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WAQF LAND AND SUKUK FRAMEWORK FOR WASTE DISPOSAL MANAGEMENT – A CONCEPTUAL STUDY

Mohamed Asmy Mohd Thas Thaker[a1♣], Md Fouad Bin Amin[b], Hassanudin Mohd Thas Thaker[c], Ahmad Khaliq[d], Anwar Allah Pitchay[e], Neneng Ela Fauziyyah[f] & Riasat Amin Imon[g]

[a,d,f,g] *International Islamic University Malaysia*
[b] *King Saud University*
[c] *Sunway University Malaysia*
[e] *Universiti Sains Malaysia*

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ABSTRACT

This paper proposes a viable alternative model for waste management, termed the Waqf Land-Linked Blue Sukuk (WLLBS) model. Owing to its ever-increasing amounts of waste, this paper specifically addresses waste-management in the Indonesian context, specifically, bioplastic production to reduce waste-generation. As this paper focuses on the conceptual development of the WLLBS model, it employs a qualitative content-analysis methodology. In addition to analyzing the literature pertaining to waste-management in Indonesia, this study examines existing studies on the integration of Waqf (Islamic endowment) and Sukuk mechanisms to construct the WLLBS as a funding model. The research identifies environment-friendly bioplastic production using seaweed, as a viable means to significantly reduce the total waste-volume. However, this initiative requires tremendous financial support. In order to address this issue, an innovative Islamic financial mechanism involving the integration of Sukuk and Waqf, is proposed. Similar to the successes of green Sukuk in reducing global carbon emissions (SDG 14), it is hoped that blue Sukuk will similarly address the funding gap to sustain a large-scale seaweed-based bioplastic project in Indonesia. The development of the WLLBS model has huge implications on sustainable development as it reduces the national pollution footprint, furthers the national environmental protection agenda, and eases the government fiscal and debt burdens. These also impact human welfare in terms of quality of living and health. Furthermore, the development of the WLLBS has positive implications on Islamic financial innovation as variations of this model could be adapted to sustainably financing other social-development-related issues.

ABSTRAK

Kertas kerja ini mencadangkan model alternatif yang berdaya maju untuk pengurusan sisa, yang dinamakan model Sukuk Biru Berkaitan Tanah Wakaf (WLLBS). Disebabkan oleh jumlah sisa yang semakin meningkat, makalah ini secara khusus menangani pengurusan sisa dalam konteks Indonesia, khususnya, pengeluaran bioplastik untuk mengurangkan penjanaan sisa. Oleh kerana kertas kerja ini memberi tumpuan kepada pembangunan konsep model

[1♣] Corresponding author; Mohamed Asmy Mohd Thas Thaker, PhD, Associate Professor at Kulliyyah of Economics and Management Sciences, International Islamic University Malaysia, Gombak, Malaysia. E-mail: asmy@iium.edu.my

WLLBS, ia menggunakan metodologi analisis kandungan kualitatif. Di samping menganalisis literatur yang berkaitan dengan pengurusan sisa di Indonesia, kajian ini mengkaji kajian sedia ada mengenai integrasi mekanisme Wakaf (wakaf Islam) dan Sukuk untuk membina WLLBS sebagai model pembiayaan. Penyelidikan mengenal pasti pengeluaran bioplastik mesra alam menggunakan rumpai laut, sebagai cara yang berdaya maju untuk mengurangkan jumlah isipadu sisa dengan ketara. Walau bagaimanapun, inisiatif ini memerlukan sokongan kewangan yang luar biasa. Bagi menangani isu ini, satu mekanisme kewangan Islam yang inovatif melibatkan penyepaduan Sukuk dan Wakaf, dicadangkan. Sama seperti kejayaan Sukuk hijau dalam mengurangkan pelepasan karbon global (SDG 14), Sukuk biru juga diharapkan dapat menangani jurang pembiayaan untuk mengekalkan projek bioplastik berasaskan rumpai laut berskala besar di Indonesia. Pembangunan model WLLBS mempunyai implikasi besar terhadap pembangunan mampan kerana ia mengurangkan kesan pencemaran negara, memajukan agenda perlindungan alam sekitar negara, dan meringankan beban fiskal dan hutang kerajaan. Ini juga memberi kesan kepada kebajikan manusia dari segi kualiti hidup dan kesihatan. Tambahan pula, pembangunan WLLBS mempunyai implikasi positif ke atas inovasi kewangan Islam kerana variasi model ini boleh disesuaikan untuk membiayai secara mampan isu berkaitan pembangunan sosial yang lain.

Keywords: Seaweed, Plastic Waste, Waqf, Sukuk and Islamic Financing

1. Introduction

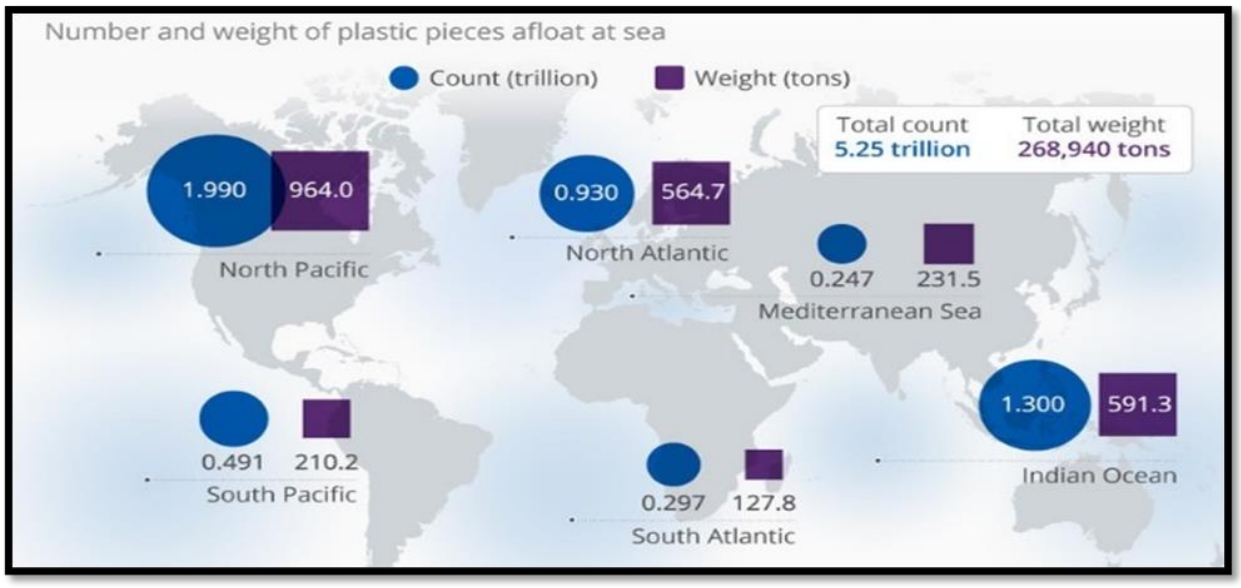
The United Nations Development Program (UNDP) determined 17 Sustainable Development Goals (SDGs) for its member nations to commit to in 2015. The SDGs include a wide range of social development criteria based on the five domains or five Ps of people, planet, peace, prosperity and partnership. SDGs are the improved version of the Millennium Development Goals (MDGs) which was less comprehensive, as is evident from its only eight target goals. More specifically, the SDG-framework also recognizes developed countries as part of global concerns, whereas the MDGs were restricted to developing countries. The 17 SDGs, are further quantified into a total of 169 specific measurable targets and indicators that are to be achieved or implemented over a fifteen-year period, known as the 2030 Agenda-SDGs (Woolbridge, 2015).

The SDGs pay particular attention to upgrading the quality of the environment, economy and society. Pertaining to the environment, SDG 14 attempts to protect and conserve all aquatic life systems and resources of the oceans and seas. Apart from the restrictions on overfishing and illegal, unreported and unregulated fishing practices, this goal also emphasizes the protection of all marine and coastal areas against common forms of pollution such as plastic waste and marine debris. The preservation and sustainability of underwater life and resources, which covers more than 70% of the Earth's surface, can confer huge benefits on the global economy in terms of food, products and services (UN News Centre, 2015).

Over the last few years, the worldwide campaign on the awareness of environment-friendly plastic usage and management of plastic waste, has gained increasing traction in academia and the industry. It is a global issue in terms of environmental contamination, social inclusion and economic sustainability, which demands an integrated and holistic modeling approach for its solution. Further attention is needed in developing and transition countries where economic sustainability is unfeasible due to budgeting concerns and lacking expertise and resources. Unfortunately, not addressing these concerns only worsens social, economic, legislative, political, technical and operational outcomes, which is antithetical to sustainable development agenda.

One of the main sources of environmental pollution originates from the rampant use of plastic in everyday life. The extensive plastic usage causes unbearable harms to plant and animal life on land and in water.

Schmidt et al. (2017), as quoted by a UN report, finds that about 8 million tons of plastic waste was channeled by ten of the world's largest rivers (Asia: the Yangtze; Indus; Yellow; Hai He; Ganges; Pearl; Amur; Mekong; in Africa: the Nile and the Niger) to the ocean. It is also suspected that if the pollution continues at this rate, there will be more plastic than fish in the ocean by 2050. In a largely populated country like India, there are two big rivers i.e., Indus and Ganges, which channels the largest volumes of plastic debris into the ocean. Indonesia, having one of the largest populations in the world, is also responsible for this pollution. The next section highlights the position of Indonesia in this context.



Source: World Economic Forum, Agenda, 2018
Figure 1: The World's Oceans Are Infested with Plastic

The Ministry of Environment and Forestry in Indonesia reveals that around 12.7 million tons of plastic wastes were discarded into the ocean until 2017, which accounted for 80% of total plastic waste (Ambari, 2017). These plastic wastes are not only polluting the surrounding coastal areas but also creating hazards to local inhabitants and tourists. It also causes an adverse effect on the underwater ecosystem. A study conducted by the Research Centre of Oseanografi LIPI[1] identifies that only 6.39% of the coral reef in Indonesia can still be considered completely eco-friendly, whereas only 23.4% and 25.06% are observed to have a good to moderate quality of coral reef systems, respectively. The study also shows that around 35.15% of the coral reef is in an alarming condition (Koran Sindo, 2018). Pollution particularly from plastic wastes are the chief cause of death for a variety of sea creatures in different places as depicted in Table 1 (below). The data confirms that the main cause of the huge number of dead fishes is due to plastic waste consumption. This does not only happen to fishes, but other sea creatures that are endangered by these hazardous toxic wastes, which significantly reduces their life spans in the long run. In addition, Indonesia is the world's second-largest plastic polluter, behind only China. Plastic waste in oceans has far reaching consequences as they also directly harm entire marine ecosystems. Sea creatures like whales, turtles and fish often mistake floating plastic debris for food, swallowing material they are unable to digest. The plastic accrues in their bodies over their lifetime, killing them and/ or working their way up the food chain, and eventually circling back to humans.

[1] LIPI is Lembaga Ilmu Pengetahuan Indonesia

Table 1. Current Dead Whale and Turtle Phenomena

No	Species	Phenomenon
1	Sperma Whale	Dead on November 2018 at Wakatobi, Southeast Sulawesi, Indonesia Swallowed 5.9 kg of plastic waste
2	Turtle	Dead on December 2018 at Congot Beach, Yogyakarta, Indonesia Swallowed plastic waste
2	Ziphius Cavirostris Whale	Dead on March 2019 at Philippines, Swallowed 40 kg of plastic waste
3	Sperma Whale (Pregnant)	Dead on Maret 2019 at Sardinia, Italia, Swallowed 22 kg of plastic waste

Source: Kami (2019), Putri (2019), Zebua (2018)

In line with the goals 14 of SDGs, which concerns more towards ocean conservation, Indonesia has lagged in fulfilling the goal. The real scenario due to the causes of this particular pollution is not well captured by many studies. This limitation might be because of people's ignorance toward the marine environment or it has naturally happened from abrasion, climate change, natural disaster, etc., actually fails to draw attention to many challenges facing by the local inhabitants. Realizing these facts along with the target of achieving the SDGs' agenda, there is a need for a creative and innovative approach for drawing suitable and sustainable solutions to the problems.

Over the last few years, the concept of environment-friendly bioplastic product has not only been discussed among the bio-researchers but also implemented by using natural ingredients such as cassava, corncob, potato starch, banana peel, etc. Since the production of bioplastic requires mostly daily consumed foods, there is huge room for future research in order to search for other available and economical alternatives to support bioplastic production on large scale. Indonesia is naturally blessed with large coastal areas became a huge potential for massive production of bioplastic from abundant seaweeds. Thus, it may open a new spectrum for input substitution from the byproducts originated from daily consumed goods to the seaweed. This substitution process can generate benefit to the local agricultural farming because the bioplastic production requires no plant-based ingredients except the seaweed.

In order to implement environment-friendly bioplastic production using seaweed, it requires tremendous financial support. This paper proposes an innovative Islamic financial mechanism, such as the integration of Sukuk and Waqf, to be utilized especially for implementing the bioplastic production process. Realizing the successful application of green Sukuk in reducing carbon emissions, achieving goal 14 of SGDs, the blue Sukuk can also be applied particularly to generate necessary funds to finance the seaweed-based bioplastic project in Indonesia.

The objective of this paper is to offer a viable alternative model for waste management, termed as the Waqf Land Linked Blue Sukuk (WLLBS) model, which is expected to contribute to reduce environmental pollution in Indonesia. This research guided by two main research questions namely: (i) What is the proposed model to overcome the issue related to waste management? And (ii) How does this proposed model offers advantage to the policy maker or any other equivalent parties? We claim several contributions that generalised from this study. Firstly, this study could have an enormous impact on reducing environmental pollution via using innovative Islamic financial mechanisms, such as the integration of Sukuk and Waqf. The most important impact would be on government budgets since this WLLBS model is expected to generate its own funds from Sukuk for implementing the bioplastic production process. Secondly, the proposed model is significant not only to the local government for

materializing its environmental protection policy but also to the local economy for creating jobs and reducing poverty. Finally, the knowledge contribution whereby none of the existing literature incorporate Waqf model in reducing pollution. Through we this study, we hope the findings of this study could a game changer to enhance the waste management system and enhance the literature availability.

This study structured as follows: first section discusses about the introduction followed by the literature review. The next section postulates on the proposed model and contributed with significances of the mentioned model. Finally, this study offers conclusion.

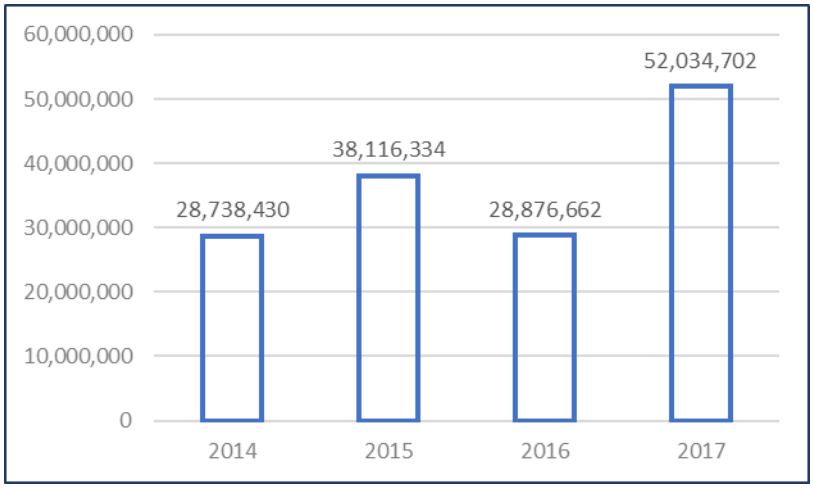
2. Literature Review

Seaweed bioplastic

A good number of studies focus on the huge potential of seaweed as the main sources or ingredients of bioplastic (Rajendran N et al., 2012; Gade et al., 2013; Pathak et al., 2014; Hii et al., 2015; Helmes et al., 2018; Souza and Unnikrishnan, 2018). Most of the studies suggest a substitution of other sources that need cultivation to seaweed to reduce the extensive pressure on agricultural land.

From a global perspective, Pathak et al. (2014) point that seaweed-based biomass is more economical and it generates more profit rather than other natural materials. This input shifting neither creates any harmful impact on the natural food chain nor increase dependency on chemical-based activities. The author also mentions that seaweed-based bioplastic product is more elastic and stronger to even survive from microwave radiation. There are various types of bioplastic products that can be used for the packaging industry, catering industry that needs bowls, plate, spoons, pots, one-time use by the medical stakeholders, automobiles industry that needs light materials for vehicles' body and biofuels (Rajendran N et al., 2012).

BKIPM[2], a notable institution in Indonesia, recorded that national seaweed traffic increased by 80.20% from 2016 to 2017 reached to 52,034,702 kilograms (Figure 2). The majority (99.86%) was dry seaweed while the rest were the wet seaweed, seaweed seed and processed seaweed. In 2017, around 70.66% of total seaweed came from North Kalimantan and distributed to the highest demanding province as East Java (54.82%), following by South Sulawesi (40.66%) (BKIPM, 2018).

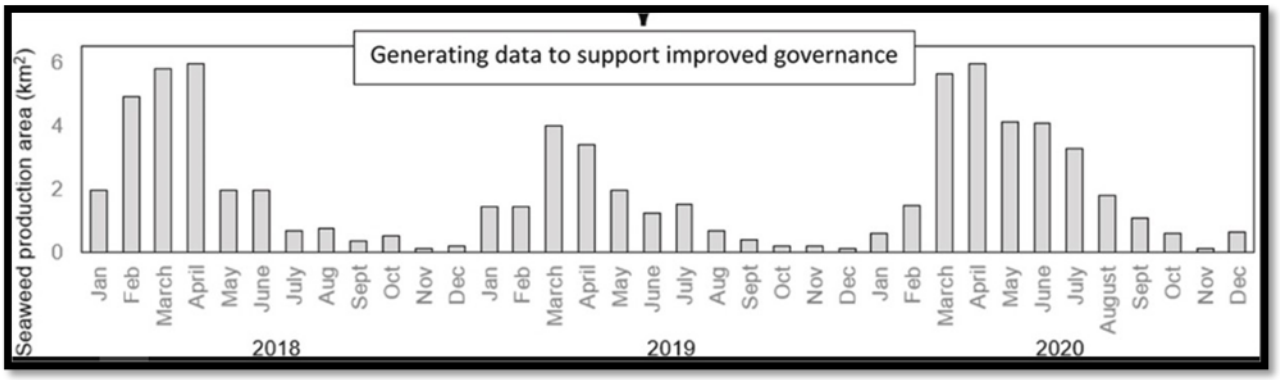


Source: BKIPM (2018)

[2] Badan Karantina Ikan, Pengendalian Mutu dan Keamanan Hasil Perikanan

Figure 2: National Seaweed Traffic

In addition, the seaweed production area also seen to expand especially from January until April as depicted in Figure 3 below



Source: Alexandra Langford (2021)
Figure 3: Seaweed Production Area (KM^2)

Furthermore, the BKIPM (2018), as quoted from UN-Comtrade (2015), stated that Indonesia exported around 70.01% of its total volume of dry seaweed (169,64 thousand tonnes) to the rest of the world in 2014. The main contributors of international seaweed market are China (55,42%), Japan (14,04%), Korea (6,11%), France (4,70%) and US (3,06%).

Overview of sukuk

According to AAOIFI as mentioned in ISRA (2012), "Sukuk is a certificate of equal value representing undivided interest regarding with a proprietary underlying asset consists of a tangible and intangible asset, usufruct, services on a particular project or special investment activities." AAOIFI has listed a total of 14 types of assets that fall under the Sukuk structure. These assets can be further categorized into five structures based on the technical and commercial feature, namely asset-backed Sukuk, asset-based Sukuk, hybrid Sukuk, subordinate Sukuk as well as stapled Sukuk. Again, the Sukuk structure can be varied based on the contract such as equity-based Sukuk (*mudharabah* and *musyaraka*h), lease-based Sukuk (*ijarah*), sale-based Sukuk (BBA, *murabahah, salam* and *istisna'*) and agency-based Sukuk (*wakalah*) (ISRA, 2012).

In 2019, Indonesia was the second-largest Sukuk issuing country in the world after the United States. With an issue-value of US $15 billion (Rp214 trillion), the government accounted for 18% of the total global Sukuk issuance of US $87 billion (Rp1,244 trillion) according to Moody's Investors Service (2019). The release of green Sukuk is one of the causes for the massive creation of Indonesian Sukuk. The use of green Sukuk in Indonesia will continue to expand in line with Indonesia's objective to cut its carbon emissions and to create more environmentally sound projects.

The concept and development of the proposed Blue Sukuk model provides another, more focused, environment-friendly option, while also providing an opportunity for the advancement of Islamic finance. Although some of its characteristics may be deemed similar to those of Green Sukuk, the aim of the Blue Sukuk and its design focuses on financing the marine economy. Forming an instrument such as the Blue Sukuk not only helps to ensure the protection and sustainable use of the oceans through investment in the

blue economy, it also helps build ocean resilience over the longer term. The Republic of Seychelles took the lead in launching the world's first sovereign blue bond in October last year, raising $15 million to protect marine environments and safeguard its territorial fisheries. Though this seems a relatively small issuance, the bond points to a growing interest in blue financing which is much needed for the sustainability of coastal areas that rely heavily on the ocean for food security, tourism, and people's livelihoods.

Research related to the development of Blue Sukuk has never been carried out as it is a relatively new concept. Earlier studies on the evolution of Sukuk and the blue economy are also scant. For example, Rusydiana and Irfany (2021) opine that the application of Blue Sukuk in Indonesia could be feasible especially with the important foundations needed in the development of Blue Sukuk such as a formal regulatory framework and interinstitutional coordination that boosts investor confidence in backing marine ecosystem-sustaining projects. Furthermore, Ismatullah (2011) in his study "Maritime Economic Paradigm in the Perspective of Islamic Economics," indicates that the future pattern of Indonesia's economic development must be geared towards marine economic policy. In this respect, his research also highlights that the Qur'an has also emphasized the importance of preserving the marine economy in its verses, from the beginning.

Arshad et al. (2018), Mitsaliyandito and Arundina (2018), Rahman et al. (2017), Altaleb and Alkhatib (2016), and Nienhaus and Karatas (2016) did several studies on Sukuk, particularly the issue of state-owned Sukuk in many locations (2016). For example, Mitsaliyandito and Arundina (2018) and Jarkasih and Rusydiana (2018) carried out specific research in Indonesia (2009). Mitsaliyandito and Arundina (2018) attempt to quantify the influence of the government bond and Sukuk market's development as one of Indonesia's financing instruments on economic growth, as well as the reverse. Meanwhile, Jarkasih and Rusydiana (2009) observed the Sukuk market's development in Indonesia and compared it to that of nearby Malaysia and the rest of the world.

There are four kinds of Sukuk contracts practised in Indonesia i.e., SBSN *ijara*h sale and leaseback, SBSN *ijarah* asset to be leased, SBSN *ijarah al-khadamat* and SBSN *wakalah* as noted by the Surat Berharga Syariah Negara (SBSN), a sovereign Sukuk issuer of the country. These structures follow the principle of Islamic Fixed Rate, Retail Sovereign Sukuk, Indonesia Sovereign Sukuk, *Surat Pemberdaharaan Negara - Syariah* (SPN S), Indonesia Pilgrim Fund Sukuk, and Project-Based Sukuk (PBS) which are issued by the government (Darsono et al.,2017).

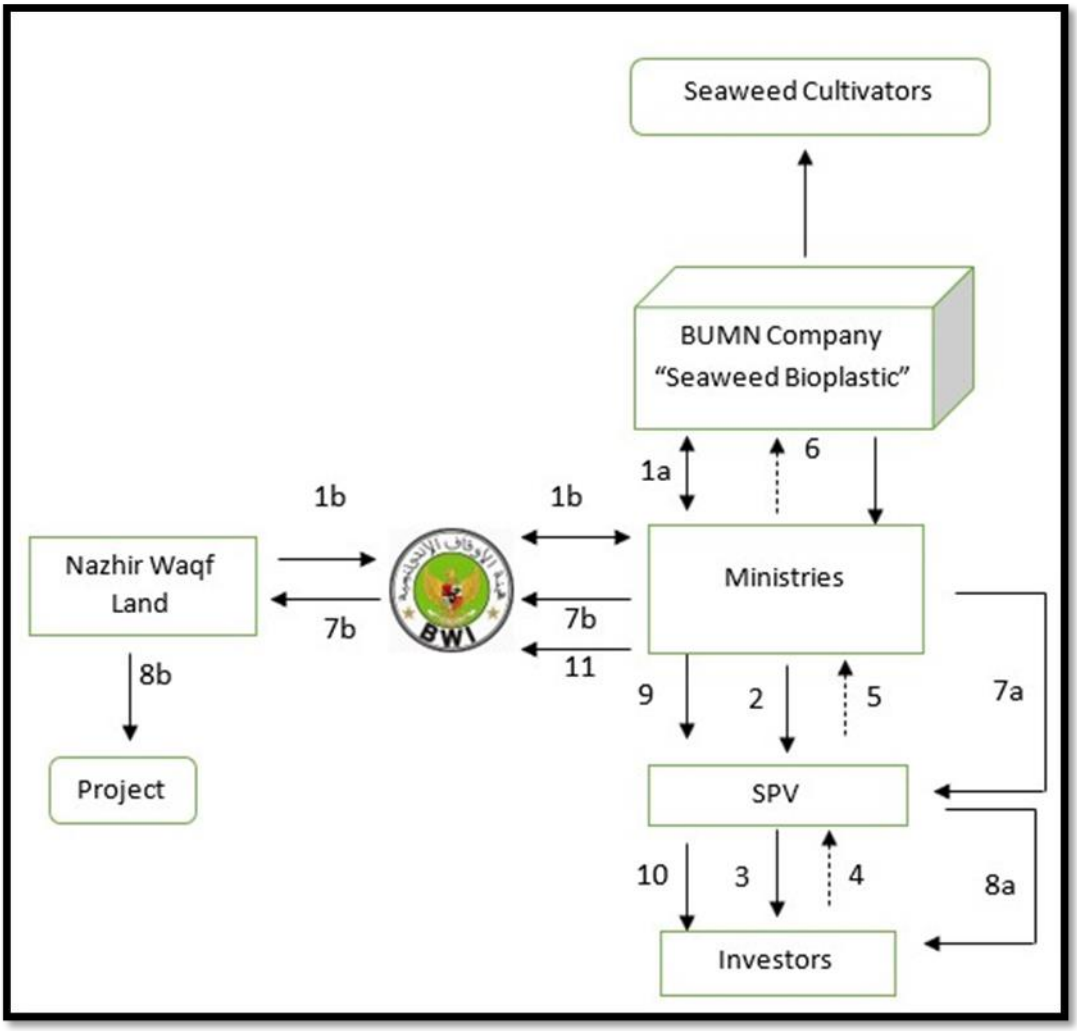
3. Research Method

This is a conceptual paper for the development of the Waqf Land-Linked Blue Sukuk (WLLBS) model. It is purely qualitative in nature, using content analysis. It comprehensively reviews the literature related to waste management issues, and existing studies related to Waqf land and Sukuk to construct the WLLBS model.

4. Proposed Model

In light of what has been discussed in the preceding sections, the authors propose a particular model termed Waqf Land Linked Blue Sukuk (WLLBS). The main stakeholders of WLLBS are the government, Waqf institutions, SPV and investors. Several government bodies including the Ministry of Finance, Ministry of State-Owned Enterprises, Ministry of Maritime Affairs and Fisheries, and the Ministry of Environment and Forestry, are expected to help to operationalize the model. Apart from the government entities, the other key party involved are of course the Waqf institutions such as those officially listed under the Indonesia Waqf Board (BWI), for example, Nazhir Waqf. Furthermore, the

proposed model is expected to be an open one, actively involving both local and international investors. The formal structure and the modus operandi of WLLBS is illustrated with the aid of a diagram (Figure 3) below. The diagram is followed by accompanying explanations of the functional relationships and processes within the model.



Source: Authors' illustration

Figure 4: Waqf Land Linked Blue Sukuk (WLLBS)

1. a. To execute the Waqf Land Linked Blue Sukuk (WLLBS) model, the concerned ministries will approve and facilitate to materialize the model by forming a specific company called BUMN for the seaweed bioplastic production. It will be based on the principle of Sukuk as the financing mechanism of developing Waqf land.
   b. The Ministry of Finance will jointly work with Indonesia Waqf Board (BWI) to identify the most appropriate Waqf land where BUMN can be operationalized under the principle of *ijarah contract* for an agreed period.

2. The ministries i.e., Ministry of Finance, Ministry of State-Owned Enterprises, Ministry of Maritime Affairs and Fisheries, and Ministry of Environment and Forestry are expected to create a Special Purpose Vehicle (SPV) which acts as an agent to issue blue Sukuk.
3. The main functions of SPV are: outline the agreement contract for the investors, estimate the budget for the potential projects, determine the Sukuk issuance period i.e., usually 5 to 10 years, and manage and distribute the profit among the shareholders. The SPV is expected to issue the blue Sukuk for financing the project. The Sukuk certificate will be issued as project-based Sukuk (PBS), which acts as an underlying asset, relying on the concept of Sukuk *ijarah*.
4. This proposed Waqf Land Linked Blue Sukuk (WLLBS) model is expected to open an investment avenue for both local and international investors. They can acquire a specific amount of share of asset or project via purchasing a Sukuk certificate.
5. The SPV is expected to transfer the collected fund to the relevant ministries and appoint them as a wakil to operate the project, which turns into an underlying asset for the issuance of the Sukuk certificate. Besides, SPV makes *ijarah (as* the leased) contract with the ministries where the concerned ministries will have to pay a fee (*Ujrah*) following their agreements.
6. The Ministry of State-Owned Enterprises is expected to respond to establish a government linked company and to operate the project on specific Waqf land. After the project is launched, the Ministry of Maritime Affairs and Fisheries will take over the operational responsibility particularly to ensure the quality of ingredients which is seaweed. Next, the Ministry of Environment and Forestry will regularly monitor the production process of seaweed bioplastic product whereas the Ministry of Finance will also assure that the adequate capital fund is raised in line with the government budget.
7. a. The assigned ministry as a leaseholder will pay the necessary fee to SPV on regular basis. During the establishment, the source of the fee has to be absorbed by the government. This fee can be given from the profits earned by the company.
   b. The *Ujrah* also give to BWI for land Waqf tenancy. BWI can claim up to 10% of the total collected fee which is used for operational expenses and transfer the rest of the fees to a particular nazhir.
8. a. SPV distributes the fee to their investors.
   b. Nazhir can utilize the fee for financing their social project.
9. The ministries can redeem their funds and buy the asset back from the investors through SPV before or on the maturity date of the Sukuk certificate.
10. SPV distributes the funds upon collecting the issued certificate from the investors.
11. The ministry of finance can also redeem the leased Waqf land from BWI unless the latter want to extend the leasing period or to make another new leasing contract on the same land or different land but with the same value.

5. Significance of the Model

The proposed Waqf Land Linked Blue Sukuk (WLLBS) model can be considered as a comprehensive socio-economic and cultural model as it connects and unifies various stakeholders with different backgrounds, using an important, common, sustainable goal. This proposed model is hoped to generate a fruitful impact on all its stakeholders including Waqf institutions, the government, seaweed cultivators, and investors who will contribute significantly to the local environment.

Impact on Waqf institutions

The proposed WLLBS will create a significant impact on the productivity of Waqf land. At present, a huge number of Waqf lands mostly remain idle or underutilized. This is partly because of the limited wealth management skills of Nazhir Waqf and due to the insufficient funds available for the development

of Waqf lands. Hence, the WLLBS is capable of significantly enhancing the effectiveness of BWI through the identification and proper utilization of Waqf land. As such, it directly addresses these underutilized resources for the development of marine ecosystems, specifically, and social development more generally.

Impact on government

The government as one of the key players of the WLLBS will be able to fulfil some of the SDGs in the long run. It also supports the government to reallocate a bulk portion of the local budget from the rehabilitation and management of disaster-prone areas for fulfilling other pressing needs of the community.

Impact on seaweed cultivators

The proposed WLLBS model is expected to boost the incomes of poor people living in the coastal area including fisherman, salt and seaweed cultivators. They find extreme difficulty in fulfilling daily needs based on the current pattern of livelihood. Once the proposed WLLBS will be materialized, the company will need the support of locals for seaweeds production. Thus, the successful implementation of the proposed model will significantly contribute not only to reduce environmental pollution but also to expedite the local economy through increasing incomes and reducing poverty.

Impact on society, economy, and environment

This proposed model provides a lot of benefits to the society, economy and the environment. It is expected that the blue Sukuk can generate at least IDR 1 million through the distribution of Sukuk certificates among local and international investors. This will not only give the monetary benefit to Sukuk investors but also open the job scope for unemployed local people. To make the project profitable, the seaweed bioplastic products can be massively promoted among ministries, government-linked companies, and all other related business entities such as small and medium enterprises (SMEs) supported by government, mini and supermarket, etc. Utilizing the benefit of mass-awareness programs on environment-friendly products, it would be possible to drastically reduce the number of plastic wastes causing environmental pollution particularly unbalancing marine ecosystem and underwater life.

Impact on academia and Islamic science

The proposed model is expected to contribute to the existing literature through the integration of the Waqf institution and Sukuk instrument. Apart from the context of environmental pollution, this study will open an avenue of new research on various innovative approaches for the solution of other socio-economic and environmental problems.

6. Conclusion

This current study proposes an innovative Islamic financial mechanism as an alternative way to finance government social development projects that are otherwise not considered owing to the high amount of capital investment required. Specifically, the proposed Waqf Land Linked Blue Sukuk (WLLBS) model supports the Indonesian government's efforts in achieving Goal 14 of the SDGs, which is marine resource conservation. This model is expected to significantly reduce the environmental pollution caused by plastic waste in the coastal regions of Indonesia, by enabling the environment-friendly production of seaweed to produce bioplastic products that are biodegradable. It is also important to note that the WLLBS also leads to a more cooperative model of production involving stakeholders from Waqf institutions, relevant ministries of the government, seaweed cultivators and investors. Among the many advantages of the successful implementation of the WLLBS, the three most important advantages are: the reduction of environmental pollution, the more productive use of underutilized or idle Waqf land, and the

employment opportunities created for the local people. Overall, the WLLBS is expected to generate massive socio-economic benefits for all the stakeholders involved.

However, this study has a few limitations. One of the main drawbacks of the proposed model is that it is based on the assumption of sufficient seaweed stock in Indonesia. As can be observed from the data displayed in Figure 1 of the preceding section, the total available seaweed traffic was only 28,738 tons compared to the export of a total of 169,640 tons in 2014. This historical data compels policymakers to reexamine the private and social costs and benefits of the seaweed export market. It is quite clear that the current stock of seaweed produced cannot fulfil the requirements of a full-scale bioplastic company that is attempting to meet the daily plastic requirements of the Indonesian consumer and producer. Therefore, this study suggests conducting an in-depth and insightful empirical research to determine the practical viability of developing an environment-friendly seaweed production industry. Besides, government and non-government organizations should also conduct awareness-building programs through knowledge sharing and training activities among seaweed cultivators on a regular basis. Most importantly, the cultivators should be provided with the ecessary capital and infrastructural support for increasing the annual seaweed production in the coastal areas of Indonesia.

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