Jurnal Serambi Engineering JSE
Volume IX, No.3, Juli 2024 Hal 10070 - 10081
p-ISSN : 2528-3561
e-ISSN : 2541-1934

Impact of Energy Transition Implications on Social Aspects of Surabaya City

Kania Salsabilah Nur Rifanda[1], Arie Dipareza Syafei[2*], Rudy Rahmaddi[3]

[1,2]Environmental Engineering Department, Institut Teknologi Sepuluh Nopember, Surabaya
[3]Ministry of Finance Republic of Indonesia
***Corresponding author**: asyafei@gmail.com

Received: June 30, 2024 Approved: July 11, 2024

Abstract
Based on the latest data for 2022-2023, climate change-related natural disasters in Indonesia have increased quite significantly. Climate change is caused by high levels of greenhouse gases (GHG) accumulating in the atmosphere. Surabaya, the second largest city in Indonesia, contributes a high amount of GHG, while Indonesia has committed to efforts to reduce greenhouse gas emissions, which will result in a reduction of greenhouse gas emissions by 29% in 2030. Energy transformation is an alternative. It is important to support it, but society needs to prepare to implement the transition to a modern, reliable and low-carbon energy system globally. At least three factors are driving the energy transition: environmental, social and economic. Therefore, the research was carried out by analysing social impact projections using quantitative questionnaire methods. The energy transition has an impact on social aspects, as shown by the percentage of public acceptance of 75.11%. The level of acceptance by the people of Surabaya City regarding the impact of energy transformation is quite high with a percentage of 83.02%.
Keywords: *social impact, questionnaire, climate change, energy transition, surabaya*

Abstrak
Berdasarkan data terbaru tahun 2022-2023 bencana alam di Indonesia yang dipicu oleh perubahan iklim mengalami peningkatan yang cukup signifikan. Perubahan iklim disebabkan oleh tingginya kadar Gas Rumah Kaca (GRK) yang terakumulasi di atmosfer. Surabaya yang merupakan kota terbesar kedua di Indonesia turut andil menyumbang GRK dalam jumlah yang tinggi, sedangkan Indonesia telah berkomitmen yaitu upaya penurunan emisi gas rumah kaca yang akan dilakukan menghasilkan penurunan emisi gas rumah kaca sebesar 29% di tahun 2030. Transisi energi menjadi salah satu alternatif penting untuk mendukung hal tersebut, namun masyarakat perlu menyiapkan agar dapat menerapkan transisi menuju sistem energi yang modern, dapat diandalkan, dan lebih rendah karbon secara global. Setidaknya tiga faktor pendorong transformasi sektor energi diantaranya adalah faktor lingkungan, sosial, dan ekonomi. Oleh karena itu, penelitian dilakukan dengan menganalisis proyeksi dampak sosial dengan metode kuantitatif kuesioner. Adanya transisi energi berdampak pada aspek sosial, ditunjukkan dengan persentase persetujuan masyarakat sebesar 75,11%. Tingkat penerimaan masyarakat Kota Surabaya tergolong cukup tinggi terhadap implikasi transisi energi dengan persentase 83,02%.
Kata Kunci: *dampak sosial, kuesioner, perubahan iklim, transisi energi, surabaya*

1. Introduction

Climate change is defined as major changes in climate variability and change over a decade or more (IPCC, 2001). Climate change can be caused by processes that occur inside the earth (such as El Niño storms) or outside the earth (such as changes caused by human activities, such as changes in air composition and land distribution). According to Article 1 of Law number 32 of 2009 concerning environmental protection and management, climate change is a condition where the composition of the atmosphere changes globally and natural climate variability changes over a comparable period of time (Ministry of the Environment, 2020).

Climate change, rainfall, and significant air temperatures over a decade or millions of years indicate these conditions. This is due to the increased concentration of carbon dioxide and other gases in the atmosphere, which causes heat to be trapped on Earth and causes the greenhouse gas effect (Malihah, 2022). The government's commitment to reducing greenhouse gas emissions is key to reducing the risk of environmental and climate damage as climate change continues to evolve into a disaster. Indonesia shows its global commitment by reducing greenhouse gas emissions as one of the countries that adopted the United Nations Framework Convention on Climate Change (UNCRC) in 1994, the Kyoto Protocol in 2004, and

the Paris Agreement in 2016 (Syukur et al., 2022). According to Indonesia's Nationally Determined Contribution (NDC), which has been updated, has been submitted to the UNFCCC in July 2021, Indonesia has been actively making efforts to reduce Greenhouse Gas (GHG) emissions. In addition, Indonesia's long-term strategy on Low Carbon and Climate Resilience 2050 (LTS-LCCR 2050)—which has been ratified into Law Number 16 of 2016 concerning the Ratification of the Paris Agreement on the United Nations Framework on Climate Change (Erwinsyah, 2021). The Ministry of Energy and Mineral Resources (EMR) has committed to reducing carbon emissions by around 314 million tons to 398 million tons of CO2 by 2030 (Rustam et al., 2023).

Indonesia has various regulations and policies that support the energy transition from fossil fuels to renewable energy. Here are some of the key regulations and regulations governing the energy transition in Indonesia:

1. Law No. 30 of 2007 concerning Energy
   Regulating national energy policies, energy management, new and renewable energy development, and energy utilization. The goal is to reduce dependence on fossil energy and encourage the use of renewable energy (Dutu, 2016).
2. Presidential Regulation No. 22 of 2017 concerning the National Energy General Plan (RUEN)
   Set a target of renewable energy contribution of 23% of the total national energy by 2025. It aims to increase the use of renewable energy and reduce carbon emissions (Nugroho et al., 2021)
3. Regulation of the Minister of Energy and Mineral Resources No. 50 of 2017 concerning the Utilization of Renewable Energy Sources for the Provision of Electricity. It contains regulations on the feed-in tariff mechanism for solar, wind, biomass, biogas, municipal waste, and microhydro power plants. This regulation aims to encourage investment in renewable energy power plants. (Sugiyono & Adiarso, 2021).
4. Government Regulation No. 79 of 2014 concerning National Energy Policy
   The regulation contains the preparation of sustainable national energy policies, improving energy efficiency, and developing new and renewable energy. The regulations were created to reduce dependence on fossil energy and promote renewable energy.
5. Regulation of the Minister of Energy and Mineral Resources No. 12 of 2017 concerning the Utilization of Renewable Energy Sources for the Provision of Electricity
   Setting electricity tariffs for renewable energy and regulating the terms for purchasing electricity by PLN. This is to accelerate the development of renewable energy power plants.
6. New Renewable Energy Development Plan and Energy Conservation (RUED)
   It contains a plan for the development of new and renewable energy at the regional level prepared by the local government. The regulation aims to adjust the national energy policy to regional conditions and potential (Atma, 2018).
7. Regulation of the Minister of Finance No. 130/PMK.08/2020 concerning the Procurement of Investment Financing Funds for the Provision of Infrastructure
   Regulate investment financing for renewable energy infrastructure. Aims to support the funding of renewable energy projects (Nur, 2022).
8. Presidential Instruction No. 1 of 2022 concerning the Postponement of the Issuance of New Permits and the Improvement of Forestry and Land Use Licensing Management
   Delay in issuing new permits for projects that do not support the energy transition and environmental protection. The regulation aims to reduce deforestation and support renewable energy projects (Anggraini, 2022).
9. Regional and Municipal Regulations
   Several cities and provinces in Indonesia have adopted local regulations that support the use of renewable energy. The goal is to support national energy policies and adjust to local needs.

Surabaya has taken significant steps to support the energy transition through various regulations and policies. Here are some of the main regulations that govern the energy transition in Surabaya:

1. Presidential Regulation Number 35 of 2018 concerning Waste Processing into Electrical Energy (PSEL):
   Providing a legal basis for local governments to accelerate the construction of waste processing facilities into electrical energy.
   Implementation in Surabaya: Surabaya became the first city in Indonesia to complete the construction of the PSEL facility in Benowo, which is capable of generating 11 megawatts of electricity from waste treatment (UCLG ASPAC, 2021).
2. Regional Energy General Plan (RUED):

Develop a plan for the development of new and renewable energy at the regional level. The goal is to adjust the national energy policy to local conditions and potentials in Surabaya, supporting efforts to improve renewable energy and energy efficiency.

3. Collaboration with Private Institutions and Companies:
   Implementation: Surabaya has collaborated with PT. Organic Resources in operating the PSEL facility in Benowo, which has been operating since 2001 and is optimized to generate electricity from waste gasification (UCLG ASPAC, 2021).
4. Renewable Energy Development Efforts:
   Content: Surabaya focuses on utilizing the potential of renewable energy such as solar energy and biomass energy as part of the energy transition strategy. The goal is to reduce dependence on fossil energy and support environmental sustainability (IESR, 2023).
5. Carbon Emission Reduction Policy:
   The implementation of policies that support the reduction of carbon emissions and the use of environmentally friendly technologies in energy management. This has the goal of achieving the net zero emission target and improving the quality of the environment in Surabaya.

Surabaya has shown a strong commitment to supporting the energy transition by adopting various innovative regulations and policies. This effort not only supports environmental sustainability but also sets an example for other cities in Indonesia in implementing effective energy transition programs.

Indonesia's energy security index calculated by the National Energy Council (DEN) is determined by four main indicators, namely availability, accessibility, affordability, and acceptability. Each indicator refers to the availability of sources and supplies, access to supply, prices, and public acceptance of infrastructure. Social impact refers to changes that occur in the social, economic, and cultural conditions of a society as a result of an action, policy, or project. These changes can be positive or negative and can affect various aspects of people's lives, such as health, welfare, education, and social relationships. Social impact indicators are used to measure changes that occur in society. The main indicators of social impact include economic welfare, health, education, quality of life, social and community involvement, social and cultural environment (World bank, 2003)

2. Material and Methods

Population of Surabaya

The population of the city of Surabaya in 2022 will reach around 2,887,223 people with a population density of around 8,500 people per square kilometer. The majority of the population is in the productive age group (15-64 years old), which covers about 70% of the total population. The population of children (0-14 years) is about 25%, and the rest are elderly (65 years and older). The literacy rate is close to 99%. Many educational institutions, including Airlangga University and the Sepuluh Nopember Institute of Technology (ITS). Surabaya has good access to health services with many hospitals and clinics, including Dr. Soetomo Hospital. This city is the center of trade and industry in East Java. The unemployment rate is relatively low compared to other major cities in Indonesia. Transportation infrastructure is advanced, including buses, city transport, and online transportation, as well as the development of mass transportation systems such as trams and light rail.

Jurnal Serambi Engineering JSE
Volume IX, No.3, Juli 2024 Hal 10070 - 10081
p-ISSN : 2528-3561
e-ISSN : 2541-1934

Table 1. Population Data of Surabaya City 2020-2022

Age Group	Total Population of Surabaya According to Gender and Age Group (Person)								
	Male			Female			Total		
	2020	2021	2022	2020	2021	2022	2020	2021	2022
0-4	106.385,0	105.374,0	104.840,0	102.228,0	101.219,0	100.697,0	208.613,0	206.593,0	205.537,0
5-9	115.126,0	113.950,0	112.646,0	110.090,0	109.141,0	107.932,0	225.216,0	223.091,0	220.578,0
10-14	116.369,0	115.621,0	114.971,0	109.552,0	109.040,0	108.751,0	225.921,0	224.661,0	223.722,0
15-19	113.683,0	112.538,0	111.554,0	107.786,0	106.520,0	105.395,0	221.469,0	219.058,0	216.949,0
20-24	110.592,0	109.363,0	108.114,0	107.386,0	106.099,0	104.767,0	217.978,0	215.462,0	212.881,0
25-29	113.380,0	112.752,0	112.144,0	113.676,0	112.659,0	111.731,0	227.056,0	225.411,0	223.875,0
30-34	113.715,0	113.327,0	112.890,0	113.907,0	113.201,0	112.399,0	227.622,0	226.528,0	225.289,0
35-39	117.321,0	117.028,0	116.922,0	117.155,0	116.548,0	116.175,0	234.476,0	233.576,0	233.097,0
40-44	114.109,0	114.114,0	113.851,0	117.182,0	116.853,0	116.202,0	231.291,0	230.967,0	230.053,0
45-49	103.054,0	103.966,0	104.984,0	106.327,0	107.174,0	108.127,0	209.381,0	211.140,0	213.111,0
50-54	89.059,0	90.083,0	90.939,0	93.046,0	94.112,0	94.977,0	182.105,0	184.195,0	185.916,0
55-59	71.384,0	72.910,0	74.458,0	77.899,0	79.792,0	81.644,0	149.283,0	152.702,0	156.102,0
60-64	56.688,0	58.233,0	59.759,0	63.572,0	65.643,0	67.727,0	120.260,0	123.876,0	127.486,0
65-69	41.588,0	43.337,0	44.970,0	49.378,0	51.538,0	53.587,0	90.966,0	94.875,0	98.557,0
70-74	22.767,0	24.286,0	25.884,0	28.022,0	29.673,0	31.485,0	50.789,0	53.959,0	57.369,0
75+	19.948,0	20.990,0	22.115,0	31.940,0	33.200,0	34.586,0	51.888,0	54.190,0	56.701,0
Total	1.425.168,0	1.427.872,0	1.431.041,0	1.449.146,0	1.452.412,0	1.456.182,0	2.874.314,0	2.880.284,0	2.887.223,0

Data Collection

The data collection stage is needed to support the implementation of research. The data used in the study consisted of primary and secondary data. Primary data is the data needed in research and obtained directly. The primary data in this study is the implementation of a survey by filling out a questionnaire in the form of public opinions about the energy transition to several groups. The survey was conducted within the scope of the city of Surabaya for each respondent for 2 weeks. The respondents who were targeted in this study include:

a. Academics from universities in Surabaya each as many as 10 respondents
b. Environmental practitioners (environmental consultants in Surabaya) as many as 30 respondents
c. Non-environmental practitioners (teachers, doctors, nurses, etc.) as many as 20 respondents
d. Students (S1-S3 ITS) as many as 20 respondents
e. Random general public in the Surabaya area as many as 20 respondents

Secondary data is data obtained through literature studies either sourced from company documents, regulations, or previous research results. The secondary data used in this study is in the form of population data for the city of Surabaya until 2022.

Data Processing

The data processing and analysis stage is carried out after all primary and secondary data have been successfully accumulated. Primary data from filling out questionnaires by respondents. The analysis of social aspects aimed at measuring the readiness of the Indonesian people in implementing the energy transition was carried out by distributing questionnaires. The outputs obtained from the questionnaire include availability, accessibility, affordability, and acceptability (Government Regulation, 2014). The sampling method is by cluster sampling.

Determination of Respondents

The number of respondents is determined based on the Cochran formula if looking at the number of population in the study is not known for certain, then use the Cochran Formula (Sugiono, 2019) as follows:

$$n = (z^2 \times p \times q)/e^2 \quad \text{.....(1)}$$

Where:

N = Number of samples required
Z = The level of confidence required in the sample is 95% with a value of 1.96
P = 50% chance of being correct = 0.5
Q = Chance of error 50% = 0.5
E = Sample error rate (error side), 10%

$$n = n_0/(1+((n_0 - 1)/N)) \quad \ldots\ldots(2)$$

Where:

n = Customized sample size
N = Population size

The calculation of the number of respondent samples in this study is:

Expected:

Z = 1.96 (Confidence level used = 95%)
E = 10% = 0.1 (maximum error rate)
P = 50% = 0.5
Q = 50% = 0.5

Population of the city of Surabaya 2022 latest BPS data update (2022) = 2,887,223

Solutions using equations (6)

$no = (z^2 \times p \times q)/e^2$
$no = ((1,96)^2 \times 0,5x\ 0,5)/(0,1)^2$
$no = 96.4$

Next, calculations are carried out using equations (7)

$n = n_0/(1+((n_0 - 1)/n))$
$n = 96,4/(1+((96,4 - 1)/2.887.223))$
$n = 96,39 = 96$ responden

Questionnaire Framework

Measuring the readiness and impact of the application of the energy transition in the community needs to meet several indicators, including availability, accessibility, affordability, and acceptability (Government Regulation, 2014). The question items about the theory have their respective outputs with a design STS score (strongly disagree) = 1; TS (disagree) = 2; R (hesitation) = 3; S (agree) = 4; and SS (strongly agree) = 5. This has been presented in **Table 2** as follows.

Table 2. Questionnaire Framework

No	Statement	Answer				
		STS 1	TS 2	R 3	S 4	SS 5
1	You often notice or read about the issue of climate change and the need for an energy transition					
2	The energy transition from fossil fuels to renewable energy sources is important to address climate change					
3	You are willing to pay more to use electricity that comes from renewable energy sources such as solar or wind					
4	Do you think it is important for the government to provide financial support, tax incentives or subsidies for the development of renewable energy					
5	You are interested in replacing your conventional vehicle with an electric vehicle in the future					
6	If you have the option to invest in energy projects, you will prefer renewable energy projects					
7	It is easy for you to access renewable energy technology such as solar panels in your area					
8	You have easy access to electric vehicle charging stations in the area where you live					
9	Information about government policies regarding renewable energy is easy to access					

No	Statement	Answer				
		STS 1	TS 2	R 3	S 4	SS 5
10	You are aware of subsidy or incentive programs from the government to support the use of renewable energy					
11	It's easy for you to obtain funding to invest in renewable energy technology					
12	It is easy for you to get renewable energy infrastructure such as solar power plants or electric vehicle charging stations in your area					
13	You often look for information about government programs that support the use of renewable energy					
14	You have taken advantage of or plan to take advantage of the subsidy or incentive program					
15	You feel that funding for investment in renewable energy technology is easy to obtain					
16	You feel that there are sufficient training or education programs about renewable energy in your area					
17	Cost considerations are often a limiting factor in your decision to use renewable energy technology					
18	You feel that subsidy or incentive programs from the government to support the use of renewable energy are easily accessible to all groups					
19	In your opinion, paying extra to use electricity from renewable energy sources is still affordable					
20	You agree that access to financing for investments in renewable energy technologies remains difficult					
21	You understand that using renewable energy technology can save energy costs in the long term					
22	You agree that the energy transition to renewable energy sources will contribute more to local economic growth					
23	You agree that the energy transition to renewable energy sources will reduce air pollution and greenhouse gas emissions					
24	You believe that an energy transition to renewable energy sources will improve the overall health of society					
25	You think that the energy transition to renewable energy sources will improve the welfare of local communities					
26	You believe that the energy transition to renewable energy sources will affect local traditions and culture					
27	You believe that the energy transition will strengthen social relations between different groups in communities					
28	You believe that the energy transition will increase public participation and involvement in energy-related decision making					
29	You often use public transportation or environmentally friendly vehicles such as bicycles or electric cars after the energy transition policy					
30	You often try to reduce energy consumption in daily activities after the energy transition policy					
31	You often look for environmentally friendly products or labeled green energy after the energy transition policy					
32	You often use environmentally friendly technology such as LED lights or low-energy household appliances after the energy transition policy					

Data Analysis

The data analysis technique in this study uses a quantitative approach, each question is given a certain weight, according to the criteria (5 to 1 or 1 to 5). Then, all the weights collected are found as a percentage. In verbal language, the total weight of the question is divided by the number of weights that should be the highest, then multiplied by the number 100%. In mathematical language it can be described as follows:

$$P = \frac{\sum BP}{\sum BM} \; x \; 100\% \quad \text{.....(3)}$$

Information:
P = Percentage result obtained
∑BP = The sum of the weights obtained from the entire question
∑BM = Maximum amount of weight that should be highest (maximum)
100 % = Fixed number in analyzing

Or

$$P = \frac{f}{N} \; x \; 100\% \quad \text{.....(4)}$$

Information:
P = Percentage result obtained
F = Number of each alternative (frequency)
N = Number of respondents 100 % + Fixed number in analyzing.

The result in the form of a percentage (%) is then entered into the percentage interval table so that the meaning presented in the following **Table 3** can be known.

Table 3. Description of Quantitative Data Percentage

Percentage Interval (%)	Interpretation
0,0-0,5	None at all
0,6-9,5	Almost no
9,6-39,5	Fraction
39,6-49,5	Almost half
49,6-50,5	Half
50,6-59,5	More than half
59,6-89,5	Most of it
89,6-99,5	Almost all of it
99,6-100	Entirely

3. Results and Discussion

Social media contains the results of analysis related to the readiness and response of the people of Surabaya with the energy transition policy set by the government. Ideally, a policy can be implemented when it meets the criteria of acceptance, accessibility, availability, and affordability as previously discussed in literature studies. Not only that, this module will also discuss the social impacts that are likely to occur when the policy is implemented. All factors are outlined in the form of a questionnaire that has been filled out by the people of Surabaya. These results will give rise to evaluations and strategies so that the energy transition will be able to run better based on the response of the community, which is an important part of the success of the policy implications.

Questionnaire Result Analysis

The questionnaire that has been distributed to several circles of society certainly produces diverse opinions. Respondents with the criteria of indigenous residents and those who are active in the city of Surabaya were selected because of their opinions and viewpoints as implementers of policies while in the city of Surabaya. The results of the questionnaire that have been distributed to the community with backgrounds including academics, active students, environmental & non-environmental practitioners, and the general public are outlined in the following table summary.

Jurnal Serambi Engineering JSE
Volume IX, No.3, Juli 2024 Hal 10070 - 10081
p-ISSN : 2528-3561
e-ISSN : 2541-1934

Table 4. Recapitulation of Questionnaire Answers by Respondents

No	Statement	Answer					Total Respond
		STS 1	TS 2	R 3	S 4	SS 5	
1	You often notice or read about the issue of climate change and the need for an energy transition	2	8	24	52	21	107
2	The energy transition from fossil fuels to renewable energy sources is important to address climate change	0	1	8	42	56	107
3	You are willing to pay more to use electricity that comes from renewable energy sources such as solar or wind	4	11	28	40	24	107
4	Do you think it is important for the government to provide financial support, tax incentives or subsidies for the development of renewable energy	0	1	2	20	84	107
5	You are interested in replacing your conventional vehicle with an electric vehicle in the future	0	4	21	48	34	107
6	If you have the option to invest in energy projects, you will prefer renewable energy projects	0	1	11	53	42	107
7	It is easy for you to access renewable energy technology such as solar panels in your area	14	40	22	25	6	107
8	You have easy access to electric vehicle charging stations in the area where you live	18	43	23	20	3	107
9	Information about government policies regarding renewable energy is easy to access	7	28	36	31	5	107
10	You are aware of subsidy or incentive programs from the government to support the use of renewable energy	12	26	28	29	12	107
11	It's easy for you to obtain funding to invest in renewable energy technology	18	35	41	11	2	107
12	It is easy for you to get renewable energy infrastructure such as solar power plants or electric vehicle charging stations in your area	14	45	24	20	4	107
13	You often look for information about government programs that support the use of renewable energy	5	21	41	30	10	107
14	You have taken advantage of or plan to take advantage of the subsidy or incentive program	5	13	31	41	17	107
15	You feel that funding for investment in renewable energy technology is easy to obtain	12	34	47	9	5	107
16	You feel that there are sufficient training or education programs about renewable energy in your area	15	41	28	19	4	107

No	Statement	Answer					Total Respond
		STS 1	TS 2	R 3	S 4	SS 5	
17	Cost considerations are often a limiting factor in your decision to use renewable energy technology	1	9	18	42	37	107
18	You feel that subsidy or incentive programs from the government to support the use of renewable energy are easily accessible to all groups	15	43	30	14	5	107
19	In your opinion, paying extra to use electricity from renewable energy sources is still affordable	8	26	47	20	6	107
20	You agree that access to financing for investments in renewable energy technologies remains difficult	3	3	30	42	29	107
21	You understand that using renewable energy technology can save energy costs in the long term	2	4	17	45	39	107
22	You agree that the energy transition to renewable energy sources will contribute more to local economic growth	1	6	28	50	22	107
23	You agree that the energy transition to renewable energy sources will reduce air pollution and greenhouse gas emissions	0	0	11	34	62	107
24	You believe that an energy transition to renewable energy sources will improve the overall health of society	0	1	16	45	45	107
25	You think that the energy transition to renewable energy sources will improve the welfare of local communities	2	13	33	40	19	107
26	You believe that the energy transition to renewable energy sources will affect local traditions and culture	5	12	21	48	21	107
27	You believe that the energy transition will strengthen social relations between different groups in communities	0	16	41	32	18	107
28	You believe that the energy transition will increase public participation and involvement in energy-related decision making	2	7	29	49	20	107
29	You often use public transportation or environmentally friendly vehicles such as bicycles or electric cars after the energy transition policy	16	26	26	30	9	107
30	You often try to reduce energy consumption in daily activities after the energy transition policy	4	10	21	53	19	107
31	You often look for environmentally friendly	1	14	26	38	28	107

No	Statement	Answer STS 1	TS 2	R 3	S 4	SS 5	Total Respond
	products or labeled green energy after the energy transition policy						
32	You often use environmentally friendly technology such as LED lights or low-energy household appliances after the energy transition policy	0	8	14	51	34	107

The **Table 4** above is a recapitulation of the total answers of 107 respondents who met the criteria for residents of Surabaya City with 32 statements on the questionnaire. Each statement listed has its own output or purpose which refers to an assessment of acceptance, accessibility, availability, affordability, and the impact felt by the people of Surabaya City in terms of its social aspects. Starting from the level of strongly disagreeing to strongly agreeing. In the bar chart, there is one section that is quite dominant, namely in the statement with the code (ACCEPT.4) which shows that the majority of respondents strongly agree with the important statement for the government to provide financial support, tax incentives or subsidies for the development of renewable energy. This is an example of a positive revenue response by the public if the government provides financial support, tax incentives or subsidies during the implications of renewable energy policies. The results of the questionnaire are then calculated to assess the weight in each statement with the calculation equation that has been included in Chapter 3 of the research method.

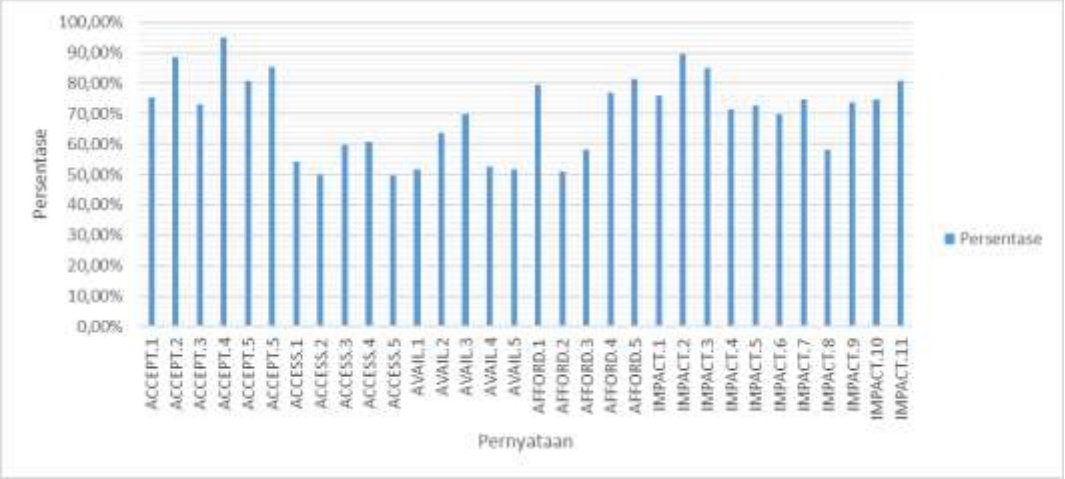

Figure 1. Questionnaire Weight Assessment of each Statement

Based on the results of the recapitulation presented in **Table 4** and **Figure 1**, the results of the analysis of several things, namely for ACCEPT.1 to ACCEPT.6, show that most to almost all people in terms of revenue are positive and interested in energy transition policies on the condition that the government is able to provide positive financial support, or subsidies. As for ACCESS.1-5, it shows that the majority of people find it difficult to access things related to renewable energy (both from technology, facilities, government assistance, and other funding). The same thing is also shown by the parameter AVAIL.1-5 which represents that more than half to most of the respondents feel that there is a lack of availability of supporting materials for the implications of the renewable energy transition. The majority of respondents also feel that the level of renewable energy affordability is still low, this is illustrated by the results of the AFFORD parameter 1-5 which states that more than half of the respondents agree that some things related to supporting renewable energy are still difficult and have not reached all groups.

As for the IMPACT 1-11 parameter, it indicates that most respondents agree that the energy transition can have an impact on society. The impact is reviewed from the social aspect, namely improving public health, improving the welfare of the local community by contributing to economic growth, later it will increase community participation and involvement in energy-related decision-making, affect people's daily habits/behaviors by slowly switching to using public transportation or environmentally friendly vehicles, reducing energy consumption, using environmentally friendly products as well as low-energy equipment.

Evaluation Based on Questionnaire Results

The results of the questionnaire that have been obtained give rise to things that can be evaluated on the energy transition policy in the city of Surabaya. Judging from the community's acceptance, it shows that the community warmly welcomes the energy transition policy, especially when the questionnaire is broken down according to the respondents' background, namely the higher the level of education and the relevance of the background to the environmental field, the higher the level of community acceptance. This is in line with research conducted by Thomas et.al (2022) which states that social backgrounds with higher levels of education will support the energy transition compared to the opposite. Unfortunately, this is hampered by several things that include availability, accessibility, and affordability.

The government needs to evaluate several things, including the availability, access, affordability of infrastructure, facilities, funding, support in the form of subsidies or other things, training and education related to renewable energy, transparency of policies that are informative to the public, community involvement in decision-making in the energy aspect. Community involvement in the planning process is very important for the acceptance of energy transition policies. While large community participation can be disruptive to developers, community involvement may be minimal. Creating opportunities for citizens to participate in the development of renewable energy little by little can significantly increase public perception. For example, information sessions, public forums, and listening to public opinions and concems can improve perceptions of renewable energy, eliminating misunderstandings, and concerns that will inevitably arise during the planning process can be addressed and mitigated. This will later have a positive impact on the social scale to the local and even national economies (Segreto et.al., 2020).

4. Conclusion

The existence of the energy transition has an impact on the social aspect, shown by the percentage of public approval of 75.11%. The acceptance rate of the people of Surabaya City is quite high towards the implications of the energy transition with a percentage of 83.02%. Some evaluation is needed for the government to consider public involvement in policy & subsidy support, and information transparency.

5. Acknowledgment

Authors thank our colleagues from Institut Teknologi Sepuluh Nopember, Universitas Serambi Mekkah, Ministry of Finance Republic of Indonesia, Statistic of Surabaya City, Indonesia who provided insight and expertise that greatly assisted the research, although they may not agree with all of the interpretations/conclusions of this paper.

6. References

[1] Anggraini, M. (2022). Renewable Energy Policy as Indonesia's Energy Security Strategy. Jurnal Mandala Jurnal Ilmu Hubungan Internasional. https://doi.org/10.33822/10.33822/mjihi.v5i1.4108.

[2] Atma, P. (2018). A Legal Analysis of Governing New Energy Related-Technology through Public and Private Regulations in Indonesia. . https://doi.org/10.2991/ICEML-18.2018.53.

[3] BPS. (2022). Data Kependudukan Kota Surabaya. Jakarta : Badan Pusat Statistik Indonesia.

[4] Syukur, Yanuardi., Anisah Setyaningrum., Sitta Rosdaniah. (2022). Pulih Bersama Bangkit Perkasa 2. Jakarta : Rumah Produktif Indonesia dan Perpustakaan Nasional Republik Indonesia.

[5] Erwinsyah. (2021). Peluang Ekonomi Hijau dan Keterampilan Hijau Menuju Netral Karbon Indonesia Tahun 2060. Journal of Applied Business and Economic (JABE), Vol.8 No.2, 159-181.

[6] Dutu, R. (2016). Challenges and policies in Indonesia's energy sector. Energy Policy, 98, 513-519. https://doi.org/10.1016/J.ENPOL.2016.09.009.

[7] IESR (2022). Indonesia Energy Transition Outlook 2023 : Tracking Progress of Energy Transition in Indonesia : Pursuing Energy Security in The Time of Transition. Jakarta : Institute for Essential Services Reform (IESR).

[8] IPCC. (2001). TAR Climate Change 2001 : The Scientific Basis. Amerika : IPCC.

[9] Malihah, Lola. (2022). Tantangan dalam Upaya Mengatasi Dampak Perubahan Iklim dan Mendukung Pembangunan Ekonomi Berkelanjutan : Sebuah Tinjauan. Jurnal Kebijakan Pembangunan, Vol.17 N0.2, 219-232.

[10] Nugroho, H., Rustandi, D., & Widyastuti, N. (2021). What Position Should Indonesia Have in Placing Its Renewable Energy Development and Energy Transition Plan?. Bappenas Working Papers. https://doi.org/10.47266/bwp.v4i2.100.

[11] Nur, A. (2022). Human Rights Aspect in the Indonesian Energy Transition: The Challenges of Promoting the Right to a Clean, Healthy and Sustainable Environment. Human Rights in the Global South (HRGS). https://doi.org/10.56784/hrgs.v1i2.15.

[12] Peraturan Pemerintah. (2014). Peraturan Pemerintah No. 79 Tahun 2014 tentang Kebijakan Energi Nasional.

[13] Rustam, Ismah., Kinanti Rizsa Sabilla., Syaiful Anam. (2023). Climate Change Adaptation Assistance to a Number of Environmental Communities in Mataram City in Supporting NTB's Commitment to Net Zero Emission. Jurnal Pemberdayaan Masyarakat, Vol. 2 No.1, 1-83.

[14] Sugiyono, A., & , A. (2021). Development of Natural Gas Infrastructure to Enhance National Energy Security in Indonesia. IOP Conference Series: Materials Science and Engineering, 1053. https://doi.org/10.1088/1757-899X/1053/1/012099.

[15] Thomas, Melanee., Brooks DeCillia., John B.Santos., Lori Thorlakson. (2022). Great expectations: Public opinion about energy transition. Energy Policy, 162 112777.

[16] UCLG-ASPAC. Breaking Through Challenges, Launching The First Waste To Energy Plant In Indonesia. Surabaya: Breaking through Challenges, Launching the First Waste to Energy Plant in Indonesia - UCLG ASPAC (uclg-aspac.org).Accessed 29 June 2024.

[17] World Bank. (2003). "Social Analysis Sourcebook: Incorporating Social Dimensions into Bank-Supported Projects." Wasihngton DC USA, The World Bank.