ISSN No:-2456-2165

Sustainable Child Friendly City Development (RPTRA) and its Energy Supply in the Archipelago Region (Case Study: Tidung Island, Thousand Islands, North Jakarta Municipality, Dki Jakarta Province

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Abstract:- Tidung Island with its island condition has various problems in its development, especially in natural environmental issues, rising sea levels that threaten this region, meeting the needs of clean water, energy to the treatment of solid and liquid waste. This study seeks to record all these problems in general and specifically pay attention to the primary needs of children in terms of education, playroom and children's development needs.Based on the basic considerations of children's needs and energy supply mentioned above, this research will direct research to the Standards of Child-Worthy Cities mentioned in the Law of the Republic of Indonesia and the regulation of municipal sustainability standards through the procurement of clean water, sewage treatment and energy supply, which for an archipelago requires a very specific solution.The fulfillment of the needs of city facilities for children is already listed in the development provisions of RPTRA (Ruang Publik Terpadu Ramah Anak) 10 (ten) Basic Empowerment and Family Welfare programs to integrate with the Child Worthy City program. Furthermore, the need to procure city facilities for children is also associated with the implementation of sustainable energy facilities, so that the construction of Tidung island based on Child Worthy Cities can be categorized into Sustainable Urban Development.The condition of Tidung Island Village as an Island, clearly has a special way of development. Tidung Island, as a city / village bounded by the sea, so that all the ordinances of life must also pay attention to the safety of children living on this island and the opportunity to develop appropriately as children from the place can be guaranteed. This problem becomes an attraction for this research, because the condition of Indonesia as a whole is an Island Nation. This should not be ignored, and the people of the Islands should still have a place to thrive and continue their traditions and culture.

Keywords:- *KLA (*Kota Layak Anak*/ Child-Worthy City), Sustainable and Energy Supply*

I. INTRODUCTION

The development of Child Friendly Cities will prioritize aspects of child protection and in this regard pay attention to and implement the contents of LAW OF THE REPUBLIC OF INDONESIA NUMBER 23 OF 2002 REGARDING CHILD PROTECTION. In this case, children need to get the widest opportunity to grow and develop optimally. The criteria for children in this case are children who are not yet 18 (eighteen) years old, including children who are still in the womb, neglected children, have disabilities, have advantages. This law mentions child protection, meaning that children's rights are part of human rights that must be guaranteed, protected, and fulfilled by parents, families, communities, governments and the state. Child-friendly Integrated Public Space, hereinafter abbreviated as RPTRA (Ruang Publik Terpadu Ramah Anak), is a place and/or open space that combines activities and activities of citizens by implementing 10 (ten) Main Programs for Empowerment and Family Welfare to integrate with the Child Friendly City program. A Child Friendly City, hereinafter abbreviated as KLA, is a city that has a children's rights-based development system through the integration of government, community and business commitments and resources that are planned in a comprehensive and sustainable manner in policies, programs and activities to ensure the fulfillment of children's rights. RPTRA (Ruang Publik Terpadu Ramah Anak)implements three services, namely children, community and disaster services. Child services, consisting of: 1. Family Development for Toddlers Early Childhood Education (BKB-PAUD); 2. Integrated Service Post (Posyandu); 3. Children's library; 4. a place for sports, 5. a place to play; and 6. children's creative activities. Community services consist of: 1. activities of 10 (ten) PKK Main Programs; 2. PKK-Mart; 3. community activities that do not have the potential to cause damage to the park and/or existing infrastructure and facilities; 4. sports, and 5. art activities. Meanwhile, disaster services consist of communication, disaster education information, disaster signs, temporary shelters for post-disaster services, disaster information and education communication and disaster signs. RPTRA (Ruang Publik Terpadu Ramah Anak)also performs other services besides the three services above, but with the approval of the management. The current RPTRA, especially in the RPTRA in Tidung Island, has not yet carried out all the services that should have been carried out as written in DKI Governor Regulation No. 123 Year 2017. In addition, the development of the current RPTRA still does not follow the concepts of sustainable development, which can be seen from the environmental, economic and social aspects. There are many benefits if the development of Child Friendly Cities follows the concepts of environmental-economic-, and social-sustainable development. The benefits in terms of sustainable environmental development include reducing energy consumption per capita, reducing energy consumption, reducing environmental impacts such as CO^2 emissions, reducing the cost of material flow to Child Friendly Cities, increasing the efficiency of the transportation system, reducing dependence on cars because everything can be achieved by road. foot. Meanwhile, the benefits of sustainable economic development include increasing various types of businesses to increase people's income. Meanwhile, the benefits of sustainable social development include increasing social interactions for the better, and reducing crime that may occur in the city. One of the most important material flows to Child Friendly Cities is energy, be it electrical energy or other energies such as oil and gas. Judging from the electrical energy used, it is still supplied or supplied by PT PLN (National Electricity Company of Indonesia). Among the islands in the Thousand Islands, Tidung Island is the island with the most electricity customers. In 2016, there were 1541 electricity customers, consisting of postpaid and prepaid. More than 99% of electricity customers on Tidung Island are postpaid. To increase the electricity supply to Tidung Island, PT PLN (National Electricity Company of Indonesia) has connected the sea cable. To improve the economy on Tidung Island, need to increase the supply of electrical energy. The economy of the people on Tidung Island is mostly in the fields of tourism and trade. The increased supply of electrical energy will cause variations in the community's economy to also increase. In addition to being connected to the grid (grid-connected), the supply of electrical energy to Child Friendly Cities (RPTRA) can also be done off-grid. There are various kinds of off-grid technologies that can supply electricity to Child Friendly Cities, as shown in Table 1. The types of off-grid technologies as shown in Table 1 are technologies that use renewable energy. Using renewable energy is one of the criteria for building a sustainable city. What type of technology is suitable to be installed to supply electrical energy to the RPTRA or Child-friendly City is very dependent on the local energy sources owned by the area, which in this case is Tidung Island. In principle, the supply of electrical energy that supplies electrical energy to Child Friendly Cities must meet the rules of sustainable development, and must also follow the 7th goal criteria of the Sustainable Development Goals (SDGs) which reads "energy access to affordable, reliable, sustainable, and modern". energy for all".

Generation Technology

Off-Grid Teknologi Technology		
conventional	Non-conventional	Hybrid Micro-Grid
Diesel Generator	1. Photovoltaic & Storage System 2. Wind Turbine & Storage System 3. Hydro Power Plant (& Storage)	Combination of Photovoltaic, Wind Turbine, Hydro Power Plant, and Storage System

Table 1: Classification of Power

This study aims to plan a child-friendly city by following the principles of sustainable development, from an environmental, economic and social perspective. Besides that, this research also aims to analyze the off-grid system that will be used to supply electrical energy to Child Friendly Cities. The analysis is more focused on technical analysis and economic analysis (techno-economic analysis) of the electrical energy supply system to the Child Friendly Box on Tidung Island.

The formulation of the problem of this research can be mentioned in the fields related to the purpose of this research, namely:

- First, what is the role of local governments in realizing child-friendly cities/districts in Indonesia?
- Second, what are the factors that influence local governments to create child-friendly cities/districts in Indonesia?

The research objectives of Sustainable Child Friendly City Development (RPTRA) and Its Energy Supply in the Thousand Islands Region are to:

- Reviewing the eligibility standards of this Kelurahan town based on the Child Friendly City Standards
- Knowing the non-physical characteristics of socio-cultural life, in the Thousand Islands region and
- Reviewing the feasibility of energy facilities and infrastructure on Tidung Island, which can meet the criteria for a Sustainable City.

This research is useful to contribute knowledge about Child Friendly City Standards for the Archipelago region and the issue of energy supply that can support sustainable city development, especially specifically for the Archipelago region. Through this research, similar research can be developed for other archipelagic areas, so that there are RPTRA models and Child Friendly Cities specifically for the Archipelago region, which are widely available throughout

ISSN No:-2456-2165

Indonesia, because Indonesia consists of more than 17,000 islands. The concept of developing the Archipelago region has often been neglected so far, so that the area is isolated due to limited distance and communication, being more left behind than other regions, and child protection against child eligibility standards is often neglected.

II. RESEARCH METHODS

In City Development researchSustainable Child Friendly (RPTRA) and Energy Supply In the Archipelago Region, the focus of this research is a sustainable Child Friendly City and energy supply for the Archipelago region. The research method used is an Analysis of Child Friendly Cities based on the Child Protection Act and the Law on Facilities for a Child Friendly City.

Thus, infrastructure facilities for activities and children's welfare will be a concern, in addition to an analysis of sustainable and environmentally sound City Development.

The last discussion is about appropriate energy for the Archipelago region.

The research steps taken are thus in the form of:

- Discussion on the Law on Child Protection and Child Friendly Cities;
- Sustainable City Development;
- Energy Supply for Tidung Island;

Researchers	Focus/issue of the study being conducted	Principles of planning	Planning strategies for sustainable Child-Worthy City development are seen in terms of environment, economy, and social (economic, environmental, and social sustainability)			Is there a strategy that strengthens each other?	Is there a conflict between the proposed strategies?	What are the co-benefits of the proposed strategy?	Policies (policies) needed so that the proposed strategy can work	Landscape shapes	The cost (very expensive / expensive / moderate / cheap / very cheap)
			Short Term 5th	Medium Term 10 th	Long-Term 25th						
1. Charles OP Marpaung 2. Uras Siahaan 3. Stepanus Andi Saputra 4. Saut Hamona with Munthe	Child Friendly Cities to produce prosperous families, and sustainable cities	1. Compactness	Island	Island	Island	Support from the City of Jakarta	Population spread towards the Thousand Islands	Pay attention to the carrying capacity of the island to the development of pdd	Strict supervision of Rencata Spatial Planning Region	Keep the condition of the islands, which are threatened by sea abrasion	Population control can make this area exclusive
		2. Density	Low	Low	Low						
		3. Mixed land use	-	-	Semi						
		4. Sustainable transportation	island transfer	island transfer	island transfer						
		5, Green structure	Local	Max 2 lt	Max 2 lt						
		6. Intensificationdll	periknn	periknn	periknn						

Table 2: Framework for Sustainable Child-Worthy City Development (RPTRA)

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QUESTIONS	Respondent	Respondent	Respondent	Respondent	Respondent	Respondent	Respondent	Respondent	Respondent	Respondent
Personal full name	Retno, Suhesti Almalta	Verischya Ramadhani	AzzaAtifah	RifiPratama Ramadhan	Daurotun Nihla	Kafka Kojanah	Kinanti Lestari	ElzetraTradatulZannah sofa	Fikri	Muhammad Iqbal
Child's Name (Parent)	Halimah& Rudi	Lamra and Adi	Santimah & Nasrallah	Juanaidi and Rani	Darmona and Syifah	Santoso and Zara	Bima and Sabilah	Bimo and Sisi	ihsak and danila	Brama and sella
Where do school holidays go, what do you play the most?	Only on Tidung Island	Only on Tidung Island	Only on Tidung Island	Only on Tidung Island	Often to another island	Only on Tidung Island	Only on Tidung Island	Only on Tidung Island	Only on Tidung Island	Only on Tidung Island
Have a relative in Jakarta, where is it?	Exist	There is not any	There is not any	There is not any	There is not any	There is not any	Exist	Exist	Exist	Exist
Have relatives on other islands?	Exist	Exist	Exist	Exist	Exist	Exist	Exist	Exist	Exist	Exist
Do you like vacations to other islands?	once in a while	Often	Often	once in a while	once in a while	once in a while	Never	Often	once in a while	once in a while
Inter-island transportation	Public transport	Public transport	Public transport	Public transport	Public transport	Public transport	Public transport	Public transport	Public transport	Public transport
Satisfied with the existing RPTRA? What toys do you need to add?	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Like to swim in the sea? Every day what? Every vacation?	Rarely, Once a Month	Often, once a week	Often, once a week	Often, once a week	Rarely, Once a Month	Rarely, Once a Month	Rarely, Once a Month	Often, once a week	Rarely, Once a Month	Often, once a week
Hobby, what games do you like on your cellphone?	Reading, No	Play Games, Like	Reading, No	Swimming on a bicycle	Play Games	Draw	Draw	Sing and learn	Playing football	Play ball, read
Playing cellphone is allowed by parents? How long do you play on your phone/day?	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day	Permission, can be all day
Average grades in school (specify SD/SMP/S	Good, average 7	Less, average 6	Good, average 7	Less, average 6	Good, average 7	Good, average 8	Good, average 8	Less, average 6	Good, average 7	Good, average 7

ISSN No:-2456-2165

MA)?										
How often do you get sick? Flu, stomach, skin, ulcers etc	Sick Flu, Fever, Stomac h Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc	Sick Flu, Fever, Stomach Etc
School still from home?	Still	Still	Still	Still	Still	Still	Still	Still	Still	Still
Can you guide the subjects at home?	Guided	Guided	Guided	Guided	Guided	Guided	Guided	Guided	Guided	Guided

Table 3: Questionnaire to local residents

- Analysis:
  - The majority of Tidung Island children's vacation spots are only on Tidung Island, only sometimes on vacation to other islands, not to Jakarta
  - 50% of respondents have relatives who live in Jakarta, all of them have relatives who live on other islands in the Thousand Islands
  - All of them use public transportation, if traveling to other islands from the Thousand Islands
  - All children and their parents are satisfied with the existence and facilities available at RPTRA
  - 50% of children swim once a week in the sea, 50% rarely swim to the sea
  - All children admit that they are always allowed to play cellphones, it can be all day
  - Only 20% of children got an average score of 8, 50% got an average score of 7 and 30% got an average score of 6
  - All children admit that they often get flu, fever and stomach
  - All online school children from home, until the time of the survey (December) they have not been able to go to school offline
  - All claimed that their parents could guide them to school from home.

Child Friendly City (KLA) Indicators

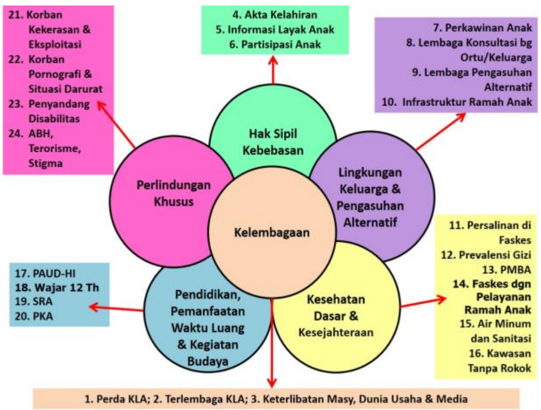

Fig. 1: Child Eligibility Indicator

All facilities required by the Child Friendly City criteria must also meet the safety and comfort of a child and be free from elements of violence, discrimination and racism, vulgarity and obscenity as well as excessive exposure to children's personal data and free of charge. A concrete example is the freedom of the streets from various cigarette advertisements that can mislead children's perceptions.

There are five levels of criteria for Child Friendly Cities, namely KLA Pratama, KLA Muda, KLA Madya, KLA Utama. Since the Child Friendly City program was launched, there have been 100 cities that have committed to make it happen.

III. RESULTS AND DISCUSSIONS

Energy Supply in Child Friendly Cities (RPTRA).

Energy supply to Child Friendly Cities must comply with all the requirements contained in the sustainable development goals, namely goal 7, namely the ability to supply modern, adequate, available energy when needed, reliable, of good quality, affordable, legal, comfortable, healthy, and safe. for all energy users across households, productive enterprises, and community institutions. Modern energy (modern energy) usually refers to energy sources that are clean, safe, and, to some extent, convenient. In this study, a techno-economic analysis of the energy supply used to electrify Laya Anak City in the archipelago, namely Tidung Island. The method used to conduct techno analysis and economic analysis can be explained as follows.

A. Technical Analysis

The design of the electricity supply to be used on Tidung Island requires several implementation steps, starting from field visits to obtaining an optimal electricity supply system. Figure 4.1 shows the microgrid system design methodology for the Tidung Island area.

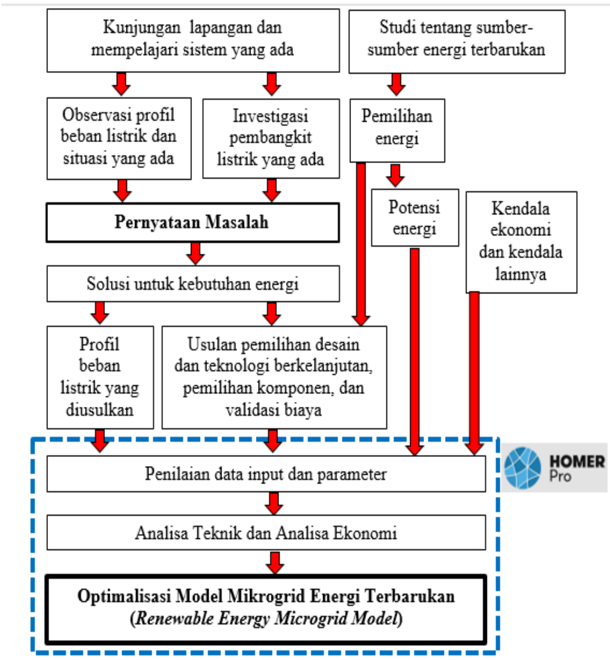

Fig. 2: Methodology of Designing an Electrical Energy Supply System in the Tidung Island Area.

The design methodology consists of several steps and procedures and is combined with technical analysis and economic analysis carried out using HOMER Pro. The design steps broadly start from a field visit to look for problems that occur in the field, in this case on Tidung Island. Through field visits and literature studies, especially those related to energy use, especially electrical energy, information on renewable energy sources and their potential is obtained. The next step is to find solutions to solve existing problems by considering various existing constraints such as economic factors, types of technology and components to be used, as well as cost validation and the parameters used to perform sensitivity analysis.

B. Economic Analysis

Discounted Cash Flow is generally used by investors as a quantitative basis for rational decision making. There are 5 methods of Discounted Cash Flow analysis that are often used, namely: Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PP), Benefit Cost Ratio (BCR), and Levelized Cost Of Electricity (LCOE). In the following, this method will be explained one by one.

a) Net Present Value

One of the dynamic methods in determining whether a project is cost effective is to use the Net Present Value (NPV) method. NPV can be calculated as follows:

$$NPV = PV_{Inflow} - PV_{Outflow}$$

If:

NPV > 0 :the project is said to be cost effective

NPV < 0 :the project is said to be not cost effective

NPV = 0 :no decision (needs additional information to determine if a project is cost effective)

NPV can be used to rank projects. The larger the NPV of a project, the more cost-effective the project is.

b) Internal Rate of Return

The Internal Rate of Return (IRR) is the value where:

$$PV_{Inflow} = PV_{Outflow}$$

Or

$$PV_{Inflow} - PV_{Outflow} = 0$$

If:

IRR > MARR, the project is said to be cost effective

IRR < MARR, the project is said to be not cost effective

IRR = MARR, no decision (needs additional information to determine if a project is cost effective)

Note: MARR = Minimum Attractive Rate of Return

c) Payback Period

*Payback Period*is the time required to recover the initial investment cost of a project. Payback Period is an economic valuation technique that provides a measure of the economic performance of an investment. There are two payback periods, namely Simple Payback Period (SPP) and Discounted Payback Period (DPP). The Simple Payback Period does not consider the time value of money, while the Discounted Payback Period considers the time value of money. The difference between SPP and DPP is that SPP only emphasizes liquidity, while DPP emphasizes liquidity and profitability. DPP is more "powerful" than SPP because decisions made based on DPP are ideal decisions.

How to Calculate Simple Payback Period (SPP)

*Simple Payback Period*can be calculated as follows:

$$\sum_{t=1}^{Y} (B_t - C_t) = C_0$$

where:

Bt = profit value in year t

Ct = cost value in year t

(Bt - Ct) = net cash flow (net*cash flow*) in year t

C0 = project investment cost at the beginning

Y = the minimum value for the return (break even) of the initial investment cost of the project

How to Calculate Discounted Payback Period

*Discounted Payback Period*can be calculated as follows:

$$\sum_{t=1}^{Y} \left[\frac{B_t - C_t}{(1+i)^t}\right] = C_0$$

where:
Bt = profit value in year t
Ct = cost value in year t
(Bt - Ct) = net cash flow in year t
C0 = project investment cost at the beginning
Y= minimum value for return (*break even*) the initial investment cost of the project by considering the time value of money
i =*interest rate*

d) Benefit Cost Ratio

Benefit Cost Ratio(B/C) can be calculated by dividing the present value of future inflows against the present value of future outflows or mathematically can be written as follows: as follows:

$$B/_C = \frac{\sum_{t=1}^{n} \frac{B_t}{(1+i)^t}}{\sum_{t=0}^{n} \frac{C_t}{(1+i)^t}}$$

where:
Bt = profit value in year t
Ct = cost value in year t
n = evaluation period
i =*interest rate*

If present value inflow = present value outflow (or NPV = 0), it means B/C = 1.

NPV > 0, then B/C > 1, and if NPV < 1, then B/C < 1.

A project is said to be attractive if B/C > 1. The bigger the B/C, the more attractive the project.

e) Levelized Cost of Electricity

LCOE can be used to compare different generators by considering the costs incurred during the entire life cycle of the power plant (Kost et al. 2012; Prognos 2013). LCOE is usually used as the basis for evaluating and comparing several alternative options when investing in power generation. LCOE reflects the selling price of electricity to ensure the amount of investment made back. LCOE can be calculated as follows:

$$\boldsymbol{COE} = \frac{\sum_{t=1}^{n} \frac{I_t + OM_t + F_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{E_t}{(1+r)^t}}$$

Where:
LCOE =*levelized cost of electricity*
It = investment in year t
OMt = cost*operation*and maintenance in year t
Ft = fuel cost in year t
et = electrical energy generated in year t
r =*discount rate*
n = generator life

IV. CONCLUSION

The development of Tidung Island, which is located in the DKI Jakarta Region, has received a lot of support from the Capital of the Republic of Indonesia, Jakarta since several decades ago, namely since the leadership of Mr. Ir. H. Jokowidodo as Governor of DKI Jakarta in 2012-2014. The DKI Jakarta government pays greater attention to the existence of the Thousand Islands, as a tourism area, as a buffer for Jakarta Bay from sea abrasion and also as a barometer of land subsidence and rising sea levels in Jakarta Bay. Tidung Island and many islands in the Thousand Islands have been threatened by land subsidence or rising sea levels. This is evident from the area of Tidung Island and other islands in the Thousand Islands from year to year, mainly due to rising sea levels.

Based on the results of the research and the answers to the problems above, some conclusions can be drawn here.

- Child Friendly City Development: The development of Tidung Island must pay attention to various aspects of child protection and the provision of facilities and infrastructure referring to the Child Protection Law and 31 Child Friendly City Standards. Maintaining and supervising the implementation of children's rights in education and child welfare, which in the survey results are still mostly in discourse, has not been 100% implemented. RPTRA and educational infrastructure are well available, but the problem of Health and the quality of Education is still not the same as that obtained in Jakarta, so the majority of children aspire to continue their education in Jakarta. Children's education and children's recreation facilities are very identical to the facilities in Jakarta, very far from the conditions of the islands. This has resulted in children on Tidung Island not having specificity in their development, love for the sea and its environment is not well formed. Children's rights that still need to be developed for example in the equality of education obtained with children in Jakarta, maintenance of health, development of education adapted to local natural conditions and overall protection of the fate of Tidung Island from the threat of sea wave abrasion and sea level rise.
- Sustainable Development Land use planning on Tidung Island is not yet well developed, so that the placement of city facilities is not well organized, for example the placement of final waste disposal, which has not been able to handle the landfill independently, still has to be processed in Bantar Gebang. In addition, there is no guarantee that the Land Use Plan is reviewed, compiled and re-approved periodically. As a result of weak monitoring of land functions, compromises will often have to be made between public and private interests. Such compromises are no easier to make when everyone agrees on what is good for everyone. Everyone will respect the provisions that have been set, if supervision is carried out continuously and law enforcement is carried out properly. (Siahaan, Uras 2013, City Architecture 148-150). Implementation of circulation in urban settlements, should pay attention to the road hierarchy and determine the width of the road in accordance with the standards and needs of road users (Müller, W 1979, Städtebau S150-

160). This is still not getting enough attention in settlements on Tidung Island.

- Energy Supply: Until now, the energy supply for Tidung Island is 100% dependent on the power plant in North Jakarta, which is channeled through submarine cables. It is possible to generate electricity with solar power, ocean waves and wind for Tidung Island. Based on the results of the research above, several possibilities can be implemented, only the payback needs to be taken into account in the future and the environmental impact of the selected technology.

REFERENCES

[1.] Acuti, D., Bellucci, M., Manetti, G.(2020), Company disclosures concerning the resilience of cities from the Sustainable Development Goals (SDGs) perspective. *Cities* 99, 102608.

[2.] Ahmadian, E., Sodagara, B., Millsa, G., Byrd, H., Bingham, C., Zolotas, A. (2019). Sustainable cities: The relationships between urban built forms and density indicators *Cities* 95, 102382.

[3.] Alberizi, J. C., Rossi, M., Renzi, M. (2020), A MILP algorithm for the optimal sizing of an off-grid hybrid renewable energy system in South Tyrol. Energy Reports 6, 21–26

[4.] Ali, F., Ahmar, M., Jiang, Y., AlAhmad, M. (2020). A techno-economic assessment of hybrid energy system in rural Pakistan. *Energy*, https://doi.org/10.1016/j.energy.2020.119103.

[5.] Asibey, M. O.,King, R. S.,, Lykke, A. M., Daniel Kweku Baah Inkoom, D. K. B. (2021). Urban planning trends on e-waste management in Ghanaian cities. *Cities* 108, 102943.

[6.] Aziz AS et al., (2019). Feasibility analysis of grid-connected and islanded operation of a solar PV microgrid system: A case study of Iraq. *Energy*, https://doi.org/10.1016/j.energy.2019.11659.1.

[7.] Banai, R. (2020). Pandemic and the planning of resilient cities and regions. *Cities* 106, 102929.

[8.] Baruah, A., Basu, M., Amuley, M. (2021), Modeling of an autonomous hybrid renewable energy system for electrification of a township: A case study for Sikkim, India, *Renewable and Sustainable Energy Reviews* 135 , 110158

[9.] Cagnano, A. De Tuglie, E., Mancarella, P. (2020). Microgrids: Overview and guidelines for practical implementations and Operation. *Applied Energy* 258, 114039.

[10.] Caparros-Midwood, D., Dawson, R., Barr, S. (2019). Low Carbon, Low Risk, Low Density: Resolving choices about sustainable development in cities. *Cities* 89, 252–267.

[11.] Chaurey, A., Kandpal, T. C. (2010). A technoeconomiccomparisonofruralelectrificationbased onsolarhome systems andPVmicrogrids. *Energy Policy* 38, 3118–3129.

[12.] Cobbinaha, P. B., Gaisie, E., Oppong-Yeboaha, N. Y., Anim, D. O. (2020). Kumasi: Towards a sustainable and resilient cityscape. *Cities* 97, 102567.

[13.] Coelho, S., Russo, M., Oliveira, R., Monteiro, A., Lopes, M., Borrego, C. (2018). Sustainable energy action plans at city level: A Portuguese experience and perception. *Journal of Cleaner Production* 176, 1223e1230.

[14.] Cuesta, M. A., Castillo-Calzadilla, Borges, C. E. (2020). A critical analysis on hybrid renewable energy modeling tools: An emerging opportunity to include social indicators to optimise systems in small communities. *Renewable and Sustainable Energy Reviews* 122, 109691.

[15.] Debastiani, P. R. G., Nogueira, C. E., Acorci, J. A., Silveira, V, F., Siqueira, J. A. C., Baron, L. C. (2020). Assessment of the energy efficiency of a hybrid wind-photovoltaic system for Cascavel. *Renewable and Sustainable Energy Reviews* 131, 110013.

[16.] Del Pulgara, C. P., Anguelovskia, I., Connollya, J., (2020). Toward a green and playful city: Understanding the social and political production of children's relational wellbeing in Barcelona. *Cities* 96, 102438.

[17.] Dewi, S. P. (2012). How Does The Playground Role in Realizing Children-Friendly-City? *Procedia - Social and Behavioral Sciences* 38, 224 – 233.

[18.] Liu, H., Zhou, G., Wennersten, R., Frostell, B. (2014). Analysis of sustainable urban development approaches in China. *Habitat International* 41, 24e32.

[19.] Fazelpour, F., Soltani, N., Rosen, M. A. (2016). Economic analysis of standalone hybrid energy systems for application in Tehran, Iran. *International Journal of Hydrogen Energy*, 1 – 12.

[20.] Fu, Y., Zhang, X., (2017). Planning for sustainable cities? A comparative content analysis of the master plans of eco, low-carbon and conventional new towns in China. *Habitat International* 63 (2017) 55e66.

[21.] Guo, S., Liu, Q., Sund, J., Jin, H., (2018). A review on the utilization of hybrid renewable energy. *Renewable and Sustainable Energy Reviews* 91 (2018) 1121–1147.

[22.] Huseynov, E. F. O. (2011). Planning of sustainable cities in view of green architecture. *Procedia Engineering* 21, 534-542.

[23.] Łaszkiewicz, E., Sikorsk, D. (2020). Children’s green walk to school: An evaluation of welfare-related disparities in the visibility of greenery among children. *Environmental Science and Policy* 110, 1–13.

[24.] Li, M., Li, J. (2017), Analysis of methods of allocating grass space for the design of child-friendly cities: a case study of Changsha. *Procedia Engineering* 198, 790 – 801.

[25.] Mohamed, M. A., Eltamaly, A. M. Alolah, A. I. (2015). Sizing and techno-economic analysis of stand-alone hybrid photovoltaic/wind/diesel/battery power generation systems. *Journal of Renewable and Sustainable Energy*7, 063128.

[26.] Nan, F. (2020). Policy innovation on building child friendly cities in China: Evidence from four Chinese cities. *Children and Youth Services Review* 118, 105491.

[27.] Nastasi, B., Di Matteo, U. (2016). Solar energy technologies in Sustainable Energy Action Plans of Italian big cities. *Energy Procedia* 101, 1064 – 1071.

[28.] Gaonan, E. E., Trujillo, C. L., Guacaneme, J. A. (2015), RuralmicrogridsanditspotentialapplicationinColombia. *RenewableandSustainableEnergyReviews*5, 125–137.

[29.] Hirscha, A., Paraga, Y.,Guerrerob, J. (2018). Microgrids: A review of technologies, key drivers, and outstanding issues. *Renewable and Sustainable Energy Reviews* 90, 402–411.

[30.] Jahangir, M.H., Shahsavari, A., Vaziri Rad, M. A. (2020). Feasibility study of a zero emission PV/Wind turbine/Wave energy converter hybrid system for stand-alone power supply: A casestudy, *Journal of Cleaner Production* (2020), doi: https://doi.org/10.1016/j.jclepro.2020.121250.

[31.] Jansson, M., Sundevall, E., Wales, M. (2017), The role of green spaces and their management in a child-friendlyurban village. *Urban Forestry & Urban Greening* 18 (2016) 228–236.

[32.] Jenks, M., Burgess, R. (2000). *Compact Cities: Sustainable Urban Forms for Developing Countries*. Spon Press, London.

[33.] Khodayar, M. E. (2017), Rural electrification and expansion planning of off-grid microgrids. *The Electricity Journal*, http://dx.doi.org/10.1016/j.tej.2017.04.004.

[34.] Kirchhoff, H., Strunz, K. (2019).Key drivers for successful development of peer-to-peer microgrids for swarm electrification. *Applied Energy* 244, 46–62.

[35.] Liana, J., Zhang, Y., Ma, C. , yang, Y., Chaima, E. (2019). A review on recent sizing methodologies of hybrid renewable energy systems. *Energy Conversion and Management* 199, 112027.

[36.] Montuori, L., Alcázar-Ortega, M., Álvarez-Bel, C. Domijan, A. (2014). Integration of renewable energy in microgrids coordinated with demand response resources: Economic evaluation of a biomass gasification plant by Homer Simulator. *Applied Energy* 132, 15–22.

[37.] Nsafon, B. E. K., Owolabi, A. B., Butu, H. M. Roh, J. W., Suh, D., Huh, J. S. (2020). Optimization and sustainability analysis of PV/wind/diesel hybrid energy system for decentralized energy generation. *Energy Strategy Reviews* 32, 100570.

[38.] OECD (2012). *Compact City Policies: A Comparative Assessment.* OECD Green Growth Studies, OECD Publishing. *http://dx.doi.org/10.1787/9789264167865-en*.

[39.] Olatumiwa, L., Menkhilef, S., Ismail, M. S., Moghavvemi, M. (2020). Energymanagementstrategiesinhybridrenewableenergy systems:Areview. *RenewableandSustainableEnergyReviews*62. 821–835

[40.] Park, H., Andrews, C. (2018). City Planning and Energy Use. Elsevier.

[41.] Roche, M. Y. , Lechtenböhmer, S., Fischedick, M., Gröne, M. C., Chun Xia, Dienst, C. (2014). Concepts and Methodologies for Measuring the Sustainabilityof Cities. *Annu. Rev. Environ. Resour.* 39, 519–47.

[42.] Salihua, T. Y., Akorede, M. F., Abdullateef, A. I. (2020). Off-grid photovoltaic microgrid development for rural electrification in Nigeria. *The Electricity Journal* 33, 106765

[43.] Siahaan, Uras (2013), Arsitektur Kota,

[44.] Siahaan, Uras, (2015), Perencanaan Kota dan Permukiman

[45.] Singh, S., Singh, M., Kaushik, S. C. (2016). Feasibility study of an islanded microgrid in rural area consisting of PV, wind, biomass and battery energy storage system. *Energy Conversion and Management* 128, 178–190.

[46.] Subhadeep Bhattacharjee, S., Dey, A. (2014). Techno-economic performance evaluation of grid integrated PV-biomass hybrid power generation for rice mill. *Sustainable Energy Technologies and Assessments* 7, 6–16.

[47.] Suresh, V., Muralidhar, M., Kiranmayi, R. (2020). Modelling and optimization of an off-grid hybrid renewable energy system for electrification in a rural areas. *Energy Reports* 6, 594–604.

[48.] Tumer, W. J. N., Kinnane, O., Basu, B., (2014). Demand-side characterization of the Smart City for energy Modelling. *Energy Procedia* 62, 160 – 169

[49.] Thondoo, M., M'arquet, O., M'arquez, S., Nieuwenhuijsen, M. J. (2020), Small cities, big needs: Urban transport planning in cities of developing countries. *Journal of Transport & Health* 19, 100944.

[50.] Veilleux, G., Potisat, T., Pezim, D. Ribback, C., Ling, J., Krysztofinski, A., Ahmend, A., Papenheim, J., Pineda, A. M., Sembian, S., Chucherd, S. (2020). Techno-economic analysis of microgrid projects for rural electrification: A systematic approach to the redesign of Koh Jik offgrid case study. *Energy for Sustainable Development* 54, 1e13.

[51.] Wang, X., Van Dam, K. H., Triantafyllidis, C., Koppelaar, R. H. E. M., Shah, N. (2017). Water and energy systems in sustainable city development: A case of Sub-Saharan Africa. *Procedia Engineering* 198, 948 – 957.

[52.] Wanga, R., Hsua, S.C., Zhenga, S. Chen, J. H., Lia, X. X. (2020). Renewable energy microgrids: Economic evaluation and decision making for government policies to contribute to affordable and clean energy. *Applied Energy* 274, 115287.

[53.] Xua, D., Umatab, M., Mogia, G. (2019). Economic Comparison of Microgrid Systems for Rural Electrification in Myanmar. *Energy Procedia*, 159, 309-314

[54.] Yao, S., Xiaoyan, L. (2017). Exploration on Ways of Research and Construction of Chinese Child-Friendly City---- A Case Study of Changsha. *Procedia Engineering* 198, 699 – 706.

[55.] Yetano Roche, Stefan Lechtenböhmer, Manfred Fischedick, Marie-Christine Gröne, Chun Xia, Carmen Dienst (2014): *Concepts and Methodologies for Measuring the Sustainability of Cities*. In: Annual Review of Environment and Resources, Vol. 39:519–47