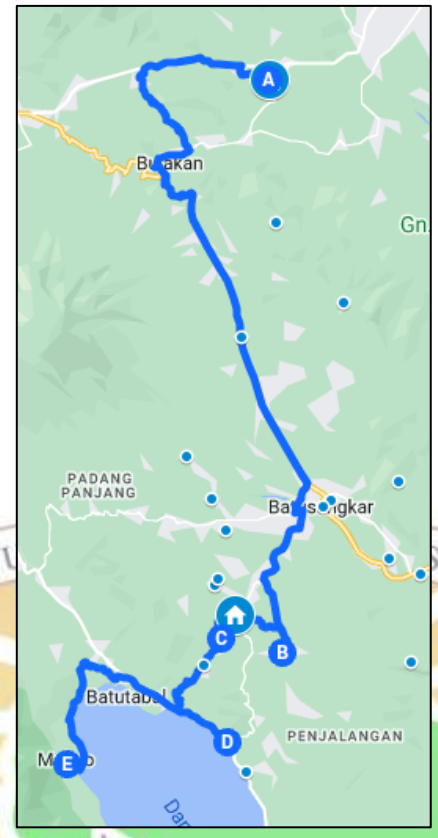

Figure 1.8 Distribution Network on Friday

Figure 1.8 The Total distance is 133 km illustrates the LPG delivery route for Friday, beginning at the SPBBE and continuing through Mulia Ramdani, Thomas Riko, Bambang, and Yontamery, then returning to the SPBBE.

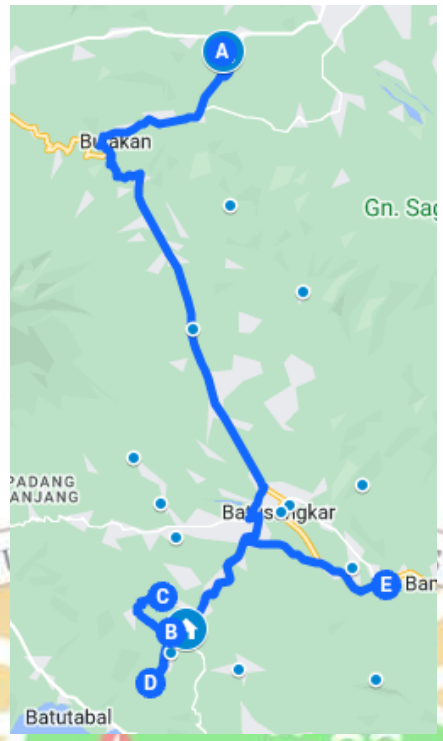

Figure 1.9 Distribution Network on Saturday

Figure 1.9 depicts the distribution network for Saturday, starting from the SPBBE and passing through Turawan Indah, Hj. Nen, Ab, and Fajar, before returning to the SPBBE.

Table 1.1 Average LPG Distribution per day

Date	September	October	November
1	560	0	560
2	560	560	560
3	0	560	560
4	560	560	560
5	560	560	0
6	560	560	560
7	560	560	560
8	1120	0	560
9	560	560	560
10	0	1120	1120
11	560	560	560
12	560	560	0
13	560	560	560
14	560	560	560
15	560	0	560
16	560	560	560

17	0	560	560
18	560	560	560
Date	September	October	November
19	560	560	0
20	560	560	560
21	560	560	560
22	560	0	560
23	1120	1120	1120
24	0	560	560
25	560	560	560
26	560	560	0
27	560	560	560
28	560	560	1120
29	560	0	560
30	560	560	1120
31		560	
average distribution a day			529
capacity of the car			560

Subsequently, **Table 1.1** indicates that the average daily delivery of LPG from the SPBBE in Payakumbuh to the 25 retailers is 529 cylinders. Although on some days, deliveries reached 1120 cylinders in accordance with the central allocation, this occurred only in specific cases. Meanwhile, the capacity of a single truck is 560 cylinders. Furthermore, based on information obtained by PT. Cahaya from the central Pertamina office, in the year 2024, PT. Cahaya Bintang Enam received an increased allocation to 20 Delivery Orders (DO) per month, with a daily distribution of 934 cylinders. This new allocation represents a near doubling of the daily LPG distribution from the SPBBE to each retailer compared to the current volume. Consequently, the existing distribution system is no longer adequate to deliver the total daily allocation of 934 cylinders. Therefore, a redesign of the distribution network and a reassessment of the transport capacity for LPG from the SPBBE to each designated retailer are necessary. This research, accordingly, aims to redesign the distribution routes and determine the optimal transport capacity to minimize transportation costs.

1.2 Problem Statement

Based on the aforementioned background, this study aims to redesign the distribution system to accommodate the increased LPG quota.

1.3 Research Objective

This study aims to redesign the distribution system toaccommodate the increasing quota LPG.

1.4 Research Scope

The research scopes of the problem in this study are as follows:

1. This research only determines the optimized transportation System.
2. This research uses data from 2023.

1.5 Outline of Report

The outline is a sequence of procedures for completing this final projectreport. The outlines of the final project report are as follows:

CHAPTER I INTRODUCTION

This chapter discusses the background of the research, the problem formulation, the research objectives, the research scopes, as well as the outline for making the final project report.

CHAPTER II LITERATURE REVIEW

This chapter contains the theoretical foundations that related and support this research and the method used to solve the problem in this research.

CHAPTER III METHODOLOGY

This chapter discusses the step used in this research to solve the problem systematically starting from the background of the problem, the problem formulation, objectives of the problem, limitations of the problem, the theoretical used, collecting data, processing data, conclusion.

CHAPTER IV DESIGNING TRANSPORTATION NETWORK

This chapter discusses the data that has been collected through observation and the designing system transportation network process.

CHAPTER V RESULT ANALYSIS

This chapter contains the analysis and results of data processing and explain and analysis the result of data processing.

CHAPTER VI CONCLUSION

This chapter contains the results of the conclusions of the entire research as well as the suggestions needed for the company and further study.