

CHAPTER I INTRODUCTION

1.1. Background

In 2020, PDAMs in Central Java, especially in the Semarang area, received complaints from customers that bills had jumped from normal usage of 50-60 thousand per month to 470 thousand. This also happened in various other regions in Central Java. The price hike occurred due to several factors, including the meter and also checks that were not reported to the PDAM [1]. This causes losses for the PDAM and also PDAM customers.

Monitoring that is still done manually, which is vulnerable to data accuracy, requires an automated system that is fast, accurate, and more efficient. Handling this solution, PERPAMSI and Telkom began working together to digitize Smart Metering as a solution to the existing problems [2]. The cooperation between Telkom and PERPAMSI, including connectivity-based services and managed solutions such as smart meters, can encourage PDAMs to become more efficient, advanced, and modern [2].

Although it will be implemented throughout Indonesia, the implementation of the cooperation between PERPAMSI and Telkom has only been carried out in Perumda Tirta Rahaja, Cipageran, Cimahi, West Java [2]. Meanwhile, other regions, including Banyumas Regency, Central Java, have not yet implemented smart metering.

Smart Metering is a tool used in Advanced Metering Infrastructure (AMI) services, which can be used to continuously read the usage of water, electricity, and gas and record it in time intervals. It can also send daily reports, perform automatic monitoring, and can provide billing information. With this AMI, both the user and the company can monitor in real-time, even if there is a disturbance [3].

In their use, smart meters do not send too much data. The data sent is in the form of parameters related to the service, so the bandwidth used is only a little [4]. Therefore, the use of existing cellular networks is considered less efficient. So the use of Low Power Wide Area Network (LPWAN) technology can be used as a solution for Smart Metering services.

LPWAN is a network technology with a wide range with little power usage. Currently, several LPWAN technologies can support the development of smart metering such as Narrowband Internet of Things (NB-IoT), Long Range Wide Area Network (LoRaWAN), and Sigfox [4].

Based on previous research, namely, which discusses the design and comparison based on techno-economics of three technologies, namely LoRaWAN, NB-IoT, and Sigfox, resulting in LoRaWAN technology which is very suitable for AMI implementation because it has the advantage of a wide coverage distance, so it requires fewer gateways and also has low power [5]. So in this research, the smart metering network design in Banyumas Regency focuses on the use of LoRaWAN technology.

This research will discuss the planning of LoRaWAN technology for smart metering independently in the Banyumas Regency area and will also conduct a comparative analysis if PERPAMSI and Telkom cooperation is implemented.

1.2. Problem Identification

The problem formulation of this research is as follows:

1. How is LoRaWAN deployment planning for smart metering in Banyumas Regency?
2. How is the availability of resources and regulations related to the implementation of IoT networks?
3. What is the cost structure of IoT network deployment for smart water metering services in terms of new deployment and also in terms of cooperation with third parties?
4. What are the parameters related to the recommendation of smart water meters?

1.3. Objectives

Based on the background and problem statement, the objectives of this study were determined as follows:

1. Analyze the planning of deploying smart water metering services at PDAM using LoRaWAN with the calculation of capacity and coverage planning.
2. Analyze the availability of resources and regulations related to the implementation of the IoT network.

3. Identify the cost structure and benefits of implementing LoRaWAN network planning between new construction and using cooperation with third parties.
4. Provide recommendations to decision-makers to determine which plan is feasible to implement.

1.4. Scope of Work

The problem limitations of this research are as follows:

1. Planning and research were conducted in the Banyumas Regency area, Central Java.
2. LoRaWAN is the LPWAN technology that will be used in this research.
3. Feasibility study for smart water meter network based on technical, economic, and regulatory analysis.
4. It is assumed that there is no water pipe leakage in the implementation.

1.5. Research Method

Some points in this research include:

- a. Input planning information:

In this step, you must understand a tool used in Advanced Metering Infrastructure (AMI) services, which can be used to continuously read the usage of water, electricity, and gas formation before planning, namely both the technology used, default scenarios, market information related to research, regulations that are in accordance with the topic to be discussed, equipment costs, and also the target market.

- b. Cost and Structure Revenue:

In this step must take into account the costs that will be obtained and the costs that will be incurred for this smart water metering. Judging from the calculation of CAPEX, OPEX calculation, calculation of income or revenue, and is a network technology with also total expenses.

- c. Technical Analysis:

In this step, network technology with have to analyze from the start of forecasting data, the research area to be studied, the characteristics of the technology used, and also the appropriate assumptions. Later it will produce capacity calculation

and coverage calculation. The output produced from this technical analysis is a network planning simulation.

d. Regulatory Analysis:

This step will evaluate regulatory recommendations to support the network used, whether by regulations or not.

e. Overall Analysis:

After conducting an analysis of the three previous steps, then the next step will analyze the whole based on its economic analysis. Determine business feasibility in the form of NPV, IRR, PP, and also PI based on total cost.

f. Conclusion:

At this stage, we will determine the conclusion of smart water metering based on the steps that have been carried out previously, to determine the suitability or suitability for implementation in Banyumas Regency.

1.6. Hypothesis

The use of smart water meters is a digitalization solution that has been implemented to overcome the problems that often arise today [1] [2]. The use of LoRaWAN as LPWA technology for smart water meter implementation is very suitable because it has a long transmitting power, and also has low power and long durability of LoRaWAN [4]. So LoRaWAN is used in the implementation of this research, which will then be compared in terms of implementing the collaboration between Telkom and PDAM [2]. Then after being able to make a comparison of the plan, recommendations can be drawn.