BLUE ECONOMY DEVELOPMENT IN INDONESIA

Oksana Razladova[1], **Antonio E.L.Nyoko**[2]
[1]Heriot-Watt University,UK [2]Nusa Cendana University, Indonesia
[1] *or2@hw.ac.uk*, [2]*antonio.nyoko@staf.undana.ac.id*

ABSTRACT

This work is highlighting the possibilities to enhance blue economy development in Indonesia with environmentally friendly and sustainable solutions to assure successful future and growth. Literatures review and Focus Group Discussion were conducted to collect Indonesia profiles and potential factors to be developed in blue economic strategic planning. Blue economy employment opportunities would enhance gender balance also due to specialization job offers where females proved to be potentially more productive than males. Marine Spatial Planning (MSP) originates from nature conservation approach in the Great Barrier Reef. MSP has gain since then a lot of attention due to overused of marine areas. Ecosystem based approach for MSP could result in clean, healthy, safe, productive, and diverse ocean. It could influence where and when the human activities could occur. MSP normally require authority to plan the one and another to implement. Funding normally has government based but could be supported with grants, partnerships, and private sector funding. All activities have to be monitored to assure progress of achievements and environmental effect.

***Keywords**: Blue Economy Development, Indonesia, Gresik, Marine Spatial Planning*

INTRODUCTION

This work is highlighting the possibilities to enhance blue economy development in Indonesia with environmentally friendly and sustainable solutions to assure successful future and growth. Indonesia - the largest economy in the South East Asia, has an obvious potential economic growth development due to surplus possibilities in female labor engagement. However, it is necessary to understand the current economic situation, issues and needs, as well as cultural background to achieve the maximum efficiency of suggested approach. Eastern societies generally considered to be collectivist and cultures with high power distance (Nozdreva et al., 2000). The current political culture and political consciousness of the society are also important. Even in ancient ages, the political ideas formed the moral system of the society. Political consciousness is the social consciousness that includes opinions, concepts, and ideological perception of the society. Political consciousness is the part of political activity and determined by the prevailing political system. (Zerkin, 2000). In 2002 female labor force was only 37.5%. Female literacy rate is 8% lower than males, and time spent in school on average is one year less (Badan Pusat Statistik, 2021). The data in income contribution is showing far more significant difference

– 38% compared to 62%. Moreover, regional disproportional in income distribution and poverty rates also should be highlighted. (Cahyonol et al. n.a)

What allows country to escape from poverty, or to achieve prosperity, is a process of growth over a succession of years. Therefore, one of the most important questions in economics, probably the most important one, is "what creates growth?" (Sorensen et al., 2005) Taking into consideration the World Bank strategy we would have a look to the basic needs approach. It states that productivity and income of the poor directly related to the provision of health and access to the education, also argued that facilities like water supply, sanitation, etc. should be provided publicly to assure wise spending. What is necessary to mention that developing countries considered such approach as possibility to influence their independence and sovereignty. Developing countries rely in their strategy to the need of investment; this fact is supported by many economists define this as a major factor assuring further growth. What could directly affect the country potential to produce and increase living standards are infrastructure and R&D investments. (Thirlwall, 2006) That in fact could result in more productive society. Indonesia is exporting mostly products of agricultural nature. (Badan Pusat Statistik, 2021) Blue economy sector is underdeveloped and should be enhanced with more knowledge intensive possibilities. The certain level of output would be required to employ females entering the labor market. Another aspect to consider is consistency with population growth that could result in the further increase in unemployment. This is again proving the importance of females become employed, since affect the number of children in the family consistent with time availability. The need of the skilled jobs creation is obviously arising as a challenge the country could face in the nearest proximity.

LITERATURE REVIEW

Politics & Culture

Indonesian republic was established in 1945, constitution adopted in 1950. Since 1949 country is member of Indonesian-Netherland Union led by Dutch Queen. Before 2002 the president and vice president were elected by the Indonesian government. Since 2004 election supposed to be conducted directly. President is responsible to appoint the cabinet of ministers. Since 1999 direct election is applied to local government. The country is a member of ASEAN, OPEC, and the UN. Indonesia is represented by a varied diversity of ethnical groups, emigrants' families are mostly Chinese, Indian or Arab origin. Before

the sovereignty in 1945, the number of printing material was issued at the Dutch language. After the independence, the public materials mostly use Indonesian dialects, Chinese and Dutch language. The official language of the country is Indonesian or Bahasa Indonesia. The large number of languages are used in the country, they are all interrelated and creating the Malago-Polynesian group. From 15 century Islam is prevailing religion, less common are: Brahmanism, Buddhism, and Christianity. In the minority of regions still prevailing totemism and shamanism. (Indonesia | Facts, People, and Points of Interest, 2019)

Social

According to OECD data 2018 population is equal to 265 million people, with a growth rate equal to 1.2%. Rural areas are inhibited with almost half of this figure. Below poverty line are 26 million people (Indonesia | Global Focus, 2021). According to the UN World Population Prospects 2019, Indonesia is within the nine countries that would assure more than 50% increase in the population worldwide. For the last decades, the mortality rates in the country have decreased significantly, mostly due to improvements in health provision and life quality (Indonesia - Urban Settlement | Britannica, 2020). However, the quality of the provided service in education and health care is still doubtful (Indonesia | Global Focus, 2021). According to UNICEF 2019 Annual Report children in the wealthiest region is five times more likely to be in school comparing to poor ones, such as Papua. About 4.4 million children and adolescents are not in school including those with disabilities. In the 1950s the education system was reorganized in accordance with US example. The number of higher education institution has increased from 10 in the 1950s to almost 3000 (Study in Indonesia | THE World University Rankings, 2017). The largest libraries are in Jakarta and in Bandung. According to the IEA report, one of the defined targets is the provision of high-quality jobs in engineering and project finance.

Environment

Indonesia discovered problems with the achievement of UN SDGs, the most challenges were noticed with SDG 9 – industry, innovation, and infrastructure (Santika et al., 2020). According to the joint ADB-ILO-IDB Environmental Performance Index, in 2010 Indonesia is ranked 134th out of 163 countries (Dutu, 2016). In 2015 Indonesia was the 5th largest GHG emitter (Yuaningsih et al., 2020). Nowadays child under- five

mortality compound 24 per 1000, the infant mortality is 20 per 1000. The main causes are respiratory infections. Air pollution is one of the main factors affecting children mortality (Indonesia (IDN) - Demographics, Health & Infant Mortality, 2021). It is necessary to note that most of the emissions in Indonesia are not due to industrial activity, 38% originated from peatland – mainly due to fires, 35% is due to changes in land use. According to the UN report within Asia Pacific countries affected by natural disasters, Indonesia is ranked the fourth compound for 312 cases, e.g. the earthquake and tsunami in 2004. (Miyata & Shibusawa, 2018) Following to COP21, it is required to reduce emissions in Indonesia up to 29% till 2030 (Dutu, 2016).

Energy

Indonesia's total area is 1904 thousand square km., from East to West is around 5100 km., and from North to South 1800 km. The country consists of more than 17000 islands. Thus, it is one of the largest countries in South East Asia and one of the fastest growing countries for energy consumption; the prognosis is that for the year 2030 it would more than triple (IRENA, 2017). Energy annual demand growth is expected to be at 8%. The investment in the energy projects mostly sourced from Indonesian government via PLN and its subsidiaries (Cameron et al., 2016). For the last two decades' sufficient achievements in the electricity access provision, despite the population growth could be noted. According to IRENA report 2017 highlighting the major renewable prospects in Indonesia, it is planned to provide 100% electricity access till 2026, to assure the current lack of electricity in 10% of the population.

Country and region economic information

As have been already mentioned, disproportional economic development between the regions in Indonesia could be noted. Poverty rate in East Java region is rather high in Bangkalan, Lamongan, Mojokerto, at the same time Gresik, Sidoarjo and Surabaya shows data with income per capita satisfactory for the normal living conditions (Cahyonol et al.,n.a). Looking more precisely to the Gresik region e.g. Ujung Pangkah Subdistrict the population is mostly involved in fishing (37%) and farming (45%). Almost one third of the land usage in the area is pond land and rice fields is approximately 1000 ha or 1/9 of the total Ujung Pangkah Subdistrict. During the pandemic, unemployment shows even further increase. The development of community is required as well as enhancement of gender

equality (ITS, Heriot-Watt, 2021). Following the necessity to reduce the level of unemployment in the rural area it is also necessary to consider possibility of rural-urban migration due to proximity of Surabaya (approx. 4 hours). The city emerged as a center to attract people to migrate due to employment opportunities and became the growing force prerogative. According to World Bank the poverty rates could be reduced due to development of agricultural sector and rural non-farm economy, i.e. market-oriented farming; non-farm rural employment; migration (World Bank, 2007). The IMF report suggested digitalization (e-commerce) to mitigate the pandemic effect and support of economic recovery in Indonesia. The necessity to meet SDG is highlighted with the need to increase expenditure on education, infrastructure, health and social safety (IMF Country report No 21/46: Indonesia, 2021). The Ujung Pangkah Subdistrict is also has another prevailing activity of aquaculture development. Gresik is designated for aquaculture industrial development (Badan Pusat Statistik, 2021). Despite that overall country development could be considered with enhancing intra-regional trade (i.e. relying on the competitive natural advantage each region could bring following the specialized production) aquaculture development has different origins and thus could provide the base for the variety of products.

Considering the sea life algae is an indispensable part that create sustainable natural conditions. In particular it involved in the food chain for the marine habitats, thus decreasing or disappearing of the one would affect the complete food chain system. Marine algae could be defined in several types green (more than 1800 species), brown (2000 species), red (more than 7200 species). It is possible to meet the terms such as microalgae and macroalgae. The main difference is the size of the plant, micro is microscopic one. Microalgae is within the major source for pharmaceutical industry due to contents of vitamins, minerals and anti-oxidants. Another the most important factor of algae is absorbing CO2 this is simply because cultivation of algae is required carbon dioxide. Besides the mentioned factors algae is a great possibility for biofuels production. Nowadays several parts of the world faced a problem of sufficient disappearing of the resource. As a solution artificial projects, "sea forest", were created in order to support the further development and utilization. Seaweeds has a variety potential usage: starting as a food possibility for humans that is an important factor for a food security, cosmetics production, organic fertilizer, marine algae, as have been already mentioned, also perfectly correspond for the biofuel production. What is defined is that usage of algae would lead

to the elimination of pollution and economically valuable effects, e.g. average annual value of the brown algae collected and cultivated worldwide could be estimated as USD 300 million. However, it is also necessary to consider that algae blooms, that usually occurs during the summer period could produce toxins that negatively influence the environment and could harmful influence to the marine inhabitants and humans. Bioenergy production: Nowadays research mostly covering the usage of microalgae after harvesting for bioethanol fermentation and biofuels production. Oil content in microalgae could exceed 80%. Production process of biodiesel from algae similar to those harvesting on the land. The benefits include higher and easier level of grows of such resource. Usual process includes biochemical processing (bio-refinery approach) – exceed the yield achieved with from terrestrial products, thermochemical process. Biochemical conversion – decomposition in the oxygen-deficient atmosphere for the production of methane gas or fermentation for production of alcohols or ethanol. Thermochemical process – decomposition under high temperature (500 – 900°C) in a low oxygen atmosphere. Production results in gas or liquids. Macroalgae has more potential for coastal countries and more suitable for production of biogas, however possibility for bioethanol is still exist. The production process is similar to microalgae. Perspective are within the large farms that could be combining with fish farming. The most potential areas defined with sea temperature 18-20°C. There are different possibilities for the algae production, however the most valuable is cultivating in the sea. This would maximize the resource potential as well as minimize environmental impact (Seaweed.ie, 2019);(Algae Biomass Organization, 2019); (Caron, D, 2010);(Chia R.S, 2017);(Najafi, G, 2011).

METHODOLOGY

This research aim to highlight the possibilities to enhance blue economy development in Indonesia. Literatures review and Focus Group Discussion were conducted to collect Indonesia profiles and potential factors to be developed in blue economic strategic planning in Indonesia. The member of FGD are the academics and university students from variety area of study in Indonesia and hosted by the academics and keynote speakers from Institut Teknologi Sepuluh Nopember Surabaya and Heriot-Watt University,United Kingdom.

RESULT AND DISCUSSSION

Blue Economy Employment

Blue economy employment opportunities would enhance gender balance also due to specialization job offers where females proved to be potentially more productive than males. Relying on the current regional specialization i.e. Ujung Pangkah Gresik Region defines 37% for fish production employment opportunities (ITS, Heriot-Watt, 2021) due to the number of observations available the preliminary analysis of the Cobb Douglas Production Function would be performed. The output production is defined from total Gresik GRDP as average Indonesian share of fishing, the data received consistent with provided share of Gresik GRDP for Agriculture, Fishing and Forestry; capital defined by internal food expenditure on fish products; and labor is considered as regional employment rate.

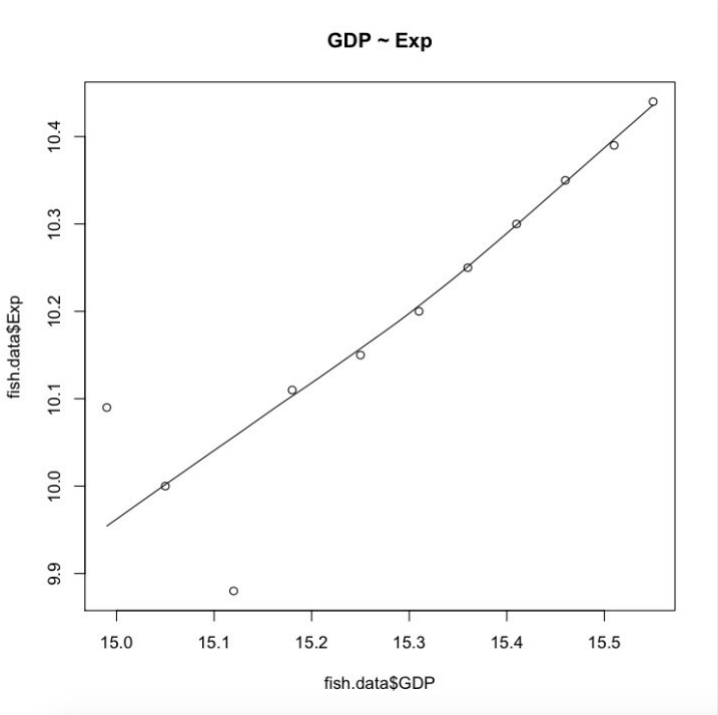

Fig. 1
Scatter diagram parameters Gresik regional GDP fishing share and local food expenditure - fish

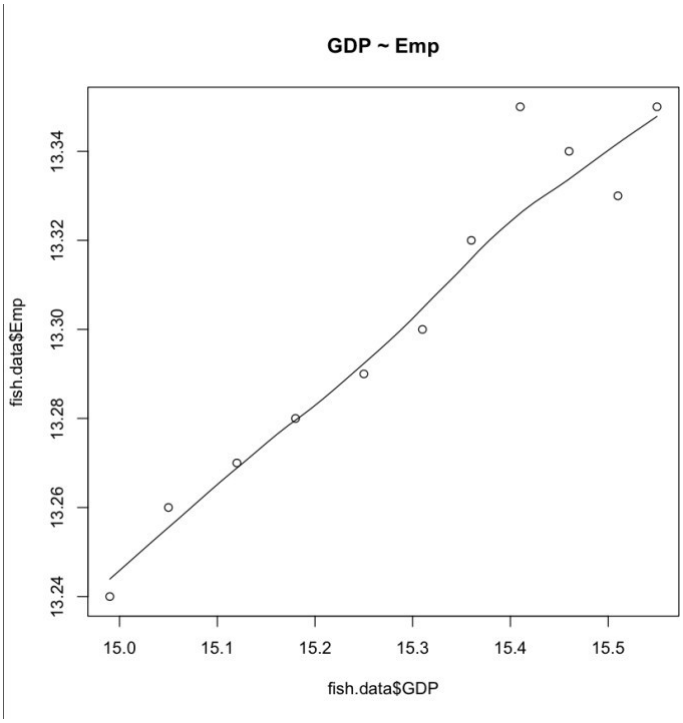

Fig. 2
Scatter diagram parameters Gresik regional GDP fishing share and total employment

The relationship estimated defines:

$\beta_2\, lnExp = 0{,}3$

$\beta_3\, lnEmp = 3{,}59$

That proves the marginal quantity of labor to be more influential on fishing production then regional expenditure on fish products. Since the level of employment influence the production, thus engagement of female labor force could bring additional benefits to regional GDP growth. However, the diversification of activities is important to keep the level of fishing at environmentally sustainable level, since increase in labor and technological approach could shift the yield and result in the environmentally inconsistent output. The East Java region has 58 fishing ports, almost all of them do not require special facilities and fishing unfortunately mostly not officially recorded. (Badan Pusat Statistik, 2021) From economic perspective it would also finally result in the reduction of the total output.

Energy Potential

IEA and OECD defined Indonesia as one of the world's top emerging and developing countries expected to account for the 90% of the global power demand growth

in the upcoming decades, and is taking globally around 4% of stand-alone system, and one of the ten countries with the largest potential market (OECD, 2018; IEA, 2020).

Almost 40% of TFEC in ASEAN region rely on Indonesia. Within Indonesia more than 50% of energy consumption goes to Java-Bali, Sumatra follows with one-quarter, and other islands consume around 19%: Kalimantan – 9%; Sulawesi – 6%; Bali & Nusa Tenggara – 3%; Maluku & Papua 1%; Bioenergy is dominating in industry, building, and transport. Residential, commercial and public buildings account for more than third of energy consumption – 2.5 EJ, where 90% goes to household's consumption, and 10% to commercial buildings. West Nusa Tenggara, Papua and Sulawesi taking the main part within the 13 poorest provinces that use fuelwood for cooking. Share of energy consumption in industry is the biggest – 2.7 EJ. Renewable energy use in industry is only bioenergy that is 22%. The consumption of energy in transport sector overall is 2EJ. The growth in the share was the fastest (IRENA, 2017).

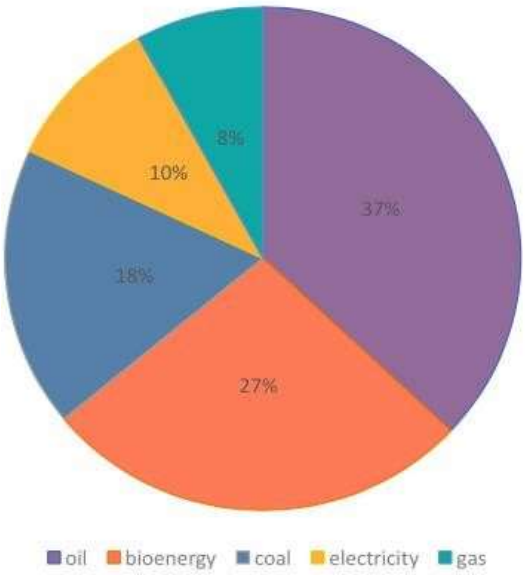

Fig. 3 Indonesia's TFEC (IRENA, 2017)

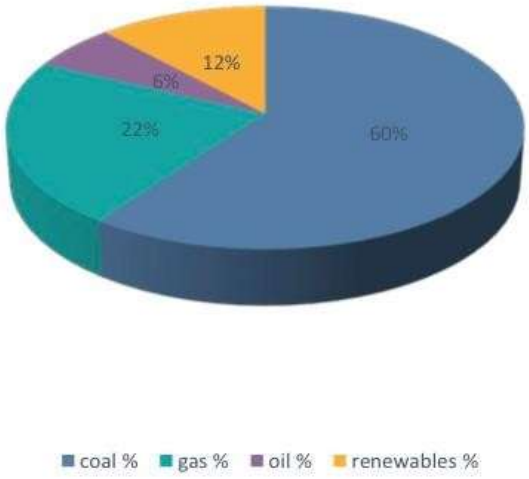

Fig. 4 Indonesia's electricity shares (Hartono et al., 2020)

Indonesia's financial inflows in the electricity development are insufficient. To achieve the targets the resources is needed for the electricity infrastructure. Thus, private sector would be crucial for such development. Renewable energy is supposed to account for 19.6% according to the NDC target, the further construction of 7.4 GW till 2030 would be necessary (Maulidia et al, 2019). The Indonesia's renewable energy target is 23% till 2025 and 31% till 2050 (Maulidia et al, 2019). Energy access is essential for the provision

of decent life conditions, such as to assure sanitation, clean water, health care, reliable lighting, heating, cooking, transport and telecommunication (Cameron et al., 2016). It is particularly true for the market the need to provide and maintain the access to electricity in different islands and strengthen the grid for renewable energy project integration. According to IEA report Indonesia is rather raw but potential market for off- grid projects. The feed-in-tariff supports projects with less than 10 MW capacities. Off-grid solutions could be viable to enhance the power access, but not eligible for feed-in-tariff (Cameron et al., 2016). The case of Indonesia grid extension could be extremely expensive since around 60 million reside in rural areas and outside the mostly populated islands. Thus, renewable energy-based village grids could provide the needed solution. Moreover, rural cooperation could generate and distribute electricity independently from PLN (Schmidt, Blum and Wakeling, 2013). Currently, electricity supplied in the rural regions either via grid extension or diesel generation (Maulidia et al., 2019). State own PLN – monopoly at the Indonesian electricity market – is planning to implement solar power village grids on several hundred islands in upcoming future (Schmidt, Blum and Wakeling, 2013). Low wind speed makes projects not very attractive for the development (Santika et al., 2020). Hydro and Geothermal despite the high potential assure additional difficulties due to land access. Country has a third largest tropical forest in the world. MSP in Indonesia used since 2014 for coasts and ocean in accordance with the national Law on the Sea (msp.ioc-unesco.org, 2020). The precise analysis of the legislation base for seabed usage and electricity generation is required, to identify the peculiar to the region expenses. Partnership with Belt and Road Initiative, Asian Infrastructure Investment Bank could bring additional benefits and assure the economic development of the action area. Moreover, further development of infrastructure especially roads, bridges, tunnels is energy intensive (Zhou, 2020). Country has a third largest tropical forest in the world. It would be also logical to consider this for the comparative analysis of the projects and provide additional research for the biodiversity under the threat. Preferably to conduct environmental assessment to assure the minimum level of the environmental disturbance. Consistency with nature and environmental improvement from renewable energy project would provide another important factor to enhance the country/region profile. Wave potential capacity in Indonesia is within the range of 15-40 kW/m (OES | Ocean Energy | GIS Map Tool, 2020). The wave energy potential is underestimated and almost not considered for implementation providing an available market share. Power facility is

infrastructure investment that has direct positive impact on productivity. Moreover, infrastructure investments lead to improvements in environmental conditions, support coping with population growth and power reduction (Thirlwall, 2006). This is doubtless true for the project of renewable power station. Implementation of off-grid wave power RVG project could be entitled for Indonesian electricity subsidies, additional funding via international or local grants, and international carbon credits due to replacement of diesel generators. (Schmidt, Blum and Wakeling, 2013) Moreover, innovative energy project would result in improvement of environmental conditions.

The RE potential of the country and implementation difficulties could be noted from the table below

Table 1: Indonesia Renewable Energy Potential
Sources: (Dutu, 2016); (Santika et al., 2020); (IRENA,2017); (Maulidia, et al, 2019); (Cameron et al., 2016); (Sugianto, et al, 2017); (Zikra, 2017)

RE	Indonesia Potential	Areas potential	Targets according to National Electricity General Plan (RUKN) 2015-2034	Installed capacity	Underdevelopment	Announced	Irena Remap In Gw/year	Burocratic obstacles	Land required	Energy price $/kWh
Solar	532.6 Gw	Sumatra 137.1 Gw Java-Bali 38.7 Gw Kalimantan 149.0 Gw Sulavesi & Nusa Tenggara 66.8 Gw Maluku & Papua 140.9 Gw	6.4 Gw	According to different sources from 42 to 80 Mw in 2011-2012	-	over 700 Mw	3.1	Exist	Complicated	0.10 $/kWh Feed-in-tariff for 150 Mw in Java and 100 Mw in other locations from 0.145 $/kWh to 0.25 $/kWh
Wind	Onshore: 9.3 Gw	Sumatra 1.0 Gw Java-Bali 3.9 Gw Kalimantan 0.3 Gw Sulavesi & Nusa Tenggara 3.9 Gw Maluku & Papua 0.3 Gw	1.8 Gw	9.4 Mw in 2016	50 MW in Samas (Java), 60 MW in Jeneponto (Sulawesi) and 70 MW in Sidrap (Sulawesi)	more than 500 MW	0.3	Exist	Complicated	0.10 $/kWh large scale PPA could be negotiated with PLN

Geothermal	29.5 Gw	Sumatra 12.9 Gw Java-Bali 10.1 Gw Kalimantan 0.2 Gw Sulavesi & Nusa Tenggara 4.8 Gw Maluku & Papua 1.5 Gw	7.1 Gw	1.4 Gw in 2014 mostly in Java	more than 1Gw till 2017	-	0.6	More strict due to forest location	More complicated	0.10 $/kWh Feed-in-tariff 0.122 $/kWh – 0.296 $/kWh
Hydro	Large hydro 75 Gw;	Small Hydro: Sumatra 5.7 Gw Java-Bali 2.9 Gw	21 Gw	-	-	-	1.6	More strict Due to location	More complicated	0.10 $/kWh
	Small hydro 19.4 Gw	Kalimantan 8.1 Gw Sulavesi & Nusa Tenggara 1.8 Gw Maluku & Papua 0.8 Gw								< 10 Mw Feed-in-tarif depends from region and vary in years e.g. Papua for the first 8 years 0.12 $/kWh – 0.144 $/kWh then 0.075 $/kWh – 0.09 $/kWh ; large scale PPA could be negotiated with PLN.
Ocean	Tidal: 18Gw Wave: 1200 MW with plant capacity of 0.5 - 2 MW	Tidal: Sumatra 8.3 Gw Java-Bali 2.4 Gw Sulavesi & Nusa Tenggara 6.9 Gw Maluku & Papua 0.4 Gw Wave : Sungai Pulau, Bengkulu 7.703 MW/year 1.9	3.1 Gw			Wave: 1.5 MW. The annual production 10 GWh with expected cost of energy 6 cents (US) per kWh	0.3	Exist	Seabed	0.10 $/kWh Feed-in-tariff not applicable

		GW/year South of Java 15 to 22 kW/m								

[1] Challengeable process to obtain permit due to different licences from different autorities (Maulidia et al, 2019);

[2] Land rights in Indonesia are complicated. According to the Agrarian Law (1960) the land rights have to be registered but time frames were not determined. Only 1/3 of privately owned plots were registered by National Land Agency (BPN) in the last four decades. In rural areas the land mostly unregistered. The right of the new owner could not be legally confirmed until the certificate received that confirms that land is not state land (Dutu, 2016) (IRENA,2017) (Maulidia, et al, 2019);

[4] Projects below 10 MW are eligible for feed-in-tarif; (Cameron et al., 2016) PLN issued regulation not in line with Ministry of Energy's policy for the tariff of micro hydro; (Maulidia et al, 2019); Off-grid are not eligible for the feed-in-tarif (Cameron et al., 2016); feed-in-tariff limited to 85-100 % of PLN's regional production price, electricity subsidies as of 2014 USD 0.042 per kWh (IRENA,2017); Frequent policy changes (Santika et al., 2020); Support to coal industry (Dutu, 2016) (Santika et al., 2020);

CONCLUSION

Land considers to be a highly political issue that historically resulted in wars. Legislative aspects of the countries could bring correction of the decisions for the economic agents decided to start activity in the sector. Considering renewable energy projects would require rather large land plots with specific location due to resource availability. Merger of marine and land planning is rather challengeable, even that systems is obviously interacts. Integrated Coastal Zone management were offered as a solution; however, implementation was faced difficulties due to scope and geographical coverage. Marine spatial planning is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas. This is done to achieve ecological, economic and social objectives. GVA of global economy is in increasing pattern, ocean economy keeping the share equal 2.5%. Marine Spatial Planning (MSP) originates from nature conservation approach in the Great Barrier Reef. MSP has gain since then a lot of attention due to overused of marine areas. Ecosystem based approach for MSP could result in clean, healthy, safe, productive, and diverse ocean. It could influence where and when the human activities could occur. MSP normally require authority to plan the one and another to implement. Funding normally has government based but could be supported with grants, partnerships, and private sector funding. All activities have to be monitored to assure progress of achievements and environmental effect.

REFERENCES

Active with Indonesia. OECD, Oct. 2018.

Algae Biomass Organization. (2019). Renewable and sustainable commodities derived from algae. [online] Available at: https://algaebiomass.org

Annual Report Indonesia Focus. UNICEF, 2019.

bps.go.id. 2021. Badan Pusat Statistik. [online] Available at: <https://www.bps.go.id/> [Accessed 22 September 2021].

Cameron, Lachlan, and Xander van Tilburg. The Case for Small and Medium Scale Renewable Energy Investments in Indonesia. Policy Brief. ECN Policy studies, Mar. 2016.

Caron, D., Garneau, M., Seubert, E., Howard, M., Darjany, L., Schnetzer, A., Cetinić, I., Filteau, G., Lauri, P. and Jones, B. (2010). Harmful algae and their potential impacts on desalination operations off southern California. Water Research, 44(2), pp.385-416.

Chia R.S.l , 2017. Sustainable approaches for algae 10tilization in bioenergy production

Dahno I., 2000. International Economic Law Kyiv: Interregional Academy of Personal Management

Doumen D., Dennison D., Doumen M., 2004 Market research is easy Rostov-on-Don:

Phenix
Dutu, R., 2016. Challenges and policies in Indonesia's energy sector. Energy Policy, 98, pp.513-519.
Energy Management Programmes for Industry, IEA, 2012
Gielen, Dolf, et al. Renewable Energy Prospects: Indonesia. IRENA, 2017. Gresikkab.bps.go.id. 2021. Badan Pusat Statistik. [online] Available at:
<https://gresikkab.bps.go.id/> [Accessed 22 September 2021].
Gu, A. and Zhou, X., 2020. Emission reduction effects of the green energy investment projects of China in belt and road initiative countries. Ecosystem Health and Sustainability, 6(1), p.1747947.
Hartono, Djoni, et al. "Comparing the Impacts of Fossil and Renewable Energy Investments in Indonesia: A Simple General Equilibrium Analysis." Heliyon, vol. 6, no. 6, June 2020, p. e04120, 10.1016/j.heliyon.2020.e04120. Accessed 10 Nov. 2020.
Indonesia – Countries & Regions – IEA. "Indonesia – Countries & Regions – IEA." IEA, 2016, www.iea.org/countries/Indonesia.
www.imf.org. 2021. [online] Available at:
<https://www.imf.org/en/Publications/CR/Issues/2021/03/01/Indonesia-Selected-Issues- 50132>
www.imf.org. 2021. [online] Available at:
<https://www.imf.org/en/Publications/CR/Issues/2021/03/01/Indonesia-2020-Article-IV- Consultation-Press-Release-Staff-Report-and-Statement-by-the-50131>
"Indonesia (IDN) – Demographics, Health & Infant Mortality." UNICEF DATA, data.unicef.org/country/idn/.
"Indonesia | Facts, People, and Points of Interest." Encyclopædia Britannica, 2019, www.britannica.com/place/Indonesia.
"Indonesia | Global Focus"---. Reporting.Unhcr.org, reporting.unhcr.org/node/10335.
"Indonesia – Urban Settlement | Britannica." Encyclopædia Britannica, 2020, www.britannica.com/place/Indonesia/Urban-settlement.
ITS, Heriot-watt. The Place of Blue Energy In The Blue Economy: Developing An Indonesian Blueprint. 2021
Laurens N.L. 2017. State of Technology Review – Algae Bioenergy An IEA Bioenergy Inter- Task Strategic Project. IEA
Najafi, G., Ghobadian, B. and Yusaf, T. 2011. Algae as a sustainable energy source for biofuel production in Iran: A case study. Renewable and Sustainable Energy Reviews, 15(8), pp.3870-3876.
Maulidia, M., Dargusch, P., Ashworth, P. and Ardiansyah, F., 2019. Rethinking renewable energy targets and electricity sector reform in Indonesia: A private sector perspective. Renewable and Sustainable Energy Reviews, 101, pp.231-247.
Miyata, Y. and Shibusawa, H., n.d. Environmental And Natural Disaster Resilience Of Indonesia. Mori, A., 2020. Foreign actors, faster transitions? Co-evolution of complementarities, perspectives and sociotechnical systems in the case of Indonesia's electricity supply system. Energy Research & Social Science, 69, p.101594.
Msp.ioc-unesco.org. 2020. Overview. [online] Available at: <http://msp.ioc-unesco.org/world- applications/overview/> [Accessed 4 December 2020].
Nozdreva R., Sineckiy B., Kormyshev V., Myasoedov S., Polyanova T., 2000 Organisation and Management of foreign economic activity Moscow: INFRA-M
"OES | Ocean Energy | GIS Map Tool." Www.Oceanenergysystems.org, www.oceanenergysystems.org/ocean-energy/gis-map-tool/. Accessed 10 Nov.

2020.
Priyoko Prayitnoadi, R, et al. "Analysis of Sea Wave Power Plant Design in Bangka Island Indonesia." IOP Conference Series: Materials Science and Engineering, vol. 694, no. 10.1088/1757-899X/694/1/012021, 21 Nov. 2019, p. 012021, 10.1088/1757-899x/694/1/012021. Accessed 10 Nov. 2020.
Santika, W., Urmee, T., Simsek, Y., Bahri, P. and Anisuzzaman, M., 2020. An assessment of ener policy impacts on achieving Sustainable Development Goal 7 in Indonesia. Energy for Sustainable Development, 59, pp.33-48.
Shaukat, Amama, et al. "Board Attributes, Corporate Social Responsibility Strategy, and Corporate Environmental and Social Performance." Journal of Business Ethics, vol. 135, no. 3, 7 Feb. 2015, pp. 569–585, link.springer.com/article/10.1007%2Fs10551-014-2460-9, 10.1007/s10551-014-2460-9.
Schmidt, T., Blum, N. and Sryantoro Wakeling, R., 2013. Attracting private investments into rural electrification — A case study on renewable energy based village grids in Indonesia. Energy for Sustainable Development, 17(6), pp.581-595.
Seaweed.ie. 2019. The Seaweed Site :: information on marine macroalgae. [online] Available at: http://www.seaweed.ie
Sørensen, P. and Whitta-Jacobsen, H., 2005. Introducing Advanced Macroeconomics. Maidenhea McGraw-Hill.
"Study in Indonesia | THE World University Rankings." Times Higher Education (THE), 16 Feb. 2017, www.timeshighereducation.com/student/where-to-study/study-in-indonesia. Accessed 10
Nov. 2020.
Sugianto, Denny Nugroho, et al. "Wave Energy Reviews in Indonesia." International Journal of Mechanical Engineering and Technology, vol. 8(10), Oct. 2017, pp. 448–459., www.iaeme.com/IJMET/issues.asp?JType=IJMET&VType=8&IType=10.
Taranuha U., Zemlyakov D., 2002 Microeconomics Moscow: Lomonosov Moscow State University I Servis.
The World Bank. Available at: <https://www.worldbank.org/en/understanding-poverty>
Thirlwall, A., 2006. Growth And Development. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan.
Varian, H. and Varian, H., 1992. Answers To Exercises, Microeconomic Analysis, Third Edition. Ne York: Norton.
Wave Energy Scotland Limited, 2016. High level cost metrics for WEC machine element World Energy Investment – Country Focus. Attracting Private Investment to Fund Sustainable
Recoveries: The Case of Indonesia's Power Sector. IEA, July 2020.
Yazdani-Chamzini A. et al. 2013: Selecting The Optimal Renewable Energy Using Multi Criteria Decision Making
Yuaningsih, L., Febrianti, R. and Kamran, H., 2020. Reducing Co2 Emissions Through Biogas, Wind And Solar Energy Production: Evidence From
INDONESIA. International Journal of Energy Economics and Policy, 10(6), pp.684-689. Zerkin D., 2000 Political Science Rostov-on-Don: Phenix
Zikra, Muhammad. "Preliminary Assessment of Wave Energy Potential around Indonesia Sea." Applied Mechanics and Materials, vol. 862, no. 10.4028/www.scientific.net/AMM.862.55, Jan. 2017, pp. 55–60, 10.4028/www.scientific.net/amm.862.55. Accessed 5 Sept. 2019.