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Stakeholders' Linkage in Biogas Use as the Application of Blue Economy Concept

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Abstract

The purpose of this study is to analyze the relationship, strength and influence among stakeholders in the use of biogas as an alternative energy to realize the blue economy concept. Blue economy is the concept of zero waste in economic activity so that the sea and sky remain blue. This research uses sequential mixed method. The analysis tools used are Matrix of Alliance and Conflict: Tactics, Objectives, and Recommendations (Mactor) with 8 stakeholders and 6 objectives.

The results of the study show that the actor with high influence and low dependency level are Environment Agency (Dinas Lingkungan Hidup), Regency Development Planning Agency (Badan Perencanaan Pembangunan Daerah, or BAPPEDA) and Office of Cooperatives and Small Medium Enterprises (Dinas Koperasi dan Usaha Kecil Menengah, or KUKM). Three objectives are accepted positively by all stakeholders, while the other three objectives are both positively and negatively accepted by each actor. Convergence analysis shows that the strongest relationship is between the Environment Agency and environment academics, and divergence analysis shows strong relationship between one another. This research has an effect on the utilization of various wastes as environmentally friendly renewable energy with blue economy concept.

Keywords: Mactor, Biogas, renewable energy, blue economy

INTRODUCTION

Blue Economy is a concept that combines economic development and environmental conservation. The principle of blue economy is, first, nature efficiency, that is working in accordance with what is provided by nature efficiently without reducing or enriching nature. Second, zero waste, where waste from one activity will become food / energy source for other activities so that the living system in the ecosystem remains balanced (Bogdan, Istudor, Gruia, & Florea, 2014). The key to the implementation of blue economy is social inclusiveness, natural resource efficiency,

and zero waste production system (Bari, 2017). The development of blue economy in Indonesia prioritizes the utilization of natural resources for economic growth, community welfare, and environmental sustainability. Meanwhile, the challenge lies in the dependence of the business world and the industrial sector on increasingly limited natural resources. This requires support and commitment from the government as a regulator to ensure the sustainability of the program (Kathijotes, 2013).

Blue economy is actually a necessity for all levels of society from the smallest level, the family. Blue Economy will have a very high economic value if developed in a community. The success rate of Blue Economy is determined by community participation and support from government, education, and business sectors. The four actors are often called ABCG concept: Academics, Business, Community, and Government. The development of the blue economy concept in Indonesia is supported by the 9th Blue Economy congress held in Surabaya, Indonesia as a continuation of the previous congress in Madrid, Spain. The congress aims to accelerate the realization of community involvement by utilizing the Corporate Social Responsibility (CSR) of industries managing natural resources, as stipulated by Law no. 47 of 2007 and Government Regulation no. 40 of 2012.

Biogas derived from cow dung is one of alternative energy that can be exploited for the application of blue economy (Bedi, Sparrow, & Tasciotti, 2017). The population of beef cattle and dairy cows in Indonesia can be utilized to produce energy derived from biogas. In 2015, the number of beef cattle in Indonesia is 15,494,288, with the highest population in East Java Province with 4,326,261 followed by Central Java Province with 1,628,093. Meanwhile, in the same year, the dairy cow population was 525,171, with the largest population also in East Java with 253,830 followed by West Java Province with 135,345

The application of zero waste has been done by the makers of tempeh chips in Ngawi Regency. Most tempeh chips makers also raise cattle as an investment. The main raw material of tempeh chips is soybeans whose epidermis can be used as cow feed to accelerate weight gain. Cow manure is stored in digester and can be used as biogas as LPG replacement energy for cooking. The use of biogas also helps reduce illegal logging in Ngawi. Such zero-waste implementation is also applied in Beijing, China (Chen, Cong, Shu, & Mi, 2017). A previous study in Ngawi that analyzed public awareness to use biogas found that only education variable showed influence, while income, age, cattle rearing costs and the number of family dependents showed no influence (Abbas, Ali, Ali, Khalid, & Asif, 2017).

The continued use of biogas as an alternative energy requires support from government and CSR (Sun, Bai, Qiu, & Cai, 2014). There are five aspects / dimensions used: environmental, economic, social, management, and technical (Triwahyuni,

Hanafi, & Yanuwiadi, 2015). The purpose of this study is to identify and analyze the relationships, power, and influence of stakeholders on the use of biogas as an alternative energy source and to analyze convergence and divergence among stakeholders.

LITERATURE REVIEW

The blue economy applies the ecosystem logic, i.e. the ecosystem always works toward higher efficiency levels to deliver nutrients and energy without waste to meet the basic needs of all contributors in a system. Furthermore, the blue economy focuses on innovation and creativity that include product variation, production system efficiency, and structuring of resource management systems (Burgess, Clemence, Mcdermott, Costello, & Gaines, 2016). The concept of Blue Economy in essence is to create zero waste products and fighting against the threat of food vulnerability and energy crisis. The purpose of the Blue Economy concept is to transform poverty into welfare and scarcity into abundance. Successful implementation of the Blue Economy concept requires synergy among stakeholders. Therefore, partnership support from the public, private sector, academia, researchers, development experts, national and international institutions is much needed (Gava, Favilli, Bartolini, & Brunori, 2017).

The term "blue economy" is the dynamics of the new concept of development that is now developing by relying on marine or water resources based on three integrated pillars: ecosystem, economy and social. The term blue economy has been discussed in various international cooperation, such as the Senior Officials Meeting (SOM) for the Asia Pacific Economic Cooperation (APEC). The concept is a development concept that addresses three interests: growthBiogas according to the International Energy Agency (IEA) is a form of energy derived from natural processes that can be refilled continuously. Biogas can be derived from animal waste, agricultural waste, and organic waste that contain ± 60% methane gas, carbon dioxide ± 38%, and other content ± 2%. Biogas is one type of biomass energy, which is energy derived from the energy of plants, animals and microorganisms (Yasar, Nazir, Rasheed, Tabinda, & Nazar, 2017). The energy produced by biogas can be used to power heaters, electricity, and transportation (Hakawati, Smyth, Rosa, & Rooney, 2017). The energy generated by biogas as a powerhouse is equivalent to the energy produced by micro turbines of about 330 kW (Coskun, Akyuz, Oktay, & Dincer, 2011). If equalized, 1 m3 of biogas is equivalent to 0.46 kg LPG; 0.62 liter kerosene; 0.52 liter diesel oil, and 3.5 kg firewood; so if if biogas is optimally utilized, the sustainability of energy supply will be guaranteed and the forest ecosystem is maintained.

Trash can be utilized and can produce added value or just to be a waste without economic value. Therefore, good waste

management is required to improve environmental and health quality in developing countries. The utilization of biogas has different characteristics between rural and urban areas. Biogas utilization is usually done in rural areas, while urban is usually a continuity between technical feasibility, economic process, social acceptance and sustainable environment. Usually large cities face serious problems of large population pressures and require adequate facilities and infrastructure. To determine the cost effective and sustainable use of renewable energy, the utilization of biogas as an alternative energy source can help solve socio-economic problems (Gebreegziabher, Naik, & Melamu, 2014).

Awareness to use fossil energy for sustainable living is declining. In Africa, nearly 70% of households use firewood for cooking. Africa wants that by 2030 access to more modern energy can be done thoroughly. One form of modern energy use is the utilization of biogas to improve the living standards of villagers and achieve the Millennium Development Goals. The use of biogas as a renewable energy source is an effort that attracts the government to encourage renewable energy production. Biogas energy derived from animal waste is more widely used as energy for cooking or lighting in Africa (Mwirigi et al., 2014).

The introduction of the biogas program is done by a government-run pilot project, but the project has not produced the desired results because the pilot project has not been able to motivate the community. In addition, the digester sometimes cannot be used because the size does not match the amount of animal waste that will be accommodated. The enthusiasm of African countries in using biogas as an alternative energy source is remarkable, reaching 2,000 biogas units in 2010. The feasibility study conducted by Winrock International concludes that 100,000 biogas installations can be carried out during 2009 to 2010. The highest biogas plant growth is recorded in China, which built 5 million units of biogas plants in 2010. What distinguishes between Asian and Sub-Saharan African countries in the development of biogas usage is the number of livestock that can be used for biogas production. The cost of making digesters is more expensive in Africa than in Asia because of higher raw material (cement) prices combined with lower disposable income. Almost 86% of biogas installations in Bangladesh are financed with loans. In China, farmers receive 69% subsidies for the cost of making digesters. In general, countries in Sub Saharan Africa are still left behind compared to Asian countries (Ghimire, 2013).

The linkage of networks among stakeholders in adopting biogas as an alternative energy requires the participation of all stakeholders. Every stakeholder has an important role to maintain the continuity of biogas use as an alternative energy (Röder, 2016). Stakeholders are the various parties

involved in an activity. Stakeholders can affect (give impact) and be affected (receive impact) of decisions taken. Stakeholders are also defined as people, groups, or institutions that have a concern and / or influence the outcome of an activity as well as the achievement of an activity objective (Lawrence, Jeffrey, Dodder, & Hilliard, 2013).

MATERIAL AND METHODS

Stakeholder analysis is appropriate if it is used to determine the role of each actor involved as stakeholder. The role of each stakeholder and the relationship between the actors and the existing objectives will be analyzed. The way the MACTOR analysis tool works is by quantifying qualitative data. Each actor in the stakeholder group was asked to give an assessment of their relationship, with a score between 1 and 9. The higher the score, the closer the relationship. The score was then calculated with a matrix to measure the scale of dependence and influence among the stakeholders. To measure convergence and divergence, each actor was asked to convey their perceptions of the objectives, to show how these objectives will influence the policies and programs set. Perspective value was calculated with a score between 1 and 9 and then calculated with a matrix to identify actors' opinions on the same objectives. The more similar the perception of the actors, the more converging the relationship of the actors and vice versa. In this study, the stakeholders consist of 8 actors, namely (1) Mekar Jaya Cooperative (KMJ) as a cooperative that houses tempe kripik makers; (2) Small Medium Enterprises 1 (SME 1); (3) Small Medium Enterprises 2 (SME 2); (4) Environment Agency; (5) Office of Cooperatives and Small and Medium Enterprises (KUKM); (6) Regency Development Planning Agency (BAPPEDA); (7) Economists; and (8) Environmental Academics. Objectives used as indicators include (1) Profits; (2) Impact; (3) Procurement; (4) Economic benefits; (5) Communal; and (6) Food.

The six indicators are described in detail as follows:

a. Profits: whether biogas is perceived to provide profits.
b. Impact: whether the use of biogas is perceived to reduce environmental impact, especially cattle dung.
c. Procurement: whether the cost of digester procurement (20 million rupiah) is perceived expensive or affordable.
d. Economic benefits: whether the use of biogas is perceived to provide economic benefits, especially in fuel cost savings.
e. Communal: whether the government plans to establish a communal cattle enclosure to ensure the cleanliness of the chips

production sites is perceived positively or negatively.

f. Food: perception about the effect of cow dung biogas on the processed food quality.

This study uses primary data obtained by in-depth interview method guided by questionnaire. The interviewee consists of the relevant agencies in charge of policy determination. In addition, FGDs were conducted on Mekar Jaya Cooperative and 20 SMEs, grouped into two: SME 1 for entrepreneurs who have used biogas independently and have agreement on their utilization and SME 2 for entrepreneurs who have used biogas but not consistently.

RESULTS AND DISCUSSIONS

The MACTOR method provides an overview of stakeholder relationships that can influence (give impact) and be influenced (receive impact) of decisions taken. The following four quadrants explain the type of stakeholder relationship:

a. High Influence Low Dependence.
b. High Influence High Dependence.
c. High Influence High Dependence.
d. Low Influence Low Dependence.

Figure 1 The level of influence and dependence of biogas stakeholders in Ngawi Regency:

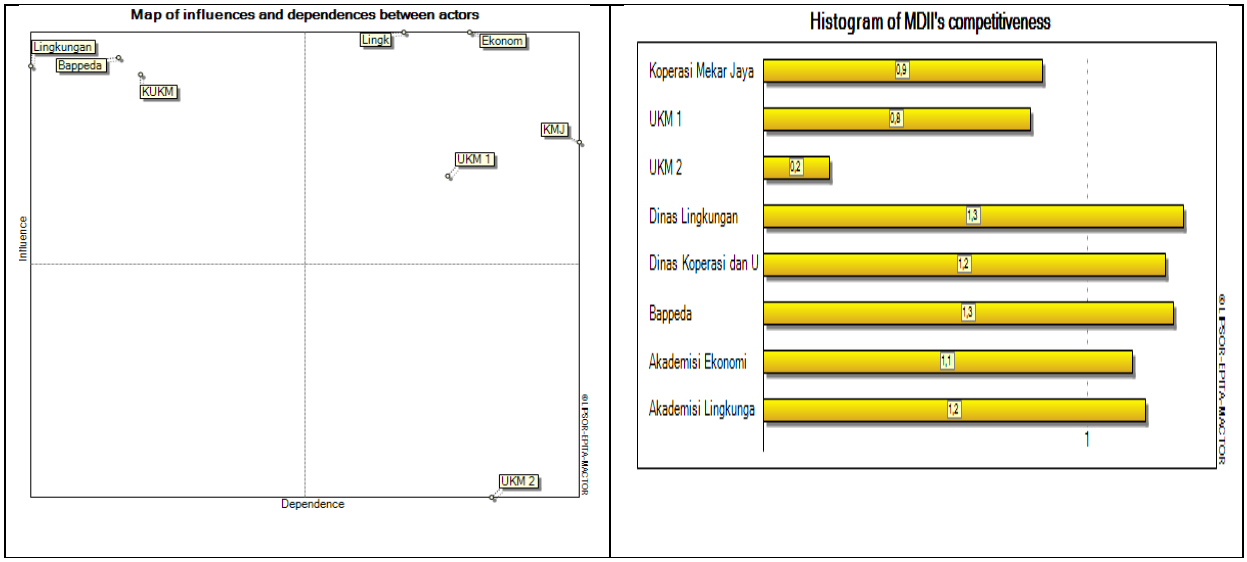


Figure 1 shows that stakeholders with high influence and low dependence are Environment Agency, Regency Development Planning Agency and Office of Cooperatives and Small-Medium Enterprises. This result is very reasonable because as the Regency Work Unit (*Satuan Kerja Perangkat Daerah*, or SKPD), the

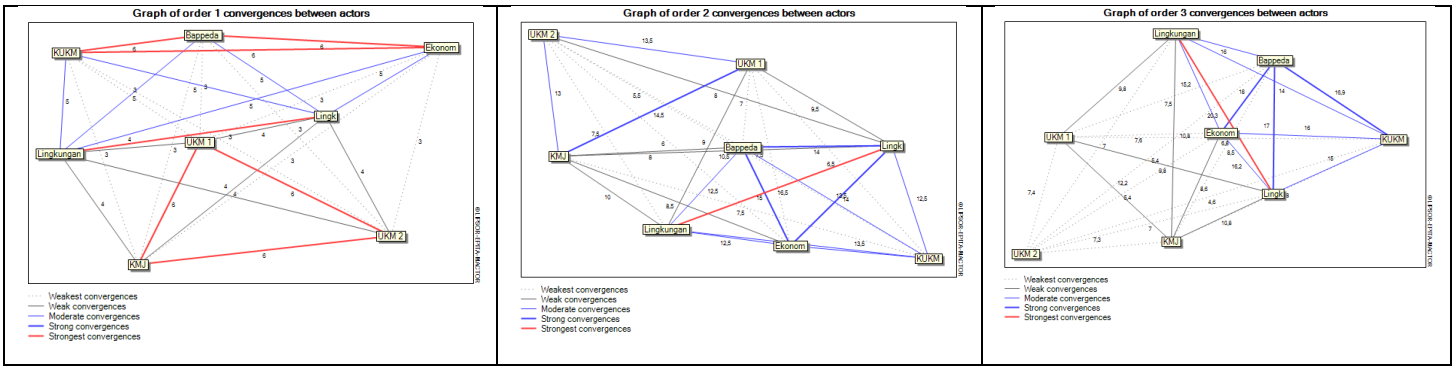
three agencies become the policy makers of programs and activities related to biogas and have independence and great influence on other stakeholders.

This result also shows that environmental academics and economists, Mekar Jaya Cooperative and SME 1 have high influence and high dependence because although the four stakeholders have high influence, but because they are not policy makers, they also have high dependence. In quadrant three, actors with low influence but high dependence are SME 2. This may be because SME 2 does not have initiatives and simply join programs and activities undertaken by third parties.

Convergence matrix is needed to identify the general position of the actors against the objectives: pro or contra. Convergence matrix is divided into 3 orders. In the first order, the closer actors will have strong convergence, shown in red, while neutral positions are not considered. The second order is related to the actors X objectives, i.e. calculating the average convergence intensity between two actors when they have the same level of pro and contra. The third order identifies the number of alliances and considers the actors' preference in objectives and competitiveness.

The relationship between the actors is shown on the network graph with the following criteria: the dashed line indicates a very weak relationship, a thin black line indicates a weak relationship, a thin blue line indicates a moderate relationship, a thick blue line indicates a strong relationship, while the red line indicates a very strong relationship.

Figure 2 Convergence Chart between the Actors



Source: Field data processed

Order 1 on the convergen chart shows the grouping into three very strongly linked networks. In the first group, three strongly linked stakeholders are Regency Development Planning Agency, economists and Office of Cooperatives and Small-Medium Enterprises. In the second group, a strong relationship exists between environmental academics and the Environment Agency, while in the third group, stakeholders with very strong relationships are Mekar Jaya Cooperative, SME 1 and SME 2. Each group is strongly, moderately, weakly and very weakly connected.

Order 2 shows the similarity between stakeholders' opinions and their chosen objectives. The results show that only environmental academics and Environment Agency have very strong convergence in order 2 because both have similar perceptions, thoughts, main tasks and functions. A strong relationship exists between SME 1 and Mekar Jaya Cooperative because based on in-depth interview results, it is known that the Cooperative provides support to SMEs which have consistently used waste as biogas. Strong relationship is also established between economists, Environment Agency and Regency Development Planning Agency as economists provide direct support within the framework of blue-economy development and the support is integrated into programs planned by Regency Development Planning Agency.

In order 3, very strong relationship is also established between Environment Agency and environmental academics for the same reason. Meanwhile, strong relationships are increasingly focused on Regency Development Planning Agency, economists, Office of Cooperatives and Small-Medium Enterprises and environmental academics.

CONCLUSION AND RECOMMENDATION

Mactor results show that stakeholders with high influence and low dependence are

the Environment Agency, Regency Development Planning Agency and Office of Cooperatives and Small-Medium Enterprises. Meanwhile, environment academics and economists, Mekar Jaya Cooperative and SME 1 have high influence and high dependence because although the four stakeholders have high influence, but because they are not policy makers, they also have high dependence.

Very strong convergence in orders 1, 2 and 3 is between Environment Agency and environment academics, whereas strong convergence is seen in two groups: SME 1 and Mekar Jaya cooperative, Regency Development Planning Agency, economists, Office of Cooperatives and Small-Medium Enterprises and environment academics.

The study recommends that all stakeholders synergize through the alignment of work programs, especially in the utilization of blue economy and its socialization to the community.

LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This research is limited to the opinions and relationships among stakeholders in the development of the blue energy concept. Further research is expected to discuss how biogas is utilized before and after the implementation in the field, to more accurately demonstrate the importance of blue economy in improving community welfare.

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by Nurul Istiqomah

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2014). There are five aspects / dimensions used: environmental, economic, social, management, and technical (Triwahyuni, Hanafi, & Yanuwiadi, 2015). The purpose of this study is to identify and analyze the relationships, power, and influence of stakeholders on the use of biogas as an alternative energy source and to analyze convergence and divergence among stakeholders.

LITERATURE REVIEW

The blue economy applies the ecosystem logic, i.e. the ecosystem always works toward higher efficiency levels to deliver nutrients and energy without waste to meet the basic needs of all contributors in a system. Furthermore, the blue economy focuses on innovation and creativity that include product variation, production system efficiency, and structuring of resource management systems (Burgess, Clemence, Mcdermott, Costello, & Gaines, 2016). The concept of Blue Economy in essence is to create zero waste products and fighting against the threat of food vulnerability and energy crisis. The purpose of the Blue Economy concept is to transform poverty into welfare and scarcity into abundance. Successful implementation of the Blue Economy concept requires synergy among stakeholders. Therefore, partnership support from the public, private sector, academia, researchers, development experts, national and international institutions is much needed (Gava, Favilli, Bartolini, & Brunori, 2017).

The term "blue economy" is the dynamics of the new concept of development that is now developing by relying on marine or water resources based on three integrated pillars: ecosystem, economy and social. The term blue economy has been discussed in various international cooperation, such as the Senior Officials Meeting (SOM) for the Asia Pacific Economic Cooperation (APEC). The concept is a development concept that addresses three interests: growthBiogas according to the International Energy Agency (IEA) is a form of energy derived from natural processes that can be refilled continuously. Biogas can be derived from animal waste, agricultural waste, and organic waste that contain ± 60% methane gas, carbon dioxide ± 38%, and other content ± 2%. Biogas is one type of biomass energy, which is energy derived from the energy of plants, animals and microorganisms (Yasar, Nazir, Rasheed, Tabinda, & Nazar, 2017). The energy produced by biogas can be used to power heaters, electricity, and transportation (Hakawati, Smyth, Rosa, & Rooney, 2017). The energy generated by biogas as a powerhouse is equivalent to the energy produced by micro turbines of about 330 kW (Coskun, Akyuz, Oktay, & Dincer, 2011). If equalized, 1 m3 of biogas is equivalent to 0.46 kg LPG; 0.62 liter kerosene; 0.52 liter diesel oil, and 3.5 kg

firewood; so if if biogas is optimally utilized, the sustainability of energy supply will be guaranteed and the forest ecosystem is maintained.

Trash can be utilized and can produce added value or just to be a waste without economic value. Therefore, good waste management is required to improve environmental and health quality in developing countries. The utilization of biogas has different characteristics between rural and urban areas. Biogas utilization is usually done in rural areas, while urban is usually a continuity between technical feasibility, economic process, social acceptance and sustainable environment. Usually large cities face serious problems of large population pressures and require adequate facilities and infrastructure. To determine the cost effective and sustainable use of renewable energy, the utilization of biogas as an alternative energy source can help solve socio-economic problems (Gebreegziabher, Naik, & Melamu, 2014).

Awareness to use fossil energy for sustainable living is declining. In Africa, nearly 70% of households use firewood for cooking. Africa wants that by 2030 access to more modern energy can be done thoroughly. One form of modern energy use is the utilization of biogas to improve the living standards of villagers and achieve the Millennium Development Goals. The use of biogas as a renewable energy source is an effort that attracts the government to encourage renewable energy production. Biogas energy derived from animal waste is more widely used as energy for cooking or lighting in Africa (Mwirigi et al., 2014).

The introduction of the biogas program is done by a government-run pilot project, but the project has not produced the desired results because the pilot project has not been able to motivate the community. In addition, the digester sometimes cannot be used because the size does not match the amount of animal waste that will be accommodated. The enthusiasm of African countries in using biogas as an alternative energy source is remarkable, reaching 2,000 biogas units in 2010. The feasibility study conducted by Winrock International concludes that 100,000 biogas installations can be carried out during 2009 to 2010. The highest biogas plant growth is recorded in China, which built 5 million units of biogas plants in 2010. What distinguishes between Asian and Sub-Saharan African countries in the development of biogas usage is the number of livestock that can be used for biogas production. The cost of making digesters is more expensive in Africa than in Asia because of higher raw material (cement) prices combined with lower disposable income. Almost 86% of biogas installations in Bangladesh are financed with loans. In China, farmers receive 69% subsidies for the cost of making digesters. In general, countries in Sub Saharan Africa are still left behind compared to Asian countries (Ghimire, 2013).

The linkage of networks among stakeholders in adopting biogas as an alternative energy requires the participation of all stakeholders. Every stakeholder has an important role to maintain the continuity of biogas use as an alternative energy (Röder, 2016). Stakeholders are the various parties involved in an activity. Stakeholders can affect (give impact) and be affected (receive impact) of decisions taken. Stakeholders are also defined as people, groups, or institutions that have a concern and / or influence the outcome of an activity as well as the achievement of an activity objective (Lawrence, Jeffrey, Dodder, & Hilliard, 2013).

MATERIAL AND METHODS

Stakeholder analysis is appropriate if it is used to determine the role of each actor involved as stakeholder. The role of each stakeholder and the relationship between the actors and the existing objectives will be analyzed. The way the MACTOR analysis tool works is by quantifying qualitative data. Each actor in the stakeholder group was asked to give an assessment of their relationship, with a score between 1 and 9. The higher the score, the closer the relationship. The score was then calculated with a matrix to measure the scale of dependence and influence among the stakeholders. To measure convergence and divergence, each actor was asked to convey their perceptions of the objectives, to show how these objectives will influence the policies and programs set. Perspective value was calculated with a score between 1 and 9 and then calculated with a matrix to identify actors' opinions on the same objectives. The more similar the perception of the actors, the more converging the relationship of the actors and vice versa. In this study, the stakeholders consist of 8 actors, namely (1) Mekar Jaya Cooperative (KMJ) as a cooperative that houses tempe kripik makers; (2) Small Medium Enterprises 1 (SME 1); (3) Small Medium Enterprises 2 (SME 2); (4) Environment Agency; (5) Office of Cooperatives and Small and Medium Enterprises (KUKM); (6) Regency Development Planning Agency (BAPPEDA); (7) Economists; and (8) Environmental Academics. Objectives used as indicators include (1) Profits; (2) Impact; (3) Procurement; (4) Economic benefits; (5) Communal; and (6) Food.

The six indicators are described in detail as follows:

a. Profits: whether biogas is perceived to provide profits.
b. Impact: whether the use of biogas is perceived to reduce environmental impact, especially cattle dung.
c. Procurement: whether the cost of digester procurement (20 million rupiah) is perceived expensive or affordable.
d. Economic benefits: whether the use of biogas is perceived to

provide economic benefits, especially in fuel cost savings.

e. Communal: whether the government plans to establish a communal cattle enclosure to ensure the cleanliness of the chips production sites is perceived positively or negatively.
f. Food: perception about the effect of cow dung biogas on the processed food quality.

This study uses primary data obtained by in-depth interview method guided by questionnaire. The interviewee consists of the relevant agencies in charge of policy determination. In addition, FGDs were conducted on Mekar Jaya Cooperative and 20 SMEs, grouped into two: SME 1 for entrepreneurs who have used biogas independently and have agreement on their utilization and SME 2 for entrepreneurs who have used biogas but not consistently.

RESULTS AND DISCUSSIONS

The MACTOR method provides an overview of stakeholder relationships that can influence (give impact) and be influenced (receive impact) of decisions taken. The following four quadrants explain the type of stakeholder relationship:

a. High Influence Low Dependence.
b. High Influence High Dependence.
c. High Influence High Dependence.
d. Low Influence Low Dependence.

Figure 1 The level of influence and dependence of biogas stakeholders in Ngawi Regency:

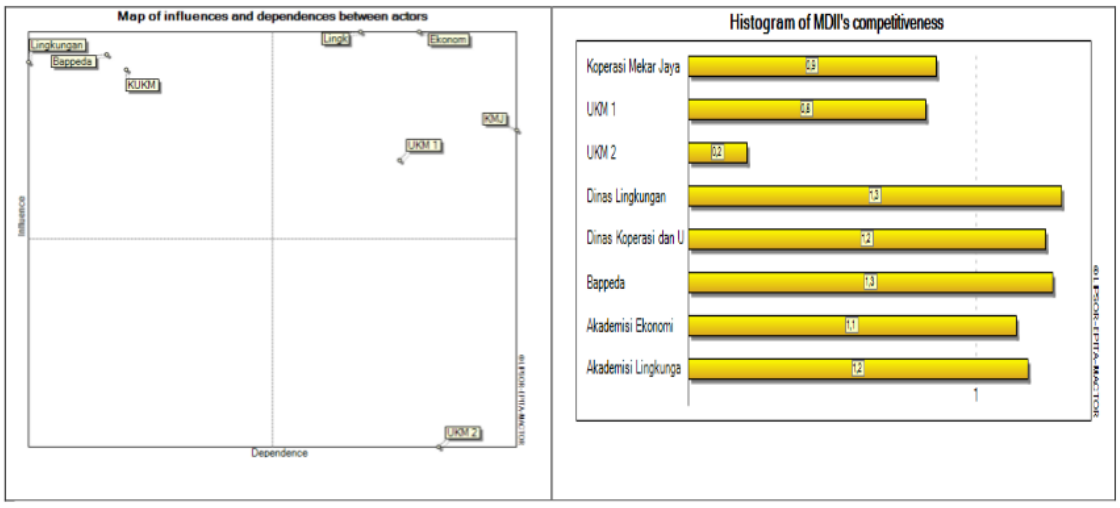


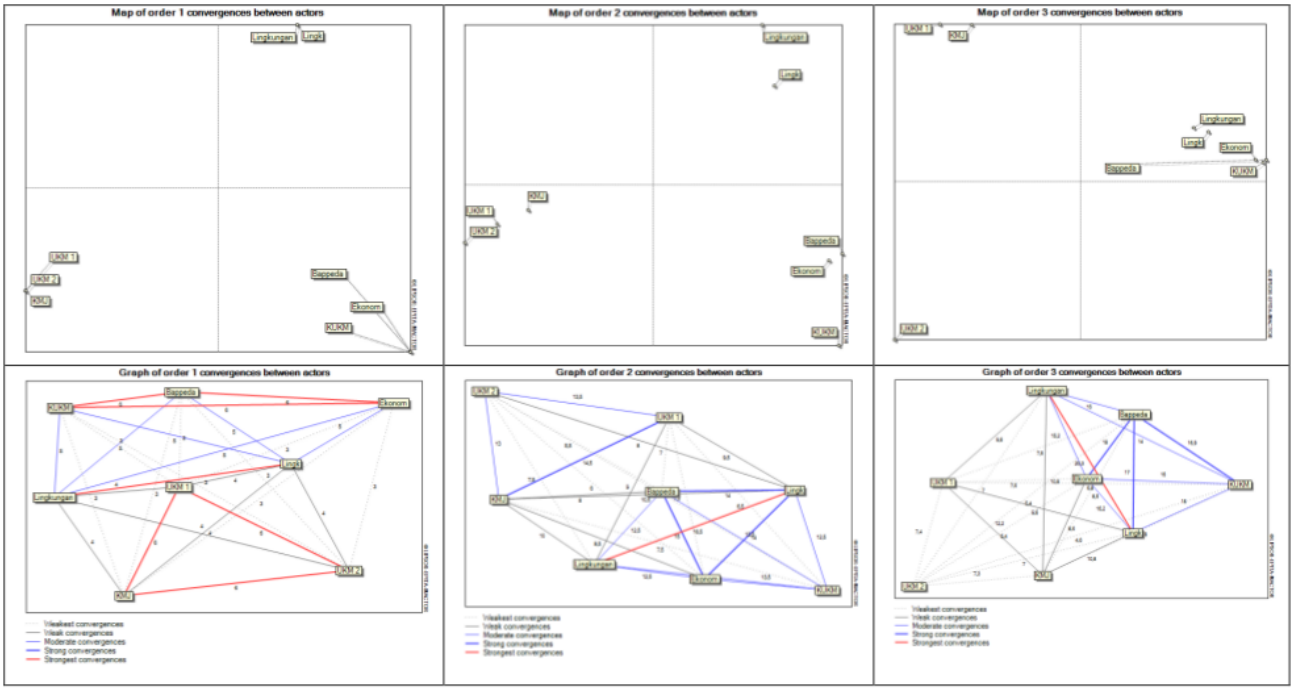
Figure 1 shows that stakeholders with high influence and low dependence are Environment Agency, Regency Development Planning Agency and Office of Cooperatives and Small-Medium Enterprises. This result is very reasonable because as the Regency Work Unit (*Satuan Kerja Perangkat Daerah*, or SKPD), the three agencies become the policy makers of programs and activities related to biogas and have independence and great influence on other stakeholders.

This result also shows that environmental academics and economists, Mekar Jaya Cooperative and SME 1 have high influence and high dependence because although the four stakeholders have high influence, but because they are not policy makers, they also have high dependence. In quadrant three, actors with low influence but high dependence are SME 2. This may be because SME 2 does not have initiatives and simply join programs and activities undertaken by third parties.

Convergence matrix is needed to identify the general position of the actors against the objectives: pro or contra. Convergence matrix is divided into 3 orders. In the first order, the closer actors will have strong convergence, shown in red, while neutral positions are not considered. The second order is related to the actors X objectives, i.e. calculating the average convergence intensity between two actors when they have the same level of pro and contra. The third order identifies the number of alliances and considers the actors' preference in objectives and competitiveness.

The relationship between the actors is shown on the network graph with the following criteria: the dashed line indicates a very weak relationship, a thin black line indicates a weak relationship, a thin blue line indicates a moderate relationship, a thick blue line indicates a strong relationship, while the red line indicates a very strong relationship.

Figure 2 Convergence Chart between the Actors



Source: Field data processed

Order 1 on the convergen chart shows the grouping into three very strongly linked networks. In the first group, three strongly linked stakeholders are Regency Development Planning Agency, economists and Office of Cooperatives and Small-Medium Enterprises. In the second group, a strong relationship exists between environmental academics and the Environment Agency, while in the third group, stakeholders with very strong relationships are Mekar Jaya Cooperative, SME 1 and SME 2. Each group is strongly, moderately, weakly and very weakly connected.

Order 2 shows the similarity between stakeholders' opinions and their chosen objectives. The results show that only environmental academics and Environment Agency have very strong convergence in order 2 because both have similar perceptions, thoughts, main tasks and functions. A strong relationship exists between SME 1 and Mekar Jaya Cooperative because based on in-depth interview results, it is known that the

Cooperative provides support to SMEs which have consistently used waste as biogas. Strong relationship is also established between economists, Environment Agency and Regency Development Planning Agency as economists provide direct support within the framework of blue-economy development and the support is integrated into programs planned by Regency Development Planning Agency.

In order 3, very strong relationship is also established between Environment Agency and environmental academics for the same reason. Meanwhile, strong relationships are increasingly focused on Regency Development Planning Agency, economists, Office of Cooperatives and Small-Medium Enterprises and environmental academics.

CONCLUSION AND RECOMMENDATION

Mactor results show that stakeholders with high influence and low dependence are the Environment Agency, Regency Development Planning Agency and Office of Cooperatives and Small-Medium Enterprises. Meanwhile, environment academics and economists, Mekar Jaya Cooperative and SME 1 have high influence and high dependence because although the four stakeholders have high influence, but because they are not policy makers, they also have high dependence.

Very strong convergence in orders 1, 2 and 3 is between Environment Agency and environment academics, whereas strong convergence is seen in two groups: SME 1 and Mekar Jaya cooperative, Regency Development Planning Agency, economists, Office of Cooperatives and Small-Medium Enterprises and environment academics.

The study recommends that all stakeholders synergize through the alignment of work programs, especially in the utilization of blue economy and its socialization to the community.

LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This research is limited to the opinions and relationships among stakeholders in the development of the blue energy concept. Further research is expected to discuss how biogas is utilized before and after the implementation in the field, to more accurately demonstrate the importance of blue economy in improving community welfare.

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