Financial Services Industry Strategy Architecture for Initiating Biogas Finance Development In Indonesia

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Abstract. Indonesia is an agricultural nation with significant potential for bioenergy (biodiesel, bioethanol, biomass, and biogas) and is poised to see a 50 percent increase in biofuel consumption and production. This potential is crucial for reducing carbon emissions by transitioning from fossil fuels to new and renewable energy sources. This study evaluates the government's efforts to promote biogas usage via PLTBg (biogas power plants). The study develops a strategic architectural framework using SWOT analysis and the Berlian Porter model with secondary data. The findings outline the development of financing strategies for biogas utilization through PLTBg in three phases: preparation and acceleration (short term), expansion (medium term), and final goal achievement (long term). The financing process follows a build, own, operate, and build-own-transfer business model, incorporating the 5C Principles aligned with ASRI principles. To optimize the biogas financing process, stakeholders have agreed to enhance efficiency in the biogas sector through PLTBg and foster a competitive business environment to prevent agency problems. The goal is that proper implementation of this strategic architecture will expedite the transition to renewable energy, especially biogas, via PLTBg, using suitable funding schemes or financing from the financial services industry.

Keywords: Bioenergy, Biogas Power Plants (Pltbg), Financing Strategies, Renewable Energy Transition, Strategic Architectural Framework

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1 Introduction

Global population growth and industrial development have increased the demand for energy use. Energy use in most countries is still dominated by fossil energy, affecting global warming and climate change. When fossil fuels are burned, they release large amounts of carbon dioxide emissions and greenhouse gases into the air. Greenhouse gases trap heat in the atmosphere and cause global warming and climate change [1]. Fossil fuel dependency impacts climate change and human health and well-being directly through volatile and unpredictable fossil fuel markets, weak supply chains, and geopolitical conflict [2]. International Energy Agency estimates global energy demand will increase 47 percent in the next 30 years, driven by population and economic growth, particularly in developing countries in Asia, which will require increased production of oil and natural gas [3].

Reducing dependence on fossil fuels is challenging for the government and society. In parallel, limited natural resources and increasing amounts of waste have caused the circular economy concept to grow in importance over the last decade [4,5]. The basic principles of optimal and responsible use of resources for purposes that lead to the transition to a circular economy are contained in the SDGs in supporting sustainable development between the economy, environment, and society [6]. Concerns over energy supply and security have encouraged the government to incentivize faster implementation of the paradigm shift from fossil fuels to environmentally friendly renewable energy. This will encourage countries' commitment to the Paris Agreement in efforts to transition from fossil fuels to address climate change, with a target of reducing carbon emissions by 30 percent by 2030 and achieving net zero by 2050 [7].

A vital movement to replace fossil energy is to use renewable energy and the concept of a circular economy. This is an effort to reduce carbon emissions on the planet [8] and sustainable energy [9]. Countries' commitment to using renewable energy and the impact of the stigma of the energy crisis provide new opportunities and challenges for countries worldwide in using renewable energy. Global renewable energy capacity is estimated to increase by almost 2,400 gigawatts (almost 75 percent) between 2022 and 2027 [10].

Biogas upgrading can be crucial among renewable energy sources thanks to its lower operating and capital costs and distinct organic biomass waste. Produced from anaerobic fermentation of organic materials, biogas is considered a renewable energy source, belonging to the ‘short carbon cycle’ [11]. Biogas can play a significant role in developing the renewable energy market. It is estimated that biogas use worldwide will double in the coming years, from 14.5 gigawatts in 2012 to 29.5 gigawatts in 2022 [12]. Biogas demand in the global market is expected to increase from 26 to 39 billion USD from 2020 to 2028 [11]. Biogas production has increased rapidly in the last decade due to the introduction of striking incentives for biogas production from renewable biomass [13].

Indonesia is an agricultural country with abundant bioenergy potential (biodiesel, bioethanol, biomass, and biogas) [14]. Indonesia's biofuel consumption and production are expected to increase by 50 percent from 2022 to 2027 [10]. The Indonesian government has committed to implementing renewable energy through biofuels as

stated in the Presidential Regulation of the Republic of Indonesia Number 22 of 2017 concerning the General National Energy Plan by setting a target to achieve 23 percent renewable energy utilization in the national energy mix and providing a biogas digester with target 1, 7 million households by 2025.

Table 1. Modeling of EBT Development for Direct Use 2015-2050 [15]

Type	Unit	2015	2020	2025*	2030*	2035*	2040*	2045*	2050*
Biofeul	Million KL	2.3	8.0	13.9	20.8	26.6	34.1	39.79	52.3
Biomass	Million Tons	5.6	6.7	8.4	10.7	12,1	16.3	17,17	22.7
Biogas	Million m3	25.2	131.9	489.8	783.5	1015.8	1346.3	1587.17	1958.9
Coal Methane Gas	MMSCFD	0.3	0.9	46	68.8	91.65	223.5	212.96	576.30

Description = * prediction data

Utilizing biogas is one of the targets for developing bioenergy-based renewable energy, as set out in the General National Energy Plan. However, the achievement of biogas utilization still needs to reach the 2025 National Energy General Plan target. Biogas Power Plants are targeted to reach a capacity of 5.5 gigawatts in 2025, but the realization is only around 1.33 percent [14]. Indonesia will need additional investment in renewable energy of around USD 8 billion per year by 2030 [16]. This paper will present the models and strategies of financial institutions in Indonesia's financing system. This paper aims to provide an overview of biogas, development strategies, and financing models for biogas in Indonesia.

2 Method

2.1 Research Approach

This research uses a qualitative approach with SWOT analysis introduced by Albert S. Humphrey in 1960, where indicators of strengths, weaknesses, opportunities, and threats are determined using Porter's Diamond of National Advantage introduced by Michael Porter in 1990 considering that this method can explain, assessing and visualizing and modeling the strategic architecture of the financial services industry in initiating the development of biogas financing in Indonesia.

2.2 Data Types and Sources

The data type used is secondary data, which can support studies in formulating a strategic architecture for the financial services industry in developing biogas-based financing. The data source for this research was obtained from literature studies through

observation techniques, and literature was obtained from several reports issued by agencies involved in developing biogas through financing in the financial services industry, as well as from several other pieces of literature.

2.3 The Conceptual Framework

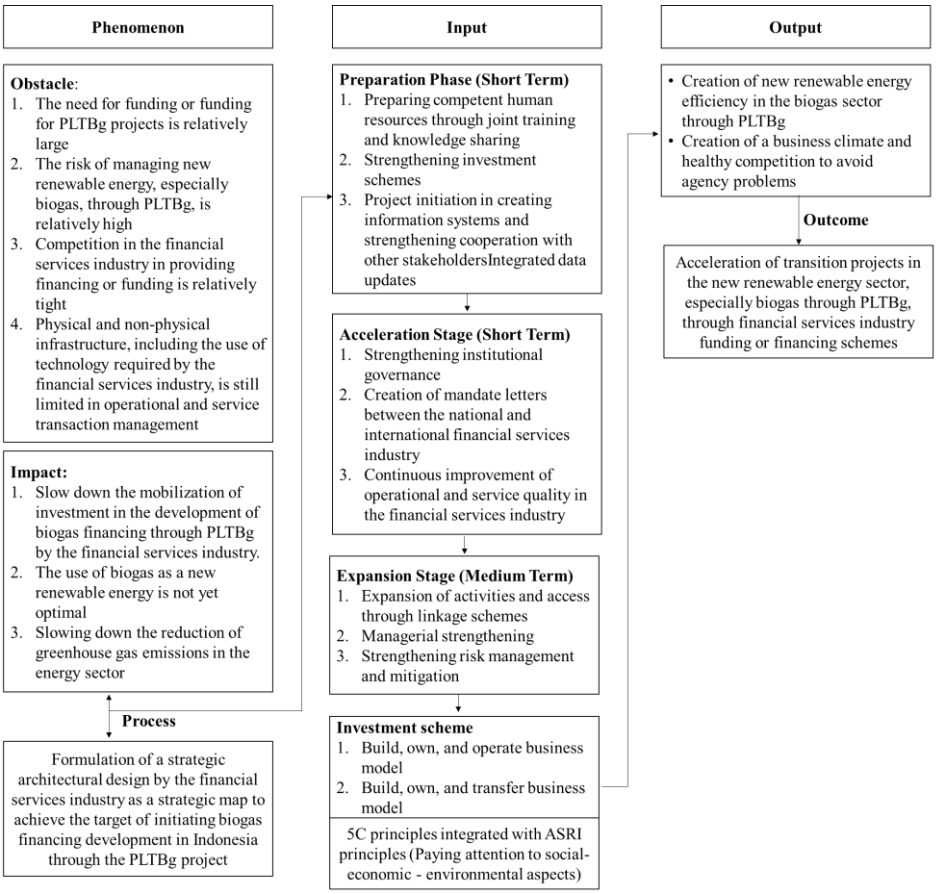

Figure 1. Initiation of Strategic Architectural Design to Accelerate the Transition Project in the EBT sector for Biogas development through the PLTBg project

. The research conceptual framework starts from the problems and obstacles that impact slowing investment mobilization in the development of biogas financing, thus influencing the suboptimal use of biogas as new, renewable energy and slowing down the reduction of greenhouse gas emissions. The financial services industry, as a provider of funds (direct lending), initiated a financial services architectural design as a strategic map to achieve the initiation of biogas financing development in Indonesia through PLTBg. This idea emerged with a build-own-operate business model scheme or a build-

own-transfer business model, which applies the 5C principles, which are integrated with ASRI principles so that it pays attention to social, economic, and environmental aspects. The successful development of biogas financing investment as a new renewable energy source through PLTBg is hoped to accelerate the transition project to the new energy sector.

2.4 Analysis Tools

The analytical tool used is SWOT analysis, which is considered appropriate to measure an organization's resource capabilities and deficiencies, its market opportunities, and threats to its future [17; 18]. The same thing was also expressed by [19; 20], where SWOT analysis is a significant tool for carrying out situation analysis with a strategic planning framework consisting of internal factors (organizational factors in the analysis of strengths and weaknesses) and external factors (environmental factors in the analysis of opportunities and threats).

The use of Porter's Diamond of National Advantage was first introduced by Michael Porter in 1990 with consideration of the four characteristics used, namely [21; 22]: (1) influencing circumstances; market conditions; (3) affiliate and ancillary industries; (4) business strategy, organization, and competitiveness. Porter's Diamond Model analysis is considered appropriate in describing how the financial services industry formulates a competitive framework that can provide value to a country [23]. So, its implementation is used to formulate the strategic architecture for the financial services industry for developing biogas financing.

Strategy architecture describes how "meta-strategies guide the selection and teaching of core competencies [24]. The same is explained by [25], where strategic architecture is a complex construct derived from measuring an organization's competitive behavior with a basic philosophy or orientation that reflects management attitudes and behavior to explain competitive advantage for the business being run.

3 Results and Analysis

3.1 The Importance of EBT Development

Governments in various countries, including Indonesia, are experiencing trade-offs, which creates a dilemma between prioritizing economic growth at the expense of environmental aspects, basic human needs, and other essential aspects and remembering that economic growth is often a measure of a country's success. The problem is that life is becoming increasingly complex and dynamic, making benchmarks for economic growth irrelevant, and new measuring standards are being sought because of social and environmental issues. According to the [26], Indonesia is included in the list of the 10 largest carbon-emitting countries in the world, reaching 700 million tonnes per year (1.7 percent) throughout 2022 (see Figure 2). Most of this increase in Indonesia's emissions is attributed to the use of fossil energy (especially coal) and Indonesia's high land conversion and deforestation.

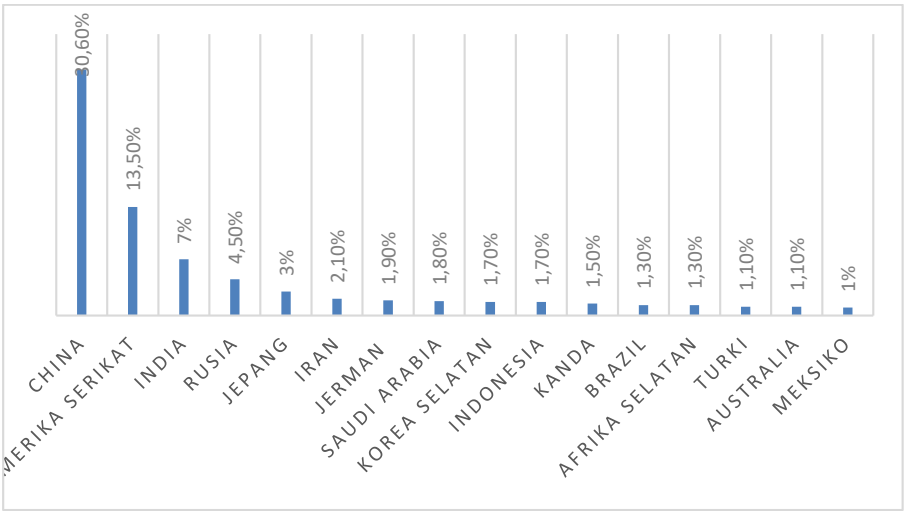

Figure 2. Countries Producing Global Carbon Emissions [26]

Another problem that arises is that without any efforts to reduce emissions, it is possible that the temperature increase of 1.5 degrees above pre-industrialization will be reached within the next seven years or perhaps sooner, and this includes the global biodiversity index which has decreased by almost 5.7 percent compared to the previous year [27]. One thing that can be done to minimize the negative impact is to implement the Doughnut Economics Model, first published in the Oxfam Report in 2012. This model offers the idea of changing the goal from unlimited economic growth to developing within a 'doughnut' (see Figure 3).

Figure 3. Doughnut Economics Model for EBT Development [28]

This model has attracted the attention of governments and the global arena, emphasizing skepticism toward economic growth in the 21st century. The implementation of this model offers a picture of a healthy and ideal economy through fulfilling human needs, which must be within the 'donut' circle, which is bounded by two ring boundaries (social foundation and ecological or environmental roof). This 'donut' model shows that the goal of the economy should be the utilization of resources so that all parties, without exception, have access to basic needs such as water, food, income, education, and health.

On the other hand, the economy can only grow without exceeding the environmental ceiling (air conditions, clean water, land, biodiversity, and ozone). This will result in a decline in world economic GDP of 11-18 percent if temperatures increase by 3.2 degrees in 2050 [29]. If economic growth exceeds the limits of the environmental ceiling, society will become unable to fulfill its basic needs because it disrupts the sustainability of food needs. In addition, people below the social foundations will be forced to use resources in unhealthy and unsustainable ways to meet their basic needs.

3.2 The Role of Stakeholders in the Development of PLTBg in Indonesia

The development of biogas through PLTBg in Indonesia involves various stakeholders, including both central and regional governments, fund providers, PT PLN (Persero), and developers. Institutionally, considering the complexity of the business or investment process in biogas development, the Indonesian Government has developed a strategy involving the roles and functions of relevant Ministries/ Institutions, including regional governments, in formulating policies and regulations, licensing systems, investment processes, and other related to the use of biogas as a renewable energy power [30; 31]. Each stakeholder plays a crucial role in the development of biogas in Indonesia in order to create an attractive investment climate and encourage investment mobilization with the use of clean energy and efforts to reduce greenhouse gas emissions in the energy sector [32; 33] (see Figure 4).

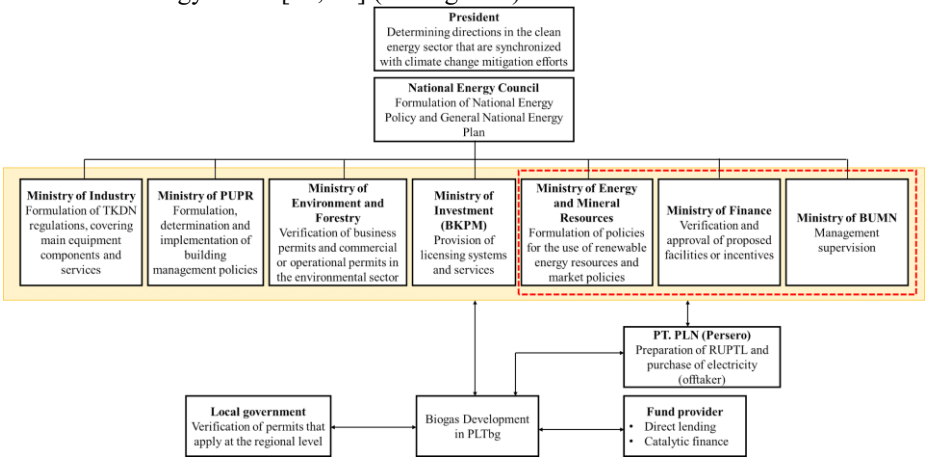

Figure 4. Institutions of Stakeholders in Biogas Development in Indonesia [30]

The government's seriousness in this management is manifested in establishing a regulatory framework for using biogas resources for electricity supply, which includes the statutory level and its derivatives, such as government, presidential, and ministerial regulations [34]. All regulations are classified into eight categories relating to the development of biogas-based electricity generation through PLTBg (see Table 2).

Table 2. Regulatory Framework for Biogas Development through PLTBg [35; 36; 37]

Regulations	Poured on	Information
Energy resources	Law Number 30 of 2007 concerning Energy	This legislation regulates energy accessibility in Indonesia as well as the formation of the National Energy Council which has the authority to formulate the National Energy Policy. Apart from that, this category has derivative regulations that regulate the use of renewable energy sources.
Electricity	Law Number 30 of 2009 concerning Electricity	This legislation regulates processes and provisions related to electricity, especially in business activities providing electricity and electricity purchase and sale agreements.
Waste management	Law Number 18 of 2008 concerning Waste Management	This legislation regulates the implementation of waste management to improve public health and environmental quality, as a source of renewable energy.
Job Creation	Law Number 11 of 2020 concerning Job Creation	This legislation regulates the creation of a quality business and investment climate for business actors, including foreign investors. One concrete proof is the simplification of business licensing related to the supply of electricity. Apart from that, this category has derivative regulations that regulate the licensing process and management of renewable energy sources.
Environment Life	Minister of Environment and Forestry Regulation Number 22 of 2018 and Minister of Environment and Forestry Regulation Number 26 of 2018	This regulation regulates the procedures and requirements for business licensing related to the environment

Fiscal Facilities	Minister of Finance Regulation Number 66 of 2015; Regulation Minister of Finance Number 11 of 2020; Regulation Minister of Finance Number 11 of 2020	This regulation regulates increased investment for the development of PLT-Bio including the development of biogas through PLTBg with various facilities that can be utilized by developers. This regulation also regulates the procedures and requirements for granting and utilizing fiscal facilities (tax allowances and tax holidays) provided by the government to developers.
Domestic Component Level	Law Number 3 of 2014 concerning Industry	This legislation regulates the obligations of users of domestic products according to the quantity of domestic components
Regulation by PT PLN (Persero)	PT PLN (Persero) Board of Directors Regulation Number 0062 of 2020	This regulation regulates the purchase of electricity from new renewable energy generators including regulating the mechanisms and procedures for purchasing electricity from renewable energy including biogas through PLTBg

3.3 The Importance of the Financial Services Industry Being Involved in Financing Biogas Development in Indonesia

In the last few decades, national banks have begun to actively participate in financing the new renewable energy sector. This is done so that banks can become actors of change that encourage development in a more sustainable direction while solving the problem of the climate crisis through green funding and emphasizing carbon-intensive sectors [38; 39]. Unfortunately, this has not been supported by targets and commitments to move away immediately from fossil financing, and national banks still need emissions reduction targets in financing and investment activities that align with the Paris Agreement targets. According to the [40], banks need to be involved in financing the sustainable business sector, which is realized by integrating environmental and social aspects in providing credit. In addition, banking policies and procedures that indicate the role and responsibilities of banks in implementing their policies need to be outlined in determining capacity and procedures as well as evaluation and monitoring in providing loans, including risks and mitigation in environmental and social aspects when carrying out the process and monitoring of lending.

In practice, financial services banks will only consider environmental and social aspects if they can review them themselves, so banks collaborate with independent consultants to obtain objective opinions. The thing to pay attention to regarding the development of biogas through PLTBg is financial analysis, which generally uses NPV and IRR with several assumptions that must be considered and considered, namely [40]: (1) assumptions used; (2) completeness of cost and income structures to predict cash inflows and outflows; (3) potential cost overruns; (4) a sensitivity analysis will test the assumptions used if the project experiences disruption. Generally, banks will fund 70

percent of the investment costs, while the project sponsor will provide the other 30 percent. According to [31], the financing structure, investment costs, PLTBg project location, and utilization scenarios will influence the magnitude of the NPV and IRR. In order to consider credit analysis from banks for the development of biogas through PLTBg, a 5C principle analysis was carried out, which also included ASRI aspects (see Table 3).

Table 3. Analysis of the 5 C Principles in Providing Banking Credit in Biogas Development through PLTBg [41]

Principle	Information
Capacity	Demonstrate the ability to repay the loan. ASRI integration in this principle considers the financial analysis of PLTBg, which considers financial and non-financial assumptions used to estimate future cash flows to assess the ability to pay loans and interest.
Collateral	Shows the PLTBg credit guarantee, which generally constitutes the PTBg itself. The ASRI concept is fundamental to evaluate because the cash flows and project assets used for collateral are used for loan payments, which are assets that have both environmental and social risks. When conditions require a bank to take over collateral, the bank will be directly affected by the impact of environmental and social risks
Capital	Shows the capital strength of the project sponsor (the other 30 percent), where this credit analysis considers the financial requirements required by PT PLN (Persero) or the Ministry of Energy and Mineral Resources for the project sponsor.
Conditions	Demonstrates the characteristics of PLTBg in producing electricity by utilizing waste close to the community. So, credit analysis must realize that the success of PLTBg is closely related to social and environmental risks, including changes and dynamics.
Character	Shows aspects of the debtor's characteristics and behavior. ASRI integration, where credit analysis needs to pay attention to the credit applicant's track record and whether they have been involved in environmental and social violations.

3.4 SWOT analysis

According to [43], developed a qualitative approach to analyze external conditions (opportunities and challenges) and internal conditions (strengths and weaknesses). One of the analytical tools that can be used is Porter's Diamond Model, which also applies the descriptive analysis of institutional conditions that can be implemented in the financial services industry to estimate the competitiveness of these institutions in initiating financing in the biogas sector [44]. This analysis can be implemented by institutions, including the financial services industry, in biogas financing in Indonesia [45; 46; 47; 48; 49] (see Table 4).

Table 4. SWOT Identification for Investment in the PLTBg Industry

No	Variable	Condition Identification		
		S	W	O
	Main Factors Condition Factors			
1	Ease for managers of the financial services industry in offering convenience in funding and financing as well as for the biogas industry as an object so that it is easy to receive funding and financing assistance from the financial services industry	v		
2	Criteria for HR managers in the financial services industry who meet managerial needs	v		
3	The health of the financial services industry in accordance with Financial Services Authority Regulation Number 4 /POJK.03/2016 concerning Assessment of the Soundness Level of Commercial Banks and Financial Services Authority Regulation Number 28/POJK.05/2020 Assessment of the Soundness Level of Nonbank Financial Services Institutions	v		
4	*Linkage system*with channeling, executing or joint financing schemes that can be utilized between the financial services industry which can increase funding and financing service capacity and overcome liquidity problems			
5	The technology used in the financial services industry is still limited in operational transaction management. So it is necessary to collaborate with external parties, technology companies or universities in forming information systems		v	
6	Physical and non-physical infrastructure as management equipment still has weaknesses that can be developed because it must comply with standards and is still simple		v	
	Request Conditions			
1	Realization of operational and service quality from the financial services industry in funding or financing that is in accordance with customer perceptions (compliance, assurance, responsiveness, tangible, empathy, reliability)	v		
2	The characteristics of the new renewable energy sector, especially biogas through PLTBg, generally require a large funding ceiling or financing			
3	Procedural or administrative funding or financing with complicated bureaucracy		v	
4	The availability of complete integrated data on funding or financing in the new renewable energy sector, especially biogas through PLTBg, is still limited			
5	Growth in funding or financing in the new renewable energy sector as a whole or in the biogas sector through PLTBg is still relatively limited when compared to other market shares		v	
	Related and Supporting Industries			

1	Relatively good access to funding or financing from the financial services industry through collaboration to strengthen capital with linkage schemes either through channeling, executing or joint financing	v		
2	Proposals related to the Mandate Letter from both the international and multinational financial services industry to accelerate the transition project to the new and renewable energy sector, especially biogas through PLTBg which is being worked on by the company			v
3	There is no special institution that handles funding or financing of the new renewable energy sector, especially biogas through PLTBg, so this has the potential to create obstacles to funding and financing			
4	In the energy transformation scenario, investment and efficiency in the new renewable energy sector, especially biogas through PLTBg carried out by the financial services industry, is able to contribute to the macro economy, especially in opening up new jobs		v	
Structure, strategy and competition				
1	Institutional governance (good corporate governance) of the financial services industry in collaboration with insurance and guarantee companies is good in providing funding or financing to the new renewable energy sector, especially biogas through PLTBg	v		
2	Tight business competition because they have the same market segmentation in providing funding or financing services in the new renewable energy sector, especially biogas through PLTBg			
3	The development of the new renewable energy sector, especially biogas through PLTBg, which requires funding or financing that encourages operations and practices in the financial services industry			v
Supporting Factors for the Role of Government				
1	The government is encouraging new energy and other low-carbon technologies to create new jobs and restore the economy			v
2	There needs to be regulatory support to form healthy competition in the financial services industry to and avoid agency problem practices (the emergence of costs related to the behavior of stakeholders and financial institution managers)			v
3	Ease for the financial services industry in channeling funding or financing through programs proposed by Ministries or institutions for the new renewable energy sector, especially biogas through PLTBg	v		
The Role of Chance				
1	Investments made by the financial services industry in the new renewable energy sector, especially biogas through PLTBg, are aimed at achieving an energy price structure that is economically appropriate so that it is in line with people's purchasing power and the availability of energy infrastructure			v
2	Opportunities for the financial services industry to invest are open because the development of the new renewable energy sector, especially biogas through PLTBg, is still supported by the APBN structure.			v
3	Improved economic growth will increase the need for the new renewable energy sector, especially biogas through PLTBg, to attract investment in the			v

	financial services industry which is needed in the development of the energy sector

3.5 Strategic Architectural Design

Strategic architecture analysis is a strategic map that can be used to achieve the target of initiating biogas financing development in Indonesia through the PLTBg project [51] (see Figure 4). This strategy is divided into three stages carried out in the long term to achieve the expected final goal, namely [52; 53]: (1) preparation, (2) acceleration (acceleration), and (3) expansion (expansion). This architectural design can guide the financial services industry in accelerating the transition project to the new and renewable energy sector, especially biogas, through PLTBg through funding or financing schemes [54; 55; 56]. This is done to create new, renewable energy efficiency, especially in the biogas sector through PLTBg, which is based on economics, society, and environment, and creates a business climate and healthy competition to avoid agency problems.

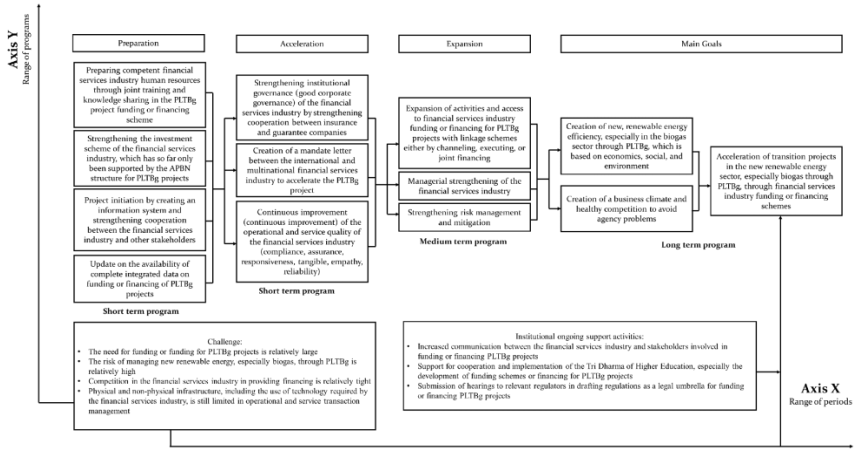

Figure 5. Architecture of the Financial Services Industry Strategy in Initiating the Development of Biogas Financing in Indonesia

4 Conclusion

The Indonesian government has committed to implementing renewable energy through biofuels as stated in the Presidential Regulation of the Republic of Indonesia Number 22 of 2017 concerning the General National Energy Plan by setting a target to achieve 23 percent renewable energy utilization in the national energy mix and providing a biogas digester with a target of 1.7 million households by 2025. The utilization of

biogas is one of the targets for developing bioenergy-based renewable energy, as set out in the General National Energy Plan. However, the achievement of biogas utilization still needs to reach the General National Energy Plan target in 2025. Biogas Power Plants are targeted to reach a capacity of 5.5 gigawatts in 2025, but the realization is only around 1.33 percent.

Strategic architecture analysis is a strategic map that can be used to achieve the target of initiating biogas financing development in Indonesia through the PLTBg project. This strategy is divided into three stages carried out in the long term to achieve the expected final goal, namely: (1) preparation, (2) acceleration (acceleration), and (3) expansion (expansion). This architectural design can guide the financial services industry in accelerating the transition project to the new and renewable energy sector, especially biogas, through PLTBg through funding or financing schemes. This is done to create new, renewable energy efficiency, especially in the biogas sector through PLTBg, which is based on economics, society, and environment, and creates a business climate and healthy competition to avoid agency problems.

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