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Review of Clean Water Supply System Development's Feasibility in Indonesia's Samosir Regency

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ABSTRACT

Around 15,352 families (42.66 percent) in Samosir Regency still have access to clean water, which is still a rather low percentage compared to the remaining 20,638 families (57.34 percent) who do not. The local government is concerned with this situation to create the BUMD PDAM Samosir Regency. This research was done to see if it would be possible to start a local water firm in Samosir Regency. To determine whether there is a potential water source that is adequate, sustainable, and manageable economically and profitably in the context of public services, as well as whether the establishment of PDAM Samosir Regency is worth reviewing, interviews and questionnaires were distributed to the community, SPAM owners, and State Civil Servants. In addition to socioeconomic factors, there are financial factors, market factors, legal factors, managerial factors, organizational factors, and technical factors. Legal, social and economic, technical, and notably from economic considerations with IRR = 72.32 > I = 12 percent/year, PP = 3.34, and BCR = 6.27, BUMD PDAM Samosir Regency is feasible to be founded.

1. Introduction

The Samosir Regency mainly relies on raw water sources, including rains, rivers, groundwater (boreholes and built wells), and lakes, to provide its clean water demands. The Samosir people are afraid about the dry season since it will have an impact on their water supply, especially in the hilly region of the island. Since there are no natural water sources in the mountains, residents in mountainous areas must obviously rely on pumps from Lake Toba to meet their needs for water. Three (three) sub-districts on the Sumatra Island mainland that are part of the Samosir Regency still have access to pure water since they get their supply from the mountains. The other 6 (six) sub-districts, on the other hand, have a very tough time getting drinking water. In mountainous places, rainwater collection is used to provide drinking water. The purchase of water pumps and the storage of rainwater must be done with APBN funding; APBD funds are insufficient. As a result, his party maintains ties with the provincial and federal administrations to ensure the success of this initiative. One of the ways to produce a clean water supply is to establish a drinking water corporation (PDAM)[1].

The Special Allocation Fund (DAK) was unable to complete the building of 5 (five) packages of rainwater reservoirs in the mountainous region of Samosir Island because the Covid-19 pandemic struck North Sumatra. Situated on the edges of Lake Toba, in the Pangururan and Simanindo regions. Drinking water is accessible, processed with more secure filtration, and even supplemented with other elements so that the population can utilize the Lake Toba water treated, although its capacity is still quite little.

In general, the Samosir Regency Government's capacity to manage Regional Original Revenue is comparatively insufficient to finance the current development. Therefore. The Regional Government might make additional efforts in this regard to boost local revenue streams. Establishing and running regionally owned businesses according to sound economic principles is one of the things that can be

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done to boost the source of regional income. As a business entity, BUMD strives to be self-sufficient and profitable so that it can maintain its operations and advance the well-being of the neighborhood. BUMDs must promote a professional culture in their management to maintain and maximize their position in the increasingly open and competitive global economy. This can be done, among other things, by directing their management and supervision in accordance with the principles of good corporate governance.

Definisi of water, fresh water is defined as water with a salt content less than 0.5 ppt [2], but specifies that fresh water includes all water above and below the ground surface, excluding sea water and fossil water [3]. Tasteless, odorless, colorless, does not contain hazardous microbes, and does not include heavy metals are the standards for drinking water [4]. Water is defined as any water that is either above or below the ground surface, including surface water, ground water, rainwater, and sea water on land [5]. Water that is fit for drinking is water that is processed/without processing that meets health requirements and can be drunk directly" [6]. Water is a liquid made up of hydrogen and oxygen that has no flavor, color, or odor (H_2O) [7].

1.1 The Opening of the PDAM Tirtanadi Branch in Samosir

On July 17, 1999, the Toba Samosir Regency Government launched a Cooperation Operation (KSO) with the PDAM Tirtanadi North Sumatra Province, using the operating districts of Balige, Laguboti, Porsea, Ajibata, and Pangururan. The Operational Cooperation (KSO) agreement with Samosir Regency was requested to be renewed in 2005 by PDAM Tirtanadi, Samosir Branch. The procedure of extending the collaboration until 2013 has not, however, been completed. And on October 2, 2014, PDAM Tirtanadi and the Government of Samosir District No. 23 of 2014 and 06/SPJN/DIR/2014 with the service area of Pangururan District created an operational cooperation agreement.

1.2. Project Feasibility Analysis and Feasibility Study

Firm feasibility research is the process of examining an existing or proposed business to ascertain its viability [8]. Generally speaking, feasibility study is described as an initial assessment that must be made before to operating a firm and to manage operational activities to maximize profit. Investment feasibility studies often focus on three areas: financial and economic considerations, community benefits, and state-related issues. The viability of a project is evaluated using IRR, NPV, Payback Period, BCR, and other metrics. In order to evaluate a project's suitability in light of the evaluation criteria: The project is possible if IRR > Loan Interest Rate, PP > Half Life Project, and BCR > 1, but not if IRR Loan Interest Rate, PP > Half Life Project, and BCR 1.

2. Method

In order to create decisions with the lowest amount of potential risk, the research includes a variety of topics, including market factors, technical and production elements, management and organizational aspects, financial aspects, socio-economic and legal issues. Consequently, it needs both secondary and primary data. While secondary data includes things like regional geographic and demographic conditions, DED for SPAM Development, regional financial condition (revenue and expenditure), and regional economic structure, primary data includes the policies and plans of the regional government as well as community responses regarding the creation of PDAM Samosir Regency.

2.1 Data Collection

The release of Samosir in figures for 2015 and 2019 by the Central Bureau of Statistics of Samosir Regency provided secondary data. Various stakeholders, such as representatives of Regional Apparatus Organizations (OPD), communities, SPAM managers, restaurants, schools, hotels, and others, were surveyed or interviewed to gather primary data.

2.2 Investigated Issues

The following aspects are analyzed in this research:

Market Factors

Whether the product (goods or services) that will be produced is in demand (demand) or has buyers is the key question in the market aspect. These aspects are generally:

a. Demand, specifically demand for a product (goods or services), by location, by customer type, and others, including estimates for the future.
b. Supply, specifically how much of the demand or need has been met, how it is expected to develop going forward, and the variables that affect it.
c. Cost, specifically how to calculate the product's selling price and how to compare selling prices in various locations. Are price changes trending, and if so, what is the pattern?

d. Marketing Program, which describes how the marketing plan will be applied to reach consumers or clients.
e. Estimated Sales, which refers to the estimated volume of goods that can be accomplished in terms of both units (liter/m^3) and rupiah currency.

Production and Technical Aspects
The following are the important topics of the technical and production aspects:
a. How much potential do present-day and foreseeable water sources have?
b. How to acquire, prepare, and market to customers?
c. Is the technology used in the production and treatment of the water acceptable and environmentally friendly?
d. How can water be distributed to consumers in a fair and equitable manner?
e. What has to be done for the production scale to reach its ideal state?

Organizational and Management Aspects

The following factors in management and organization must be considered: How the organization's shape and structure is chosen, how many employees and what kind of skills are required, and how the delegation of tasks, responsibilities, and authority is set up, particularly for managerial staff.

Financial Aspect
The financial aspect typically takes the following factors into account:
a. The amount of the investment fund, which includes fixed assets and current assets or working capital (operation and maintenance costs); and
b. The source of funds, which includes a comparison of internal resources and external resources or credit. Value: requirements for internal rate of return (IRR), benefit-cost ratio (BCR), and payback period (PP)

Economic and Social Aspects
Basically, social and economic elements seek to understand and take into account the project's existence on the Samosir Regency Regional Government and the community at large, including the project's impact on boosting local revenue, the project's impact the impact of the project on the distribution or addition of employment opportunities, the economic growth in the region, as well as the project's effects on the building public infrastructure, including roads, bridges, and other things.

Legal Aspects

Lawful considerations are required so that the project's existence is absolutely legal and won't break the law in any way, which is related to: Legal frameworks surrounding the project, including regional regulations, regional regulations, or others; the structure of the project's legal entity and the necessary permits; and various other necessary permits during the project's construction and operation phases, such as Amdal, UKL/UPL, and others.

Additionally, pertinent data for analysis will be used to supplement and support all of the aforementioned features. The analysis's findings will eventually influence whether the project is worthwhile to continue. It should be emphasized that some of these factors have higher priority than others, such as technical and operational factors, market factors, and financial factors. Consequently, a more in-depth and complete examination of this element is required.

3. Results

3.1 General Samosir Regency Description

A total of 144,096 people live in the 6 subdistricts, 128 villages, and 9 subdistricts that make up the Samosir Regency administration. This corresponds to a population density of 99.77 persons per square kilometer [9]. While there are 35,990 currently existing households, each of which has an average of 4.15 or 4 inhabitants. In general, the PDAM Tirtanadi Samosir Branch has not been able to meet the relative water needs; in 2018, just 1 (one) sub-district, namely Pangururan District with 14 villages/wards and a total of 3,855 customers made up of 2,718 homes, could be provided. Between 98024'00 and 99001'48 East Longitude and 904 m to 2,157 m above sea level, Samosir Regency may be found between 2021'38 and 2049'48 North Latitude. The highland region where Samosir Regency is found has a flat, sloping, slope, and steep land tapography. The region is prone to tectonic and volcanic earthquakes, and the soil structure is unstable. The diatomaceous soils, tufa toba, sand mixed with clay, and lime make up the majority of the soil's makeup. With temperatures ranging from 170°C to 290°C and an average humidity of 85.04 percent, Samosir Regency is considered to have a wet tropical climate.

3.2 Regional Potential

As is common knowledge, a region's potential is assessed based on the composition of its gross regional domestic product (GRDP). Table 1 summarizes the composition of

GRDP and the pace of economic growth by industry from 2015 to 2019.

3.3 Potential Water Sources for the Development of Drinking Water Supply Systems (SPAM)

A water source that can be used for SPAM development must be accessible to build a SPAM business unit. It is envisaged that the community's drinking water demands may be met by developing, managing, and distributing the potential of these water sources. Air Sitio-tio and Air Sianjur Mula-mula are two potential water sources in Samosir Regency now.

3.4 The Sitio-tio Water Source

The Sitio-tio water source, a tributary with an elevation of 1,361 meters above sea level (masl) and a height difference of 453 meters from the surface of Lake Toba, is situated in the Sitio-tio sub-district. This source has a usable water outflow of about 125 liters per second. Given that there is a height difference of 453, height release must be performed 4 (four) times in order to manage the maximum pressure if the treatment dose is not greater than 10 kg/cm^2. A surge tank is used to discharge pressure so that pressure control can be done with ease. The biggest obstacle in this project is that the pipeline needs to cross a lake with a width of around 400 meters, hence it is suggested that steel pipes up to 20 meters deep be used. By creating the first 2 (two) reservoirs at an altitude of 989 m for distribution to Pangururan and Palipi Districts, the existing height difference condition is taken advantage of. Using pumps from the 989 m reservoir, the second reservoir is constructed at a height of 1,107 m to service the National Housing area.

In conclusion, preparation work, pipe installation for transmission and distribution, and civil works are all included in the Budget Plan (RAB) for the construction of this SPAM, as indicated in Table 2.

3.5 Supplies of Water Mula-mula Sianjur

A tributary of the Samosir Regency's protected forest serves as the water source for the Sianjur Mula-mula Subdistrict, with a discharge of about 125 liters per second. Between the water source and the Sidalu-dalu reservoir, there is a 223 m height difference. The use of two surge tanks allows for the security of a maximum pressure of 10 kg/cm^2. The installation of pipes on the slopes of rocky, steep mountains presents a significant problem in this task, thus steel pipes are chosen and only placed on the mountain slopes with the installation of strapot or cast as the pipe holder. Water is drained from the Sidalu-dalu reservoir into the Pangururan, Sianjur Mula-mula, and Simanindo Districts.

Table 1. Economic Structure of Samosir Regency in 2015 - 2019 (percent)

No	Industry	Year				
		2015	2016	2017	2018	2019
A	Agriculture, Forestry and Fishing	51.59	51.32	51.17	51.03	50.55
B	Mining and Quarrying	0.62	0.64	0.64	0.63	0.63
C	Manufacturing	0.57	0.55	0.54	0.52	0.51
D	Electricity and Gas	0.05	0.05	0.05	0.05	0.05
E	Water Supply, Sewerage, Waste Management and Remediation Activities	0.05	0.05	0.05	0.05	0.05
F	Construction	10.39	10.39	10.55	10.86	11.42
G	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycle	10.68	10.81	10.85	10.88	10.87
H	Transportation and Storage	3.45	3.56	3.51	3.48	3.57
I	Accomodation and Food Service Activities	4.96	5.14	5.24	5.23	5.34
J	Information and Communication	0.76	0.75	0.75	0.75	0.76
K	Financial and Insurance Activities	0.92	0.91	0.91	0.91	0.89
L	Estate Activities	2.07	2.11	2.14	2.13	2.19
M, N	Business Activities	0.11	0.11	0.12	0.11	0.11
O	Public Administration and Defence; Compulsory Social Security	12.29	12.07	11.94	11.82	11.46
P	Education	0.89	0.90	0.90	0.90	0.91
Q	Human Health and Social Work Activities	0.55	0.57	0.57	0.57	0.60
R, S, T, U	Other Services Activities	0.07	0.07	0.08	0.08	0.08
	GRDP	100	100	100	100	100

Table 2. Recapitulation of Budget for Pipeline Installation and Civil Works Costs Location: Sitio-tio Village, Pangururan District, Samosir Regency

No	Job Description	Cost (IDR)
A	Preparatory work	
1	Transmission pipeline along 16,444 meters (Locations from Sitiotio Village to Atas Village)	30,910,071,000
2	Transmission pipeline along 31,162 meters (Location of Upper Booster, Palipi to Pangururan)	
B	Civil works	
1	Dam (Catchment)	67,603,002,000
2	Collecting tub size. 3.0 × 5.0 × 3.0 m^2	
3	Quick Sand Filter (SPC)	4,979,058,000
4	Reservoir Capacity 1,764 m^3 size. 21.0 × 21.0 × 4.0 m^2	
5	Reservoir Capacity 500 m^3 size. 12.0 × 12.0 × 4.0 m^2 (With Pump)	
6	Reservoir Capacity 500 m^3 size. 12.0 × 12.0 × 4.0 m^2 (Without Pump)	
7	Surge Tank 4 (four) units	
	Amouth	103,492,131,000

Table 3. Budget for Pipeline Installation and Civil Works Costs Location: Sianjur Mulamula Village, Pangururan District, Samosir Regency

No	Job description	Cost (IDR)
A	Preparatory work	
1	Transmission pipeline along 20,258 meters (Location of Sianjur Mulamula Village to Sidaludalu Village)	34,762,349,000
2	Simarsasar Village, Sidaludalu to Simanindo, Sidaludalu to Pangururan)	34,786,441,000
B	Civil Works: Dams, Collector Tub uk. 3.0 × 5.0 × 3.0 m^2, Rapid Sand Filter (SPC), Cap Reservoir. 2,200 m^3 uk. 23.0 × 23.0 × 4.0 m^2, Surge Tank 4 (four) units	2,270,079,000
	Amount	71.818.869.000

As demonstrated in Table 3, preparation work, pipe installation for transmission and distribution, and civil work are all included in the Budget Plan (RAB) for the construction of this SPAM.

It is hoped that the development of Sitio-tio and Sianjur Mula water sources can be used to serve the areas of Pangururan District, Sitio-tio District, Palipi District, Sianjur Mulamula District, and Simanindo District. Estimated water needs in the 5 (five) districts are as shown in Table 4.

Table 4. Clean Water Services in 5 Districts of Samosir Regency

No	Districts amount	Served (KK)	Not Serve (KK)	Not Serve (KK)
1	Pangururan District	7,204	5,641	1,563
2	Sitiotio District	1,955	907	1,048
3	Palipi District	3,937	895	3,042
4	Sianjur Mulamula District	2,244	799	1,445
5	Simanindo District	5,344	4,679	665
	Amount	20,684	12,921	7,763

3.6 System Development for Drinking Water (SPAM)

It is necessary to construct several SPAM-related structures, including transmission pipelines and other civilian buildings like reservoirs, collection tanks, and others, to increase the availability of drinking water in Samosir Regency. Two sources of raw water can be developed, according to the findings of the Detailed Engineering Design (DED) Development of SPAM Raw Water Sources and Distribution in Samosir Regency in 2016; With a budget of IDR 103,492,131,000, the first project is Sitiotio Water Source, and Sumber Air Sianjur Mulamula, with an IDR 71,818,869,000 spending limit.
To develop the two SPAMs, IDR 175,311,000,000, will be needed. If it is believed that the Samosir Regency Government will be able to construct one of the two SPAMs, the decision will result in Air Sianjur Mula having a debit of approximately 125 liters per second at a cost of IDR 71,818,869,000. The Samosir Regency Government can receive the requirement for SPAM development from APBD sources and from other sources by enlisting the help of the private sector.

When a project is found to be profitable, it can be implementable; if it is not found to be profitable, it cannot be implemented. But it is not always the case. Applicable

to all projects that will be undertaken if, once operational, they are lucrative. If the project has a social or public service goal, then its viability will be determined by how well improving government services. The expansion of the PDAM Samosir Regency is a part of the category of carrying out a purpose to provide clean water services for social advancement. According to PP. 54 of 2017 on BUMD, it is required that the establishment of the BUMD PDAM undergo a business feasibility analysis, which includes: market aspects, social and economic aspects, legal aspects, technical aspects, human resource aspects, and financial aspects.

3.7 Market Variables

In general, there are various things that should be examined in this regard, including:

a. Demand: According to the last condition, only about 15,352 houses in Kab Samosir (42.66 percent) receive clean water services, while the remaining 20,638 households (57.34 percent) do not. This indicates that the level of clean water services in Kab Samosir is still quite low. Thus, it is possible to enhance the community's services in terms of the requirement for clean water as one of the fundamental services.
b. Provider. They are working to increase their capacity to meet the community's clean water needs because the existing situation shows that roughly 57.34 percent, or 20,638 homes, do not have access to clean water services.
c. Price. The Regent of Samosir District determines the selling price of water, and it is anticipated that customers will pay an average of Rp. 4,000,- per m^3 for their water. The selling price of water is determined differently depending on the types of customers, although it is the same across all locations or regions.
d. Marketing Program, which describes how the marketing plan will be employed to target consumers/customers.
e. Estimated Sales, which refers to the estimated amount of products that can be sold both in units (liters/m^3) and in rupiah cash that can be attained.

According to the findings of the analysis, it is possible to construct or develop PDAM Samosir Regency from a market perspective.

3.8 Social and Economic Aspects

Social and Economic Aspects are essentially related to how the existence of a project affects the region where the project is planned, including: increasing regional income, saving/earning foreign exchange, adding/equalizing job opportunities, other industries (suppliers for certain industries and markets for other industries), and the social aspect, which is the social benefits and sacrifices experienced by the community as a result of the project.

The analysis' findings demonstrate that:

a. PDAM establishment and growth Samosir Regency will increase regional income from the divided regional assets in the form of regional revenue (PAD).
b. The Samosir Regency PDAM's establishment and construction will lead to more jobs. According to the Samosir Regency PDAM's organizational structure, the existence of this project needs personnel in both the administrative and operational categories.
c. As a supplier and a market for various business activities, the presence of PDAM Samosir Regency would support the emergence of other associated business activities.

According to the findings of the analysis, it can be concluded that from a social and economic perspective, the establishment and growth of PDAM Samosir Regency is possible.

3.9 Legal Aspects

For something to be clearly and firmly legal and not potentially break the law, there must be legal considerations in the following forms:

a. Law No. 23/2014 on Regional Government and PP. 54 of 2017 respecting Regional Owned Enterprises, as prescribed by a Regional Regulation, provide legal protection. In connection with this, the Samosir District Government has worked with the Samosir Regency DPRD to establish a regional regulation on PDAM Samosir Regency.
b. The legal structure of the project and the licenses needed.
c. Requires licenses and permits, such as the Articles of Association section of the regional legislation on the establishment of PDAM Samosir Regency, Amdal, UKL, and UPL full administration and licensing.

Therefore, from the perspective of law and legislation, the creation and growth of PDAM Samosir Regency is possible.

3.10 Financial Aspect

The analysis's findings regarding the financial element can be summarized as follows:

a. Project Identities and Features
   The project in this instance is the establishment and development of PDAM Samosir Regency through the

use of the community-managed clean water infrastructure and facilities as well as the acquisition of the PDAM Tirtanadi Branch of Samosir Regency. The amount of money spent on the creation of PDAM Tirtanadi, Samosir Regency Branch, and Clean Water Facilities and Infrastructure up until operational is therefore included in the calculated investment value. By examining the book value of the assets that are currently possessed, the investment value of PDAM Tirtanadi Branch of Samosir Regency is determined. In the meantime, the costs invested for the development of facilities and infrastructure to operations show the investment worth of clean water facilities and infrastructure that is taken over. Table 5 shows the calculated investment value as a result.

2. The Project's feasibility analysis
The Internal Rate of Return (IRR), Payback Period (PP), and Benefit-Cost Ratio (BCR) are used to evaluate the project's viability, with the following basic data:

Establishment of PDAM Samosir Regency through the acquisition of PDAM Tirtanadi, Samosir Branch, and managed Clean Water Facilities and Infrastructure. community. Investment funds amounting to IDR 40,104,248,131 were made. The funds came from the State Budget and Regional

Budget of the Samosir Regency Government. Project age is 20 years, total debit is 139.12 liters per second, number of customers is 10,178 households (one household equals one household), customer growth rate is 2 percent per three years, average water usage per household per year is 264 m^3, selling price of water per m3 is Rp. 4,000, price increase is 20 percent per five years, cost of installing new connections is Rp. 1,500,000, and operational and maintenance costs are Rp. 5,305,056,006 per year (cost) The Internal Rate of Return (IRR), Payback Period (PP), and Benefit-Cost Ratio (BCR) are computed in accordance with the aforementioned hypotheses, and the results are displayed in Table 6.

PDAM Samosir Regency's establishment and growth are financially possible, according to the assessment factors listed in Table 6: IRR, PP, and BCR. That simultaneously and partially, marketing costs and changes in sales turnover have a significant effect on company profits [10].

Table 5. Investment Value for the Development of PDAM Samosir Regency

No	Investment Project Identity	Investment Value (IDR)	Production Capacity /Installed (L/Second)	Customer (KK/SR)
A	PDAM Tirtanadi Samosir Branch	5,356,872,589	55.50	3,855
B	SPAM/SPAB Facilities and infrastructure			
	SPAM IKK Pangururan	6,506,590,073	45.12	3,840
	SPAM IKK Simanindo	1,954,004,595	10.00	362
	SPAM IKK Nainggolan	7,304,626,838	10.00	599
	Facilities and Infrastructure for Drinking Water in Palipi District	4,763,768,948	2.2	140
	Facilities and Infrastructure for Drinking Water in Harian District	3,379,873,363	4.0	100
	Facilities and Infrastructure for Drinking Water in Sianjur Mulamula District	4,605,981,924	5.3	220
	Facilities and Infrastructure for Drinking Water in Sitiotio District	2,625,976,888	2.8	907
	Facilities and Infrastructure for Drinking Water in Onanrunggu District& IKK Onan Runggu	3,606,552,913	4.2	155
	TOTAL	40,104,248,131	139.12	10,178

Table 6. Investment Eligibility Criteria

No	Indicator	Score	Assessment criteria	Comparison	Conclusion
1	IRR	73.32	> i loan	Loan interest rate ± 12%	feasible
2	PP	3.34%	< ½ project life	½ Project life = 10 years	feasible
3	BCR	6.27	> 1	Greater than 1	feasible

3.11 Technical Aspect

The following can be said about the findings of the analysis on technical and production aspects:

1. PDAM Tirtanadi Samosir Regency and Clean Water Facilities and Infrastructure controlled by the community were taken over and used to build PDAM Samosir Regency, together with the potential of the local water sources.
2. In order to avoid producing trash that harms the environment, the treatment process from the water sources to distribution to consumers is carried out using a gravity system, pumps, and processing and distribution using appropriate technology.
3. Water is allocated and distributed to customers fairly, taking into account the state and accessibility of the distribution infrastructure, such as the size of the pipe network.

Therefore, from a technology standpoint or a technical and production standpoint, the development of PDAM Samosir Regency is possible.

3.12. A Human Resources Aspect (HR)

A precise organizational structure, including the number of employees needed, is necessary for PDAM management. It is possible to determine the necessary financial resources for operational operations by knowing the number of personnel in accordance with the organizational structure. The PDAM Samosir Regency's organizational structure is depicted in basic words in Figure 1.

Table 7. Estimated Water Demand in Samosir Regency

No	Description	Existing		Estimated					
		2014	2015	2016	2017	2018	2019	2020	2021
1	Total Population	123,065	123,789	124,532	125,279	126,031	126,767	127,548	128,313
2	Pangururan District Service Area	30,273	30,468	30,651	30,835	31,020	31,206	31,393	31,581
3	Total Population Served by the Service Area	30,273	30,468	30,651	85,107	85,618	86,132	86,648	87,168
4	Estimated Number of Connections	3,125	3,266	3,416	3,616	6,616	9,616	12,616	16,043
5	Estiamted Addition of New Connections	141	150	200	3,000	3,000	3,000	3,427	3,000
6	Average Population Served (souls/connections)	4.15	4.15	4.15	4.15	4.15	4.15	4.15	4.15
7	Total Population Served (souls)	12,969	13,554	14,175	15,006	27,456	39,906	52,356	66,578
8	Residents Served in the Service Area	43%	44%	46%	18%	32%	46%	60%	76%
9	Projected Average Water Consumption (m^3)	22.1	21.74	22.5	23	23.5	24	24.5	25
10	Average Water Consumption (m^3/year)	828,750	852,034	922,320	998,016	1,865,712	2,769,408	3,709,104	4,812,900
11	Losing Water	10%	43%	30%	27%	26%	25%	24%	23%
12	Average Water Requirement (m^3/year)	909,139	1,214,149	1,199,016	1,267,480	2,350,797	3,461,760	4,599,289	5,919,867
13	Maximum Day Requirement Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
14	Maximum Water Requirement/day	954,596	1,274,856	1,258,967	1,330,854	2,468,337	3,634,848	4,829,253	6,215,860
15	Existing System Capacity	29	39	38	40	75	110	146	188
16	Capacity Reduction				(30)				
17	Need for Additional System Capacity				100		50	75	
18	Available Capacity				110	110	160	160	235
19	Capacity Idle				70	36	50	14	47

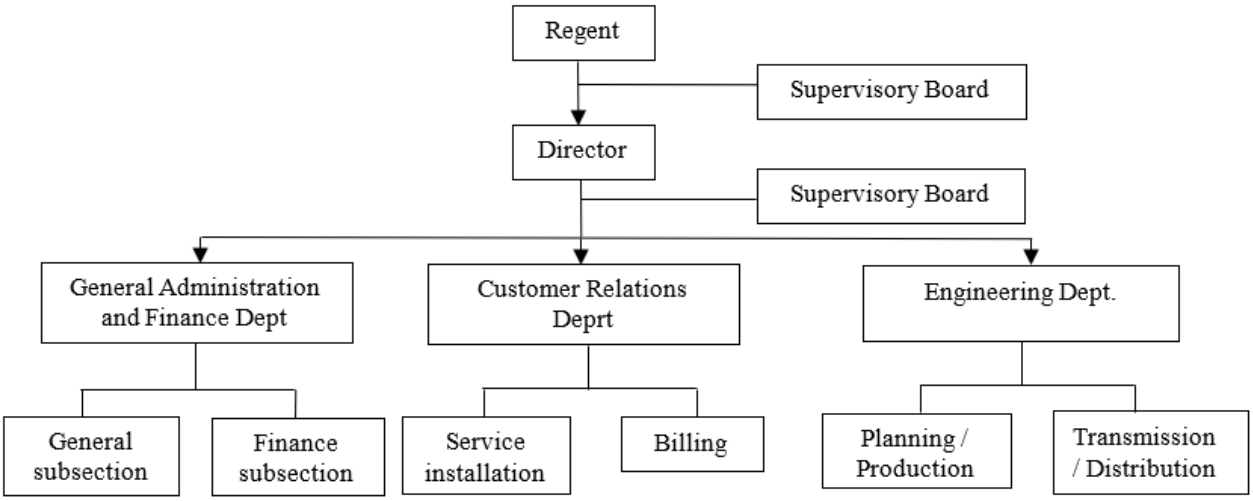

Figure 1. The Design of the PDAM Samosir Regency Organizational Structure

The organizational demands for personnel and employees, including the amount of There are approximately 31 (thirty one) persons in the structure above, including: three commissioners, one director, two internal supervisors, two members of the general affairs and finance section Relationship between 2 Engineering Section Subscribers and 2 General Section Subscribers persons, Installation/Service Subdivision 3 people, Billing Sub Division 2 people, Finance Sub Division Transmission and distribution personnel, members of Division 3's Planning and Production Subdivision, and individuals in Sub Division 3.

Both internal and external sources may be used by Pemkab Samosir to determine the number of employees mentioned above. The needs of these personnel are derived from those of Regency Government employees, according to sources from within. Samosir, which enables the transfer of the assignment. Since these positions must be filled through external sourcing, there must be a wide-open recruitment process. However, because this project involves the community's management of PDAM Tirtanadi, Samosir Regency Branch, and Clean Water Facilities and Infrastructure, the staffing requirements can be satisfied by utilizing the employment opportunities currently available at both PDAM Tirtanadi Branch of Samosir Regency and the personnel who oversee Clean Water Facilities and Infrastructure. According to the above description, it is possible to construct or develop PDAM Samosir Regency in terms of human resources (HR).

4. Conclusions

According to the study's findings, the creation of the Regional Drinking Water Company (PDAM) in Samosir Regency is feasible in terms of the market, the fact that 57.34 percent of households or 20,638 have not yet received clean water services, social and economic factors, and the likelihood that it will boost local revenue. Legal Aspects demonstrates that the draft regional regulation on PDAM Samosir Regency has been prepared in consultation with the Samosir Regency DPRD because of separated regional wealth, rising employment, and encouraging the emergence of other related business activities, both as a supplier and a market for these business activities. Technical and Production Aspects demonstrate that the technology used for water distribution and transmission is a typical type of technology that has been widely used in several places and does not harm the environment. The financial aspects show IRR = 72.32 percent greater than the interest rate of 12 percent/year, Payback Period (PP) = 3,34 years is less than half the life of the project by 10 years, and the Value of Benefit Cost Ratio (BCR) = 6. Human Resources (HR) Aspects take advantage of current employment conditions, both in PDAM Tirtanadi, Samosir Regency Branch and employees who manage Clean Water Facilities and Infrastructure.

Considering the findings of the study, it is suggested that the Regional Drinking Water Company (PDAM) be established in Samosir Regency as soon as possible after learning the findings of the analysis of various factors, which are discussed in the conclusion.

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