

# CREATING A GREEN ECONOMIC ECOSYSTEM THROUGH LEAN CANVAS MODEL: BIPV SYSTEM ACHIEVING NET ZERO EMISSION

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**Abstract-** Green Economy is a sustainable economic activity to be able to improve people's welfare without neglecting the impact that causes damage to the environment. This concept prioritizes economic activities with low carbon emissions. Currently, the largest carbon emissions are caused by power plants that still use non-renewable natural resources. One of the efforts made to reduce carbon emissions is to use a solar power plant, known as PV Solarcell. However, with new developments and discoveries for solar power plants, BIPV is perfected. BIPV is a solar power plant where the existing solar panels are attached to buildings or buildings. The aim of this research is to be able to create a new green economy business model for BIPV power plants by using lean canvas tools. This research uses descriptive qualitative method. This research starts from May to October 2022. The results of this study using the lean canvas concept can create an integrated and sustainable green economy business model ecosystem to be able to create new value.

**Keywords:** *green economy, BIPV, lean canvas, carbon emission*

## 1. Introduction

The Paris Agreement signed by 171 countries in 2015 to be able to deal with climate change. The commitment of countries to contribute to suppressing the rise in world temperatures is stated through the Nationally Determined Contribution (NDC) for the 2020-2030 period. In the Paris agreement, all parties are required to be able to prevent the earth's temperature from exceeding the threshold of 2 degrees Celsius. The target is to hold back the average increase to keep the earth's temperature from reaching 1.5 degrees Celsius. Five years since the Paris Agreement, the reduction in the greenhouse effect caused by fossil energy has not experienced an optimal reduction. From 1990-2019 emissions from the use of fossil energy reached 38 Gt CO<sub>2</sub> which increased by an average of 0.9% per year between 2010-2019. (Kompas,2023). In 2020 emissions from the use of fossils will decrease by 7% from the 2019 amount which is affected by pandemic factors and the global economic slowdown. However, this is not enough to withstand the earth's temperature below 1.5 degrees Celsius. The trend that occurs contributions from all countries including Indonesia will increase the earth's temperature to reach 3 to 4 degrees Celsius (Rappler,2023). Indonesia's geographical condition is very vulnerable to extreme climate change and sea level rise with the second longest coastline in the world and tens of millions of people living on the coast and the many small islands that make the risk multiplied. At least 23 million people in Indonesia will be affected and forced to flee if sea level rise reaches 0.6-2 meters. One of the villages in Matawai Atu, on the coast of Sumba, has eroded 100 meters of its surface due to abrasion. WALHI West Sumatra reports that the parrot and bald islands in Banyu Asin district have sunk as deep as 1 and 3 meters below sea level. (Wahli,2023). According to Vukovic, *at al.* (2019), over the last decade the green economy has emerged as an important policy framework for sustainable development in both developed and developing countries, providing a framework for producing societies that are more resource efficient, lower carbon, less environmentally damaging, and more socially inclusive). Indonesia is committed to achieving net zero emissions by 2060 at the latest, but that will not be easy, requiring new policies, changes in investment priorities and collaboration between the government, international partners and private

companies. The 26th International Climate Change Conference in Glasgow, UK is the European Union's commitment to become the world's first carbon neutral (net-zero) region by 2050 (PPID Menhik,2023). Net zero itself means a balanced condition between the emissions produced and those that are able to be absorbed by an area. One form of green innovation that will be used by the European Union is the use of clean energy, because the energy sector contributes more than 75% of the EU's total emissions, it will increasingly use new and renewable energy. In the long term, Indonesia is also committed to being net-zero by 2060 (Kompas, 2023). With this be able to reduce the increase in world temperature using renewable energy (EBT) by using the BIPV System (Gielin et.al., 2019). BIPV is a system that uses PV that is integrated with buildings which can provide a new color in the use of renewable energy (Susan et.al.,2023) To be able to achieve maximum implementation, it is very necessary to create an ecosystem in a business. To be able to create an ecosystem, one of the tools that is easy to implement is needed, namely using the lean canvas. Lean canvas is very easy to be able to find value from a business model (Harianto et. al.,2022)

## **2. Literature Review**

The use of lean canvas as a tool to be able to create a detailed concept of a business model is very efficient and streamlined because in the lean canvas there are key metrics that can measure the achievement of a business. Besides that, in the lean canvas there is a revenue stream and cost structure to be able to see the visibility of a business (Harianto ,2018; Felin, 2019; Harianto et. al.,2022). Using Lean Canvas will create a blue ocean strategy where this will make a business sustainable and very difficult for competitors to compete with (Harianto et, al., 2021).

### **Green Economy**

Green economy is a form of economy that focuses on prioritizing the economic impact on the environment in addition to meeting people's needs (Merino, et. al.,2020). An example is the use of solar power plants where this is to be able to meet people's needs for electrical energy but not damage the environment because it uses renewable energy. (Ivlev, et., al.,2018) explained the green economy is an economic concept that has an impact that prioritizes renewable natural resources, environmental welfare and reducing the risk of using natural resources. An example that can be seen is reducing the use of plastic to reduce plastic waste which has a negative impact on the environment. Menurut (Mikhno, et. al., 2021) The practice of green economy is a practice that emphasizes long-term planning because this practice is expected to reduce carbon dioxide emissions, poverty and ecosystem degradation.

### **Net Zero Emission**

Net Zero emission is the amount of carbon emissions in the atmosphere that does not exceed the amount of emissions that can be absorbed by the earth. To be able to achieve this requires a transition from the energy used at this time to renewable energy because non-renewable energy emits a lot of CO2 emissions which can cause damage to the environment. (Da Rosa, A. V.,et. al., 2021) This program is implemented to reduce harmful impacts on the environment including extreme weather, reduced sources of clean water, changes in the food chain, natural disasters and various other environmental damages (PPID Menhik,2023).

### **PLTS**

Solar power plant (PLTS) is a power plant that converts sunlight into electrical energy. The conversion process uses a tool called an inverter, which is a tool that converts electricity from sunlight with direct current (DC) electricity into alternating current (AC) electricity. PLTS in its implementation there are 3 types that are often used (Hutajulu, A.G., et.,al., 2020). The first type is an off grid system where this system uses a battery to store the electric power generated by solar panels and converted by an inverter into AC alternating current. In the offgrid PLTS type, it does not use any other source, only electricity as the main source, the second type is ongrid PLTS where this system combines other electrical power apart from PLTS and uses batteries to store the electric power generated by solar panels and converted by an inverter into alternating current. AIR CONDITIONING. The third

type is called a hybrid, where this system does not use batteries to store the power generated by solar panels but share it with other sources as a source of electrical energy (Tharo, Z., et al.,2020).

### **BIPV**

BIPV (Building Integrated Photovoltaics) are solar panels that are integrated into buildings and arranged vertically so that they can beautify the appearance of a building and can also save space for placing solar panels (Gholami, H.,et.al.,2020) .This BIPV can also function in addition to generating electrical energy to withstand solar heat entering through the vertical side of the building so that it can save on the use of air conditioners which have an impact on the efficiency of using electrical energy sources in a building (Wardhani, D. K.,et.,al., 2021; )

### **Lean Canvas**

According to Ash Maurya (2010) This BIPV can also function in addition to generating electrical energy to withstand solar heat entering through the vertical side of the building so that it can save on the use of air conditioners which have an impact on the efficiency of using electrical energy sources in a building. (Harianto, 2018; Razabillah, N.,et.,al., 2023; Bortolini, R. F.,et.al., 2021). An explanation of the nine components in the lean canvas is as follows:

1. The first block is a problem, which identifies consumer problems that need to be solved in the manufacture of products or services so as to create product and market fit. This block identifies three main problems.
2. The second block is a solution, which provides a solution to the previously identified problem. The solution block solves the three problems that have been identified.
3. The third block is key metric, which is a measure of the success of a product or service in a business. This block will be measured quantitatively so that progress can be measured at each specified period.
4. The fourth block is the cost structure, which contains the costs needed to be able to run from the lean canvas which is made from the cost of a solution that has been determined and will be implemented.
5. The fifth block is unique value proposition, which contains the value offered to consumers in the form of solving problems faced by consumers. In this block, three unique value propositions are determined that can be selected from 11 existing value propositions, namely newness (update), performance (performance improvement), customization (adjusting specifications), getting the job done (complete), design, brand, price, cost reduction, risk reduction, accessibility and convenience.
6. The sixth block is the channel, which becomes a channel to be able to distribute unique value proposition to consumers. The channel is divided into two parts, namely directly (telephone, face-to-face meetings, meetings) and indirectly (social media, WhatsApp, email).
7. The seventh block is customer segments, which are the target users of products or services made by a business. The customer segment must be identified precisely which is the point of success in running a lean canvas model. The customer segment consists of all those involved in running the lean canvas model that was created.
8. The eighth block is the revenue stream, which becomes an income or revenue when running the lean canvas that has been made. This block is a visibility study to be able to determine whether this lean canvas can be implemented when the cost structure is smaller than the revenue stream created.
9. The ninth block is unfair advantage, which becomes a special privilege in a business created that competitors cannot easily emulate. This can be a uniqueness that can become a barrier for competitors to enter into the business being created. The more specific the unfair advantage, the more difficult it is for competitors to be able to compete with the business that has been created. There is a picture of the lean canvas:

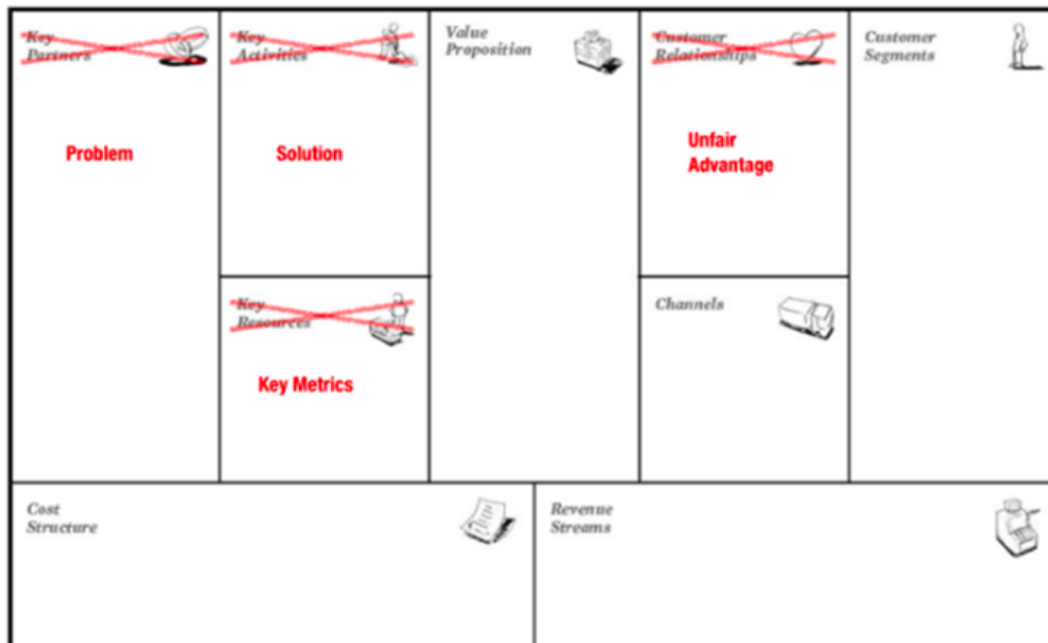


Figure 1: Lean Canvas  
Source: Ash Maurya. All rights reserved.

Lean canvas is made with the concept of lean startup, namely by using three stages including at stage one is problem and solution fit where at this stage the problems faced by consumers have been solved by the business formed. For the second stage is product and market fit where the product or service produced is in accordance with what consumers want. In this case, the value offered has been acceptable to consumers and consumers are happy to provide revenue for the products and services offered to consumers (Harianto, et.,al., 2022). At the third stage is the scale where at this stage the existing business is ready to be developed even bigger because the model has been found. At each stage there will be what is known as a pivot, namely when each stage does not match what the consumer wants, which means looking for the right pattern. Once the pattern is correct, it will enter the next stage. This happens continuously (Maurya, 2012). The following is a stage image of a lean startup :



Figure: Lean Startup  
Source: Reis Eric. All rights reserved.

### 3. Research Method

The research method used is descriptive research with a qualitative approach. Qualitative research aims to be able to explain a phenomenon by examining it in depth (Adlini, M. N.,et.,al.,2022). Qualitative research is more focused on the meaning of the research. Several steps of qualitative research are collecting data, classifying data, displaying data and drawing conclusions. This study uses a triangulation technique, which is a technique to retrieve data sources from three points of view to obtain objective data (Darmalaksana, W.,;2020). The purpose of this study is to create a green economic ecosystem with lean canvas tools with the following identification:

1. Make a lean canvas design on the implementation of the BIPV system to achieve net zero emission:
  - a. Problem (PLTS implementation problem)
  - b. Solution (PLTS implementation solution)
  - c. Key Matric (PLTS implementation measurement matrix)
  - d. Cost Structure (Cost required for lean canvas tools)
  - e. Unique Value Propotion (a unique value proposition generated by lean canvas tools)
  - f. Channel (Lean Canvas Communication Channel)
  - g. Customer Segment (Parties related to the lean canvas)
  - h. Revenue Stream (Revenue that can be created by lean canvas)
  - i. Unfair Advantage (Special Privilege)
2. Create a green economy ecosystem model from the lean canvas design for the implementation of the BIPV system to achieve net zero emission.

### **Data Collection Technique**

The data used in this study uses two sources. The first source with primary data is by conducting interviews with informants consisting of users (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1). Primary data collection techniques were carried out by researchers by way of group discussion forums, interviews and research support tools (Sari, I. N., et., al., 2022). The second source with secondary data is obtained from literacy and journals that support this research. This research took place from the month of Data was collected from May 2022 to October 2022.

### **4. Results and Discussion**

The research project under study is a solar power plant with the BIPV System which will be implemented to be an alternative to electricity other than that from Steam Power Plants and Diesel Power Plants which are distributed by the State Electricity Company. In this study, researchers made observations on solar panel installation objects at Ciputra University to be able to create a green energy BIPV ecosystem (Susan, et., al., 2023) To be able to do mapping in the lean canvas, detailed identification of 9 blocks will be carried out in the lean canvas created by Maurya (2012). as well as integrating each block to create a green energy BIPV ecosystem.

#### **Problem (PLTS implementation problem)**

Maurya (2012) says in his book is to list three very important problems to solve which are customer problems. This problem is a problem that can make consumers interested in having the product offered so as to create a product concept and market fit in accordance with the lean startup concept developed by Reis (2011). To be able to find out the exact problem, the researchers conducted interviews with two target consumer segments, namely users (P1) and experts (E1). The user informant (P1) gave the following statement in the problem block on the lean canvas: "(1) a solar power plant requires a lot of space because each panel can only produce a small amount of power compared to the capacity required by the building; (2) solar power plants require an initial investment that is not cheap in terms of installation, assembly and implementation; (3) After carrying out the installation, there are more problems that are experienced, namely that the construction and maintenance of a solar power plant is not easy because it requires special knowledge and skills in its implementation. The expert informant (E1) conveyed his views on problem blocks, namely: (1) A solar power plant that is placed horizontally requires a very large area of land for its implementation; (2) Solar power plants with inverter prices, solar PV panels and supporting PV panels require a higher initial cost because previously electricity was used from PLN which did not need an initial investment to prepare a power plant; (3) Solar power plants require special skills in installing them so that later the conversion of light into electricity reaches an optimal point. In addition, special care is needed to be able to maintain optimal solar power plants in their performance. From the results of interviews to find the top three problems in solar power plants, it can be concluded as follows:

1. Limited land in the construction of solar power plants because they have to place solar panels in a horizontal position.
2. Large initial investment in implementing the construction of a solar power plant.
3. The construction and maintenance of a solar power plant requires special skills in implementing it.

### **Solution (PLTS implementation solution)**

In connection with the solution Maurya (2012) said that every problem resulting from interviews with consumers needs to find a temporary solution. The solution sought is a solution that can solve the problems of consumers which will later be included in the solution block which answers temporarily every three problems that have been identified. After conducting in-depth interviews with informants and obtaining problem identification, the next step is to find solutions to the problems that have been obtained. In order to be able to map out the solutions, the researchers conducted interviews with user informants (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1), which finally concluded three main solutions, namely:

1. Using a solar power plant with a BIPV system to be able to overcome the shortage of land in installing PV panels.
2. Using capital from investors for a large initial investment in the implementation of solar power plants.
3. Build a green energy digital platform to be able to carry out the construction and maintenance of efficient and optimal solar power plants.

### **Key Matric (PLTS implementation measurement matrix)**

Maurya (2016) said every business has several indicators to be able to measure the performance of a company. These measurements are calculated in detail and quantitatively. In accordance with Harianto's research (2018) to be able to determine key metrics researchers are expected to be able to find the right measurements to see the performance of corporate entrepreneurship projects included in the lean canvas. This concept is in accordance with lean startup stage 3, namely scale. To be able to map the key metrics the researcher conducted interviews with user informants (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1) which finally concluded three key metrics, namely:

1. Savings in land use by 80% due to installation with the BIPV system where the PV Panel does not require a special place but is installed vertically on the building wall.
2. The use of initial capital is 30 percent and 70 percent will receive financing from investors.
3. Savings in electricity costs by 50 percent because half of electricity needs are supported by solar power plants.

### **Cost Structure (Cost required for lean canvas tools)**

Maurya (2012) said several operational costs are needed to be able to produce products that consumers need. According to research Harianto (2018) to be able to determine the exact cost structure is needed to identify operational expenditure costs to create a project that is needed by consumers. To be able to map the solution, the researcher conducted interviews with user informants (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1), which finally concluded that the required expenditures were:

1. Making green energy platform digital tools in the form of applications.
2. Power plant engineering and IT consultant fees.

### **Unique Value Propotion (a unique value proposition generated by lean canvas tools)**

To be able to determine a unique value proposition, it is necessary to be able to find a unique value proposition that is in accordance with the products produced in accordance with the wishes of consumers after getting problems and solution fit in accordance with research harianto (2018). Unique value according to Osterwalder, A., & Pigneur, Y. (2010) consisting of performance, newness, getting the job done, design, brand, price, cost reduction, risk reduction, accessibility, convenience and customization. To be able to determine the

right unique value proposition on the lean canvas, the researcher conducted interviews with user informants (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1) which finally concluded three unique value propositions that are:

1. Cost Reduction (With the creation of a green energy digital platform, there are cost savings, especially in saving land use and investment).
2. Risk Reduction (With the creation of a green energy digital platform there is a reduction in risk because experts will assist in making PLTS along with maintenance).
3. Getting the Job Done (With the creation of a green energy digital platform, work will be completed quickly because the required parties are integrated into one).

### **Channel (Lean Canvas Communication Channel)**

According to Menurut Maurya (2012) channel is how unique value proposition can reach consumers' hands so as to create products and market fit. This is also explained by Reis (2015) in the lean startup concept. Researchers conducted interviews with user informants (P1) expert (E1) which can finally be concluded as follows :

1. Direct channels, namely channels that directly relate to consumers, including: meetings, training and counseling.
2. Indirect Channels, namely channels that do not directly relate to consumers including: websites, social media and applications.

### **Customer Segment (Parties related to the lean canvas)**

According to (2012) say create a canvas for each segment of the consumer. By starting to find the right segment for products that will be marketed to promising consumers. This is the same as Harianto (2018) in his research which applied the lean canvas concept to corporate entrepreneurship projects. The researcher conducted interviews with user informants (P1) expert (E1), which in the end it can be concluded that the customer segmentation is as follows:

1. B to C (Business to Consumer) in this case what needs PLTS with the BIPV system is housing.
2. B to B (Business to Business) in this case those that need PLTS with the BIPV system are offices, industry, apartments, universities, malls, hospitals.
3. B to G (Business to Government) in this case what requires PLTS with a BIPV system is a building managed by the government.

### **Revenue Stream (Revenue that can be created by lean canvas)**

Maurya (2012) said in the lowest block, namely cost structure and revenue stream to be able to see the viability model of a business. That way you can see whether this business can be implemented. According to Harianto (2018) to be able to see a good corporate entrepreneurship project is the composition of the resulting revenue stream that is greater than the cost structure in a lean canvas model. . To be able to determine the right revenue stream on the lean canvas, the researcher conducted interviews with user informants (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1) which finally concluded that:

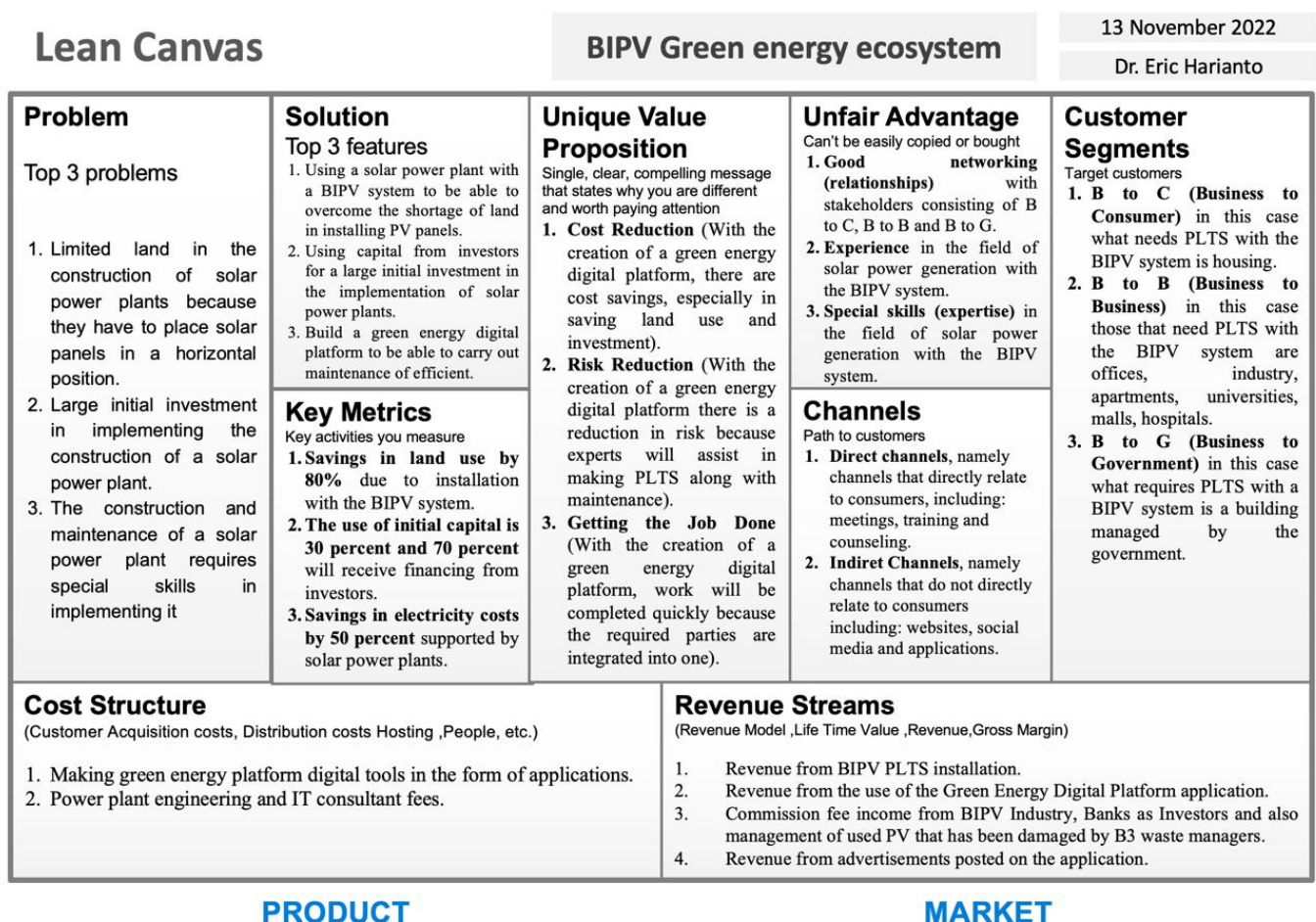
1. Revenue from BIPV PLTS installation.
2. Revenue from the use of the Green Energy Digital Platform application.
3. Commission fee income from BIPV Industry, Banks as Investors and also management of used PV that has been damaged by B3 waste managers.
4. Revenue from advertisements posted on the application.

Unfair Advantage (Special Privilege)

Maurya (2012) said that the most difficult thing to fill in was this section because it was filled in last. Unfair advantage is something that competitors cannot easily duplicate. To be able to determine the right unfair advantage on the lean canvas, the researcher conducted interviews with user informants (P1), BIPV suppliers (S1), experts (E1), government (G1), investors (I1) which finally can be concluded that:

1. Good networking (relationships) with stakeholders consisting of B to C, B to B and B to G.
2. Experience in the field of solar power generation with the BIPV system.
3. Special skills (expertise) in the field of solar power generation with the BIPV system.

The following is a picture of the implementation of the lean canvas obtained from five informants who have been interviewed in depth:



Modified by : Dr. Eric Harianto

Figure 3: Lean Canvas EkosystemBIPV Green Energy  
Source: Researcher

After integrating the nine blocks in the lean canvas, finally a green energy platform digital integration system can be mapped that can integrate the interests of the user as follows:

1. From the supplier side, namely BIPV Industry, it can directly interact with users through applications that are created both for bidding, installing, maintaining and maintaining equipment.
2. From the investor side, namely banks can provide initial funds for emission reduction programs, namely financing to consumers who need funds to install PLTS with the BIPV concept by providing light installments in collaboration with PLN.



3. From the government's point of view, it can directly deliver programs to reduce emissions, which are the greatest generated by conventional power plants, can be replaced with solar power plants and can also provide incentives to PLTS users to be able to increase the use of renewable energy by encouraging users to be able to sell the energy they use. generated by PLTS to the government in this case is PLN.
1. From the consumer side, they can immediately solve existing problems, namely from land difficulties which can later be assisted in calculating from the application, financing difficulties which will be assisted by investors in this case are cooperative banks, difficulties in obtaining programs which will be facilitated by the government, difficulties in installation or maintenance which will be assisted by the supplier, in this case, a registered BIPV vendor. Difficulties for BIPV that have expired will be assisted by the supplier of B3 waste. In addition, users can also sell if there is excess electricity to the government will later be able to create a concept of BIPV Farmer Energy.

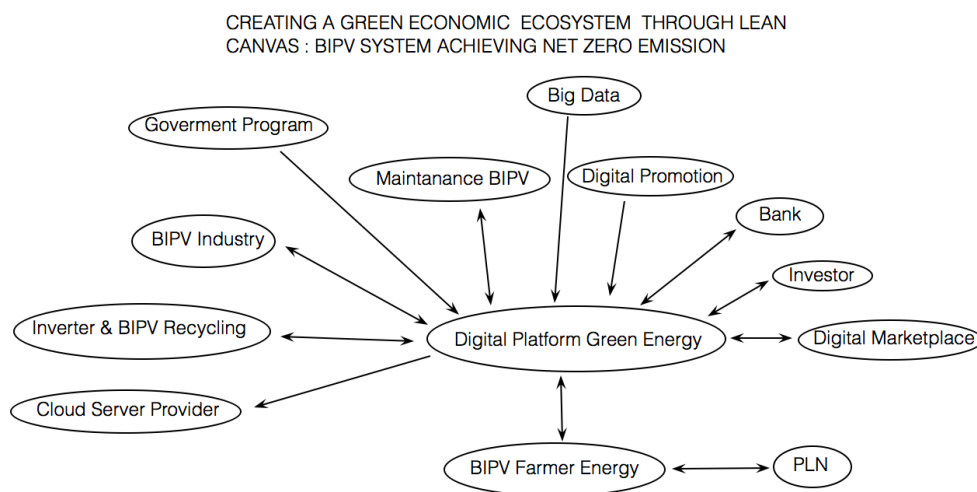


Figure 4: Creating A Green Economic Ecosystem  
Source: Researcher

#### 4. Conclusion

The conclusion of this research is that using lean canvas can create a green economic ecosystem by mapping out nine blocks on lean canvas, namely: problem, solution, key metric, cost structure, unique value proposition, channel, customer segment, revenue stream and unfair advantage. The implementation of a solar power plant with a BIPV system can provide several incomes including revenue from BIPV PLTS installation, income from using green energy digital platform applications, commission fee income from BIPV Industry, Banks as Investors and also management of used PV that has been damaged by B3 waste managers, Revenue from advertisements placed on the application. Meanwhile, the cost structure is the cost of making green energy digital platform tools in the form of applications and the costs of power generation engineering and IT consultants. So this model is very good and feasible to implement. With this, a sustainable business model is obtained to be developed and form a business ecosystem (Nuradhi, M., et., al.,2022).

## 5. Suggestion

Suggestion that can be given for further research is to be able to develop this research with the factor analysis research method that determines the decision to install BIPV in a specified customer segment.

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