

BACKGROUND DOCUMENT

SUSTAINABLE ISLAND INITIATIVE ON ENERGY AND ENVIRONMENT

INDONESIA

1 Introduction

This short background document focuses on the Sustainable Island Initiative (SII) and is a supplement to the partnership documents and work plans already prepared for the SSCs for environment and energy. The more comprehensive national analysis for the environment and energy sectors have been made as part of the on-going SSCs programmes, whereas this document includes detailed information related to the provincial and municipal levels at Lombok.

The SII is an add-on initiative as part of the SSCs for environment and energy in Indonesia. This add-on initiative has been designed in-line with the two main SSCs for energy and environment and should be seen as a roll-out of activities undertaken at national level to provincial and local level. This add-on initiative will include support to integrated provincial and local level energy and environment planning and execution with an aim to link waste management and energy for exploring synergies between the two sectors and working towards productive energy to waste solutions.

2 Environment and Energy Sector Framework - Lombok

Indonesia is the world's fourth most populous country, with a total population of 250 million people, spread over 900 populated islands. It also has a fast growing economy with an average growth rate of 5.46% between 2010 and 2018. A major challenge is that it is the 6th biggest greenhouse gas (GHG) emitter in the world and the bigger cities struggle with air pollution.

Indonesia's full waste-to-energy (WtE) generation potential is far larger than its current capacity. WtE technologies present an opportunity to both mitigate the negative environmental consequences of landfilling as well as a mean to produce renewable energy. Several WtE technologies exist and can be a commercially viable option of producing electricity. Introducing WtE facilities to Indonesia has the potential of reducing waste volume, thus reducing land demand for landfills, reduction of environmental and social externalities attributed to waste disposal as well as a source for renewable energy production. Indonesia's energy mix consists mainly of oil (41%), coal (29%), natural gas (24%) and a small percentage of renewable energy sources (6%). Indonesia has abundant coal resources and the country is the 4th largest coal producer in the world. Indonesia's oil production has declined in the recent years leading to a dependency on import on crude oil and oil products. As stated in the National Energy Policy (KEN), the renewable energy should account for 23% of the primary energy mix by 2025 and the GHG emissions should be reduced by 29% by 2030.

The SII will use the circular economy, waste hierarchy and energy trilemma to identify and evaluate options for WtE solutions at Lombok and a second island, to be identified, in collaboration with regional and local partners.

3 Background Lombok

Lombok is under the administration of the Governor of the province of West Nusa Tenggara Barat (NTB). The province is administered from the provincial capital of Mataram in West Lombok. The island is administratively divided into four regencies (Kabupaten) and one municipality (kota).

3.1 Waste

The waste management sector does not receive the necessary attention and priority compared with other sectors such as water, energy roads and other infrastructure areas. This means that the public financing of waste management is low, and that financing principles, in general, have not been well developed. Public understanding and awareness of waste is in general low, and there is a huge need to work with the public and local communities in changing perception and behaviour related to waste management. Surveys have shown that 3 out of 4 people do not consider waste as an important issue in their daily life. Additionally, the willingness to pay for waste management services are not as high as for other more traditional services such as water and electricity supply. Many people do not consider waste management service as worth paying for.

In recent years, responsibility for planning, execution and management of waste have been delegated to local authorities, which is also the case in most other countries. Ambitious national targets for reduction and handling of waste have been introduced, however many local authorities do not have the necessary financial and human resources available to achieve these targets. Furthermore, the waste management sector is characterised by being caught in a vicious cycle. Public trust in public waste management services are not well established, and their willingness to pay for public services are therefore low. As a consequence, local authorities do not have sufficient public funds to build up reliable and good waste management services. The sector is therefore caught in a vicious cycle, which has to be broken in order to move the sector forward.

3.2 Waste situation at Lombok

In general, the information on waste at Lombok is scattered and not fully reliable and accurate. Some information exist from the present Jakstrada for Lombok (environment plan) and a municipality waste management master plan for Northern Lombok made in 2019.

One of the first activities will therefore be to undertake a study of the waste situation, waste composition, waste streams etc. to establish a proper baseline on waste for Lombok.

North Lombok

In January 2019, a municipality waste management master plan was prepared for North Lombok Regency financed by the ESP3 Programme. This Municipal Waste Management Master Plan covers a territory that can be divided into two distinct areas: The five subdistricts located on Lombok Island itself (i.e. the mainland) and the three Gili Islands, Trawangan, Meno and Air, which are part of the Pemenang Subdistrict. At present the mainland is a relatively poor rural region where agriculture is central to the economy, this area is characterised by low levels of solid waste collection and only about 15% of the generated waste is collected.

The Gili Islands are one of the top tourist attractions in Indonesia and draws both domestic and international visitors to North Lombok Regency. Over the past years, the number of arrivals has been growing by almost 14% annually, leading to a rapid development of these islands. Most tourist activity is

centred on the Gili Islands and only 13% of the recorded overnight tourist stopovers are on the mainland of North Lombok Regency.

The residents on the Gili Islands are aware that cleanliness within their domain is essential to ensure visits and for many years considerable efforts have been made to promote recycling, collect waste and keep the surroundings clean. The existing system is far from perfect: Most but not all waste is collected, there is a large unsightly dumpsite on Gili Trawangan and a scrappy incinerator on Gili Meno. Furthermore, waste washes up on the beaches and pollutes the coral reefs; these problems are magnified after a strong rainfall, when large quantities of uncollected waste are washed into the sea from Lombok Island. Hence, the uncollected waste on mainland Lombok has a negative impact on the tourism industry and the environment on the Gili Islands.

This Municipal Waste Management Master Plan for North Lombok Regency aims to manage the waste arising within North Lombok Regency with the exception of the Gili Islands. The approach for the Gili Islands is described separately in a Specific Action Plan for the Gili Islands. The goal of the plan is to manage all waste in accordance with the Government of Indonesia's solid waste management and environmental policies. The core objectives for solid waste management are laid out in the Presidential Regulation No. 97/2017 on National Policy and Strategy for Household and Household-like Solid Waste where it is required that by the year 2025:

- 30% of the generated waste must be treated at source through 3R programmes. Hence waste avoidance, reuse and recycling shall decrease the overall waste stream by at least 30%.
- The remaining waste, i.e. 70% (or less) of all the generated waste, must be correctly treated through waste collection, sorting, transport, treatment and disposal.

Hence all generated waste must be properly handled by 2025, either through avoidance or recycling at source, or through appropriate treatment by the local authorities. At present, on the mainland of the North Lombok Regency, only about 19% of all generated waste is handled. Of this, about 15% is collected by the DLHPKP or by CBOs and a further 4% is recovered as inorganic materials by scavengers. The collected waste is treated in at least three different locations: The majority is dumped at an uncontrolled dumpsite in Jugil, some is dumped and burned in a field outside Bayan and finally a small amount is burnt behind a temporary storage facility (called TPS 3R – reduce, reuse and recycle).

North Lombok is still severely impacted by the devastating earthquakes that occurred in 2018. The destruction wrought has disrupted many activities on North Lombok, such as the completion of the new sanitary landfill. The most noticeable outcome of the earthquakes is the very large quantities of rubble; this construction and demolition waste is being used for land backfill, but in many areas piles of rubble can also be found along the roads or dumped in open spaces. Some of these materials will be a nuisance for many years.

The balance, or about 80% of the generated waste, is not collected and is either burned or dumped by the citizens. During heavy rainfalls some of the uncollected waste washes into the ocean, causing pollution and debris to wash up on the beaches. At present, there are plans for a number of waste banks within the Regency to increase the levels of recycling, though none of these were active at the end of 2018, a situation attributed to the August 2018 earthquakes.

At present, other than the destruction caused by the earthquakes, the North Lombok waste management system faces several challenges. The most apparent is that the local environment agency (DLHPKP) has a limited service area, so open burning and dumping of waste is common. It seems likely that somewhere

between 10 and 20% of the generated waste reaches the Jugil Dumpsite. Most areas of the Regency may receive some equipment and training from the DLHPKP, but others are frequently left to address any waste management issues independently. The fact that only a small percentage of the generated waste is collected indirectly impacts Lombok's, and especially the Gili Islands', tourism industry. As described in the Specific Action Plan for the Gili Islands, there are weekly beach clean-ups on the Gili Islands, but the shorelines are not always pristine.

The only engineered waste treatment system on the mainland is the Sigar Penjalin TPS 3R, which basically operates as a depot for two men to collect and burn the waste from the local community. When built, the intent was for this TPS 3R to be a centre that promoted recycling. It was equipped to produce compost from organic waste and to recover recyclables for sale. Overall, there are currently practically no 3R activities organised by the formal sector on mainland North Lombok.

The North Lombok Regency covers 775 km² and measures over 50 km across. This means that there are considerable transportation distances and hence costs to reach the Jugil Dumpsite, despite the fact that this place is centrally located. To avoid excessive transportation costs, waste is either burnt (as at the Sigar Penjalin TPS 3R) or dumped (and burnt) locally as is the case in Bayan. Ideally, and in line with Indonesian policy, all the Regency's waste should go to a single central landfill.

At present there is a lack of proper records pertaining to the waste management activities. There is no weighbridge at the dumpsite, this means that the quantity of waste deposited there every day is unknown. The Bayan Subdistrict does keep records of the vehicle movements, but this is the exception rather than the rule. The operation of the dumpsite is financed by the local environment agency.

The Master Plan proposes a waste management system for the North Lombok that almost completely meets the policy requirements of the Indonesian regulations. It is not anticipated that the requirement that 30% of the generated waste be treated at source can be met by the year 2025, and the plan predicts that this goal will be met in 2028. The planned percentages of waste treated at source are shown in the tabel below.

Lombok

Lombok faces significant environmental challenges associated with the handling of solid waste. Each year, industry and households at Lombok generate an estimated amount of 900,000 tons of solid waste. Only a limited part of this waste is actually collected, and transported to one of four landfills, in Lombok. The remaining part of solid waste ends up in the environment or is set on fire in inadequate small-scale facilities or open burning.

The collection of solid waste is assessed to be inadequate and largely handled locally by the villages or local enterprises. The head of some villages is arranging a "kerbside" collection a service for which they pay the local collector around IDR 40,000 per month

There are four landfills in Lombok, including Jugil. The largest landfill Kebon Kongok is a Regional landfill managed by the Provincial government of West Nusa Tenggara, while the local Regional governments manage the three others. Kebon Kongok receives daily more than 300 tons of waste from the City of Mataram and West Lombok. The landfill covers more than five hectares, has been in operation since the late 1990s and has reached its limits. Consequently, the regions and the province urgently need to find a location for a new landfill site. A problem that is almost impossible to solve, since nobody wants a landfill in his or hers backyard and the regulation requires a minimum of 1 km distances to nearest residential area.

The lack of sufficient solid waste management, including separation and collection of solid waste, results in unhealthy conditions for the inhabitants of Lombok and environmentally unacceptable impacts.. There is a risk of contamination of farmland, forests, river, oceans, etc. leading to contamination of crops, livestock, fish and seafood, often by plastic materials or particles from uncontrolled burning of solid waste. Given large part of the income on Lombok stems from tourism, uncollected solid waste poses a serious challenge as e.g. solid waste in the ocean and beaches leading to bad publicity.

The current operation cost of Kebon Kongok is 50,000 IDR/ton (3.3 USD/ton) covered by the provincial budget. It is assessed that the willingness-to-pay for the Provincial government is significantly higher than their current cost of 50,000 IDR/ton (3.3 USD/ton). From other waste treatment projects in Indonesia, KPMG has assessed a willingness-to-pay of 150,000-500,000 IDR/ton (10-33 USD/ton).

This was all concluded in a study by KPMG consultancy as part of a former SSC cooperation between the Danish Ministry of Foreign Affairs, Danish Energy Agency, Ministry of Energy and Mineral Resources and the National Energy Council. The study was published in January 2019 and included inputs and feedback from local stakeholders at PLN Nusa Tenggara Barat Province (NTB), DESDM NTB, and DLHK NTB.

3.3 Energy

The power system in Lombok today is almost entirely based on fossil fuels, with diesel being the main fuel in the mix, followed by coal. A small amount of generation from hydropower and solar power completes the current power supply. It is not interconnected to the main Java-Bali system and since most of the power supply is based on coal and diesel generation, the average generation cost is among the highest in Indonesia (13.9 c\$/kWh).

The power demand on the island has been growing steadily in the last few years, with peak demand being 260MW by the end of 2018. The expectation is that this growth will continue, driven by electrification and economic development, resulting in more than doubling of annual power consumption by 2030.

The Energy Utility (called PLN) for Nusa Tenggara Barik province, projects utilization of natural gas and coal as part of the future expansion of the energy sector. Lombok does not have access to natural gas through a gas pipeline. The gas supply for the projected 230 MW gas power capacity is expected to be delivered by CNG and LNG, which will be shipped to Lombok via a dedicated vessel. The planned expansion of CNG and LNG will require significant investments in vessels as well as infrastructure and equipment for regasification and decompression of gas hence both CNG/LNG will come at a very high cost.

With a high biomass potential in Lombok of 60-65 MW capacity combined with the large waste quantities utilising this to produce renewable energy, thus mitigating the dependence of fossil fuels, should be explored.

4. Path towards sustainable development at Lombok

The proposed Add-on Initiative will contribute to strengthening of coordination and synergy creation between the waste and energy sectors. Planning, execution and management of waste and energy should be closed linked in order to explore and utilise waste as a resource for productive purpose, in particular for energy production. In order to work towards a more sustainable development it is necessary to develop a more integrated and holistic approach to waste and energy management. Many present practices within energy and environment are not considered sustainable with the extensive use of fossil fuel and inappropriate collection and handling of waste. There are many opportunities in developing more green and renewable energy solutions while looking and treating waste as a resource.

Since solid waste is an urgent and dominant problem for Lombok, as well as for many other islands in Indonesia, it is crucial to find solutions for proper solid waste management that fits into the Circular Economy agenda supporting the goals from the national waste management strategies and plan, the Jakstranas. Identifying the circular solutions has to be done with a holistic approach to secure comprehensive and efficient coordination between energy supply and sufficient solid waste management. Holistic entrance to Circular Economy calls for strong coordination between the waste management sector and the energy sector.

The Circular Economy agenda secures the reuse and recycling of materials that are kept as high as possible in the value chain and limits the production of waste. According to the Ellen MacArthur Foundations principles, the Circular Economy aims to redefine growth, focusing on positive society-wide benefits by transition to renewable energy sources. The circular model builds economic, natural, and social capital with the following fundamental principles: reduce waste through design, keep products and materials in use and regenerate natural systems.

The Circular Economy also aims to gain higher level of circulation of materials towards waste generation. The waste hierarchy principles are tools for reaching the goal.

Waste Hierarchy principles:

- Reduction
- Reuse
- Recycling
- Energy recovery
- Landfilling

Since the current waste treatment system consists of dumping and landfilling, there is room for climbing up the Waste Hierarchy towards energy recovery and recycling. The energy recovery is primarily seen as biofication of organic waste with recycling of digestate as fertilizers. Secondary waste incineration is seen as a solution for non-recyclable materials with energy recovery in the transition towards Circular Economy.

All initiatives towards Circular Economy by Waste Hierarchy principles require strong strategies and adequate planning follow up by right governance and focus on infrastructural aspects.

The World Energy Council defines the energy sustainability based on the following three core elements: Energy security, which refers to the effective management of the primary energy supply from domestic and imported sources, reliability of the energy infrastructure and the ability of the energy providers to meet the demand. Energy equity is another element of the sustainability and refers to the accessibility and the affordability of the energy supply. The final element is environmental sustainability referring to the development of the energy supply from renewables and other low-carbon sources. Balancing these three goals constitutes a trilemma and is the basis for the prosperity and competitiveness of every country.

From the outset of covering all three elements of the Energy Trilemma, biogas and potentially incineration of both solid waste and biomass could pose a more attractive and to some degree cost-efficient solution for Lombok's energy future for the following reasons:

- Energy security: The capacity for transporting both CNG/LNG to Lombok will be limited and reliant on one vessel resulting in a very high vulnerability for supply disruption. Domestic production of biogas could mitigate this risk.

- **Energy Equity:** Establishing biogas and maybe incineration could be cost-comparative from a Levelized Cost of Energy (LCOE) point of view due to the very high cost of capital expenditures (Capex) and operation expenditures (Opex) of CNG/LNG.
- **Environmental Sustainability:** Biogas production and power production from incineration will displace fossil energy. Incineration will furthermore reduce the urgent pressure on the landfills. Reduction of organic waste at landfills will reduce leakage of harmful substances from landfills (both methane to the air and harmful organic substances to ground- and surface water).

Establishing a biogas plant in combination with an incinerator plant therefore has the potential of solving several urgent challenges at Lombok, such as addressing the current challenge of landfills being in full capacity and potentially reducing the volume of waste piling up at the landfills. In addition, it can lead towards the sustainable management of organic waste that can be collected in the island and enhanced supply of endogenous renewable energy.

5. Current and future commercial opportunities for Danish companies

The priorities of the Indonesian government within all forms of infrastructure within energy, water, waste management and maritime, does to a large extent match Danish solutions, technologies and products. Because of a general demand for Danish (and other countries') solutions within especially environment and energy, there is a potential for a market for Danish businesses in and export to Indonesia. To a certain extent, the exploration of market opportunities has already been initiated, with Denmark and Indonesia being committed to an overall bilateral Plan of Action 2017-2020 and on more specific agreements on cooperation with Indonesia within agriculture, health, maritime affairs, energy and transport and environment.

In order for a foreign company to establish themselves in the Indonesian market, it is the experience of current companies that stamina, local presence, a long-term strategy and prioritizing the market in terms of both time and money is necessary. This would be that case in most markets, as well as politics and economy are closely interlaced factors in Indonesia. This means that regulation and politics are traditionally adjusted in accordance with a strong nationalism and protectionism, which is politically motivated and part of the Indonesian increasing self-consciousness. For Danish businesses that wish to invest in Indonesia, it will therefore inevitably involve substantial capital outlays compared to other countries in the region as well as the market itself can seem obscure.

A challenge for Denmark to enter the Indonesian waste sector is that currently there are only a limited number of larger businesses within the solid waste sector in Denmark. However, a few companies, such as RUNI and DESMI are already active in the waste sector Indonesia, as well as some Danish businesses with technologies relevant to Indonesia, e.g. Ørsted and Solum Gruppen, have already shown interest in an expansion to the market. Novozymes and Grundfos are large-scale businesses that by virtue of their other markets hold interests within waste management, as well as the Danish B&W Vølund expect to supply waste incineration technologies, should the possibility of incineration plants become reality. Furthermore, a number of Danish-founded consultancy companies with knowledge within the waste sector, such as Rambøll and DHI, have established themselves on the Indonesian market. A number of production companies, the biggest being ECCO and service companies, the biggest being ISS, are requesting sound environmental policies and regulatory structures within their field of business. The proposed SII will engage with Danish and Indonesian commercial associations and networks within waste and energy, and work with the Danish Trade Council, Danida Business Finance and other commercial and investor stakeholders.

6. Proposed objectives for the SII at Lombok

The overall objective of the SII at Lombok is to support development at Lombok towards a green and low carbon pathway and the implementation of provincial sector plans, i.e. Jakstrada and RUED. This will be done via support and advice to regional and local authorities on ways forward in identification, planning and execution of integrated and sustainable solid waste management and clean energy production initiatives at Lombok.

While applying a circular economy and integrated solid waste management approach, it is expected that specific solutions will be identified contributing to a more financially feasible and attractive business case for waste and biogas at Lombok. As a result, support will be provided to promote the foundation for private sector stakeholder's engagement in WtE at Lombok.

The SII will address the problem of untreated waste and biomass at Lombok and explore methods for transforming waste from an environmental problem to a value commodity for energy production. Challenges related to waste management and affordable energy supply are not confined to Lombok but many islands in Indonesia are exposed to them, hence the replication of solutions will be of high priority. In Indonesia, revenues for WtE facilities mainly come from the sale of electricity and in a few places from tipping fees paid per ton of accepted or processed waste. This includes measures for de-risking investments and projects. Today, the expected revenues for WtE, especially incineration, often fail to deliver an internal rate of return (IRR) of at least 15%, which is considered acceptable by both industry and government. The tipping fee and/or the Feed In Tariff (TIF) either need to increase, or costs need to decrease, to make WtE facilities economically viable.

The sub-objectives of the SII are proposed as the following:

- To enhance implementation of provincial sector plans and initiatives in circular economy, solid waste (Jakstrada) and energy (RUED).
- To provide regional and municipal authorities with assessments of feasibility and possibilities for possible WtE investments at Lombok to regional/municipal/regency authorities provided; and
- To support and promote the foundation for private sector stakeholder's engagement in WtE at the two islands.

As a crosscutting activity, the SII will seek to mobilize external funding for additional enabling activities focusing on waste and biogas at Lombok, i.e. fellowship training, research projects and other synergic and collaborative initiatives. During implementation of the SII, options will be explored for mobilising investment funding depending on possible feasible solutions identified and interest from stakeholders.

7. Proposed activities by SII at Lombok

Departing from the existing studies undertaken at Lombok, DEPA and DEA will collaborate with Dinas ESDM and KLHK at Lombok and undertake activities as described below.

Many of the activities will be undertaken jointly by the two agencies and are considered being mutual supportive. The sequencing of activities are important and will be considered throughout implementation of the SII. It is envisaged that activities by DEPA will be more prominent in the first year of the Initiative, whereas DEA might be more active during second year.

It is envisaged that DEPA and DEA will work closely together during in-country missions and visits to Denmark. Synergies will be explored in relation to dialogues, seminars, workshops, technical studies, scholarship programmes, research projects and other activities.

The following activities will be undertaken:

Bioenergy - DEPA and DEA with regional partners:

- Provide recommendations for improving the enabling environment for utilisation of sustainable biomass and WtE solutions and mapping of potential economy-wide pathways of a more optimised waste management system encompassing social, economic and political aspects. Recommendations should be targeted towards B2B solutions within WtE.
- Meet with relevant Danish stakeholders from public and private sectors to mobilise Danish and Indonesian business interest and explore possible financing opportunities in Denmark and Indonesia. Provide assistance to support any screening, mapping, project preparation and/or development necessary for mobilising additional funding opportunities related to the SII.

Waste - DEPA with regional partners:

- Engage in strategic sector dialogue at regional and local levels to promote and strengthen circular economy and integrated solid waste management plans and projects.
- Provide capacity building support and peer-to-peer trainings for selected staff from the provincial and local authorities in themes related to circular economy and integrated solid waste management, planning and execution. The trainings will built on Danish and international practices and experiences and be linked to the context of Lombok and actual needs of the regional and local partners. A simple assessment of institutional and human capacity building needs will be undertaken prior to undertaking the peer-to-peer trainings. The trainings will be directly linked to already on-going or planned circular economy or solid waste management related plans, initiatives or tasks by the regional and/or local authorities. This will ensure that a hands-on and concrete implementation of specific activities and tasks by the Indonesian partners. The capacity building and peer-to-peer training might include topics within circular economy, integrated solid waste management, organic waste, plastic, EPR, waste banks, data collection, management and reporting or other relevant topics.
- Undertake feasibility study covering policy, institutional, legal, technical, financial and social aspects and challenges of integrated solid waste management and WtE projects at Lombok.

Policy, institutional, technical, financial and social challenges will be identified, assessed and recommendations will be made for integrated solid waste management solution necessary for WtE investments. The study will among others review options for governance and infrastructure for waste collection; and identify and quantify biomass streams (MSW, food industries and markets, wastewater, landfill) suitable for possible energy production, i.e. incinerator- and biogas plants.

Different WtE technologies produce different outputs, and the feasibility of the technology and the quality of the output depends on the nature of the waste stream. A detailed analysis of waste stream characteristics is therefore required to identify the particular advantages and disadvantages of each technology that might be feasible at Lombok. The study will include waste streams such as organic waste, recyclable waste, dry recoverable wastes, inert wastes and hazardous wastes. In this regard, plastic waste is of particular importance. The variety of waste reinforces the need to adequately characterize the waste streams before deciding if WtE technologies are feasible or not.

The study should propose solutions with the aim to ensure high quantity of collected waste by identifying and propose solutions to optimize waste management systems at Lombok. Identify solutions that will also ensure that waste is collected in a systematic and reliable manner to ensure a timely influx of sufficient waste to energy generation. It will be important that waste is collected and transported to waste banks, recycling centres and to WtE facilities. The security feedstock supply for energy generation must be ensured.

- Based on collected waste, site-specific technologies should be identified and estimates made on the potential for producing renewable energy through landfill mining and landfill gas production. Estimations should also be made on the expected volume of waste to be treated for energy purpose and how the treatment will reduce the volume of accumulated waste at the landfill.
- A cost benefit assessment for substituting the expected expansion of CNG and LNG with renewable energy from incineration and biogas will also be included in the study as well as how to ensure recycling of nutrients from the degassed manure. The study will also include an analysis and assessment of willingness and ability to pay for different models and types of WtE facilities. The feasibility study might include a proposal for a WtE demonstration project(s).

Energy - DEA with regional partners:

- Dialogue and consultations to identify the key challenges and need of the energy sector.
- Review the potential of energy generation based on collected waste (biogas, incineration and a biomass fired power plant). A cross sectoral technology and data catalogue will be developed SWM and energy production to acquire data for further analysis of the opportunities and feasibility of SWM and energy production from waste and biomass.
- Mapping of other large sustainable waste biomass streams than already identified such as forestry and agricultural residues at the two islands to assess the availability of feedstocks for energy production. That will include a feedstock analysis of rice husk, corn residues, manure and forestry as well as analysis of the logistic and infrastructure for the waste streams, the financial aspects, governance and regulation.
- Undertake a prefeasibility study to identify feasible solutions on WtE projects. This study will be based on previous activities where it was concluded that regasification terminals are an expensive option for the energy future of Lombok. Alternatives to replace the LNG/CNG future plans could be analysed in collaboration with local authorities along with an LCOE assessment and energy modelling of various alternative scenarios for the future of Lombok.
 - Support the implementation of the RUED at Lombok while focusing on WtE, biomass and biogas production. The activity will identify barriers for B2B solutions within WtE, biomass and biogas, and provide measures to overcome the identified barriers.

8. Approach to Capacity Building

According to the OECD/DAC definition, capacity is the ability of people, organisations and society as a whole to manage their affairs successfully and capacity development is the process whereby people, organisations and society as a whole strengthen, create, adapt, unleash and maintain capacity over time.

Capacity includes a wide range of factors from skills to systems, processes, ability to relate to others, leadership, values, formal and informal norms, loyalties, ambitions and power. Capacity Development is a process of capacity change, rather than a deliberate act to strengthen skills, introduce new systems, contract new people. Promotion of capacity development refers to what outside partners – domestic or foreign – can do to support, facilitate or catalyse capacity development and related change processes. It is fundamental that change processes are owned and led by those whose capacity is developing; outsiders can teach, coach and shape incentives for learning.

The SII will apply the same approach to capacity building as in the two present main SSCs for environment and energy.

First of all, national ownership, involvement and engagement are key shall be ensured in all processes starting with initial problem and needs analysis and planning, through execution to monitoring, completion and continuation of activities. The SII is not a traditional development project where inputs are delivered by external finance and technical inputs. On the contrary, capacity change is sought through strategic dialogue, joint and own analysis of needs, challenges and solutions and most importantly national execution of changes and new initiatives. DEA and DEPA will facilitate, coach and expose local parliamentarians, decision-makers, technical key personnel and others to new innovative approaches to waste and energy management and thereby instill reflection that hopefully will lead to action and change.

Even though there is a national policy framework for waste and energy, it is expected that the SII still will address a number of structural frame conditions that relates to local policies, institutions, finance and legal issues. The capacity building efforts will be directed towards such challenges. Additional human and financial resources, and more traditional capacities, should be provided or mobilized by the local authorities themselves and not by the partnership itself.

The capacity building approach will be directed towards changing prevalent thinking and practices of why and how to change present systems and approaches to energy and waste management. The capacity building approach aims at catalyzing changes through own problem analysis and identification of own solutions. Exposing to and learning from Danish and international experiences in energy and waste management will also be ensured during study tours and peer-to-peer training visits as well as DFC scholarship activities.

The SII will work closely with DFC in planning and execution of scholarship programmes. The Embassy and the two agencies will be involved in selection of participants and content development, and to the extent possible make sure that DFC training courses are linked to activities under the SII. These activities are already being practiced and on-going.

9. Stakeholder mapping and groups that will benefit from the proposed project

Improved circular economy, solid waste management and clean energy production will have direct impact on public health, liveability, environment, marine and the economy of Lombok, and hence a wide section of the public will directly benefit from the SII. A sustainable and clean environment is vital for the economy, livelihoods and tourism at Lombok.

Having identified a list of relevant stakeholders, these have been assessed in order to identify their key interests in the SII and to what extent their interest will affect the SII.

The below listed parameters have been used for the analysis of the stakeholders:

- Their stake in the SII
- What do the SII need from them?
- Risks and mitigation of risks

See below table for analysis results.

Additionally, the stakeholders have been graded on a scale from 1-3 on two parameters: 1) the stakeholder's power/influence on the SII and 2) on the stakeholder's interest in the SII.

Based on the grading, the stakeholders have been placed in the stakeholder map. The stakeholder map contributes to a better understanding of how the different stakeholders should be managed, following different categories; *watch, communicate generally, keep satisfied, manage actively, keep on side or keep informed.*

Additional stakeholders will inevitably be involved after the selection of the second island. At this stage, it is assumed that the analysis of provincial stakeholders of Lombok corresponds to and equally applies for the provincial stakeholders of the second island.

Stakeholder	Stake in the SII	What do the SII need from them?	Risks and mitigation efforts	Power/ influence score (1-3)	Interest score (1-3)
<i>Ministry of Environment and Forestry (KLHK)</i>	The SII builds on and extends the existing SSC, which KLHK has committed to by signing a MoU. KLHK is thereby equally committed to the SII.	Commitment and cooperation from KLHK is crucial for advancing and evolving in order to reach desired achievements of the SII, firstly in terms of choosing the next island for the SII. KLHK's acknowledgement and approval is also needed in order to interact with the environmental administrations at provincial and municipal level.	Risk: KLHK would rather allocate the SSC resources to the national level than the SII. Mitigation: Shaping the SII in relation to both regional and national agendas by feeding into their ongoing programmes.	3	3
<i>Ministry of Energy and Natural Resources (ESDM)</i>	The SII builds on and extends the existing SSC, which ESDM has committed to by signing a MoU. ESDM is thereby equally committed to the SII.	Commitment and cooperation from ESDM is crucial for advancing and evolving in order to reach desired achievements of the SII, firstly in terms of choosing the next island for the SII. ESDM's acknowledgement and approval is also needed in order to interact with the Energy administrations at provincial level.	Risk: ESDM would rather allocate the SSC resources to the national level than the SII. Mitigation: Shaping the SII in relation to both regional and national agendas by feeding into their ongoing programmes.	3	3
<i>Provincial Agency for Environment (Dinas LHK)</i>	Dinas LHK is interested in ensuring implementation of their waste management plans and the SII is an aid	Dinas LHK is one of the main counterparts in the SII and their need is therefore the foundation of the SII. Accordingly, the SII needs Dinas LHK's commitment, resources, information and for them to take ownership of the SII.	Risk: Dinas LHK might not have sufficient resources to carry out the SII. Mitigation: Supply Dinas LHK with	3	3

	of support in that regard.		knowledge and know-how from the Danish Energy Agency on how to implement the SII. Emphasize to the respective Agency the need for allocating resources both fiscal and non-fiscal to dinas LHK.		
<i>Provincial Agency for Energy and Natural Ressources (Dinas ESDM)</i>	Dinas ESDM is interested in ensuring implementation of their energy plans and the SII is an aid of support in that regard.	Dinas ESDM is one of the main counterparts in the SII and their need is therefore the foundation of the SII. Accordingly, the SII needs Dinas ESDM's commitment, resources, information and for them to take ownership of the SII.	Risk: Dinas ESDM might not have sufficient resources to carry out the SII. Mitigation: Supply Dinas ESDM with knowledge and know-how from the Danish Energy Agency on how to implement the SII. Emphasize to the respective Agency the need for allocating resources both fiscal and non-fiscal to dinas ESDM.	3	3
<i>Wastepickers and local communities</i>	Commercial interests, jobs and livelihoods.	Collaboration and support to new project undertakings.	Risk: If waste pickers and local communities are not involved in planning, management and execution of activities, public resistance might occur and undermine projects.	3	3
Stakeholder	Stake in the SII	What do the SII need from them?	Risks and mitigation efforts	Power/ influence score (1-3)	Interest score (1-3)
<i>Regional Body for Planning and Development (BAPPEDA)</i>	BAPPEDA is responsible for implementing the Sustainable Development Goals, and the SII is a measure to do so.	Coordination and alignments of budgets and general planning among the involves dinas'es	Risk: If BAPPEDA does not prioritize the need of the SII, the lack of coordination between dinas'es will render it difficult to implement the SII Mitigation: Keep BAPPEDA updated on the SII and actively include BAPPEDA in the SII.	3	3
<i>Governor of Nusa Tenggara Barat Province</i>	Due to the current plastic and waste reduction plans and ambitious goals both deriving from	Commitment from and cooperation with the Governor is crucial for the SII to be a success in Nusa Tenggara Barat Province	Risk: The governor gets a better offer or measure to implement the	3	3/2

	national level and from provincial level, the Governor is interested in implementing measures to reach these goals.		energy and waste management goals. The governor forgets about the SII. Mitigation: Meet with the Governor regularly on Lombok and update him on the progress of the SII.		
<i>PLN (National) National Electricity Provider</i>	Has an average interest in the SII as PLN (national) needs to reach the renewable energy targets set forth in the RUPTL (PLN's business plan) and the RUEN (national energy plan). To the extent the SII can support PLN in that regard, the SII is of importance to PLN.	The SII needs complete endorsement from PLN (National) as they have monopoly on production and distribution of power. With the aim of the SII to prepare development of concrete RE projects, the success is dependent on PLN.	Risk: If PLN (National) does not see a reason for engaging in the SII, potential power plants will not be able to agree with PLN on a PPA. Mitigation: Constant engagement on best practices in the energy transition. Continuous discussions with PLN, exposing the benefits of the SII and RE in general.	3	2
Stakeholder	Stake in the SII	What do the SII need from them?	Risks and mitigation efforts	Power/ influence score (1-3)	Interest score (1-3)
<i>Pak Gushwin (Special advisor for the governor)</i>	Pak Gushwin has a personal interest in the success of acceleration program on plastic reduction and therefore the SII. Pak Guswin then contributes to the governor's interest in the successful implementation in the sustainability and green agenda.	Access to the governor. Keeping the SII a priority for both governor and dinas'es. Aligning the interests in NTB around the SII, as pak Guswin is aligning the interest of the governor and the dinas.	Risk: Pak Gushwin finds other initiatives more interesting than the SII. Pak Guswin gets a bad impression of the SII and report negative feedback to the governor. Mitigation: Keep Pak Gushwin satisfied by meeting him regularly and inform him about the progress of the SII.	3	2
<i>PLN NTB</i>	Has an interest in renewable energy projects in Nusa Tenggara Barat, especially to reach the targets of RE.	First and foremost, the SII needs data from PLN NTB in order to conduct relevant and realistic studies. Endorsement by PLN NTB is also needed, especially when considering concrete RE projects.	Risk: Reluctance of providing data due to lack of interest in the SII or own interests in keeping business secrets. There is also a risk of PLN NTB prioritizing other RE Projects in NTB.	3	2

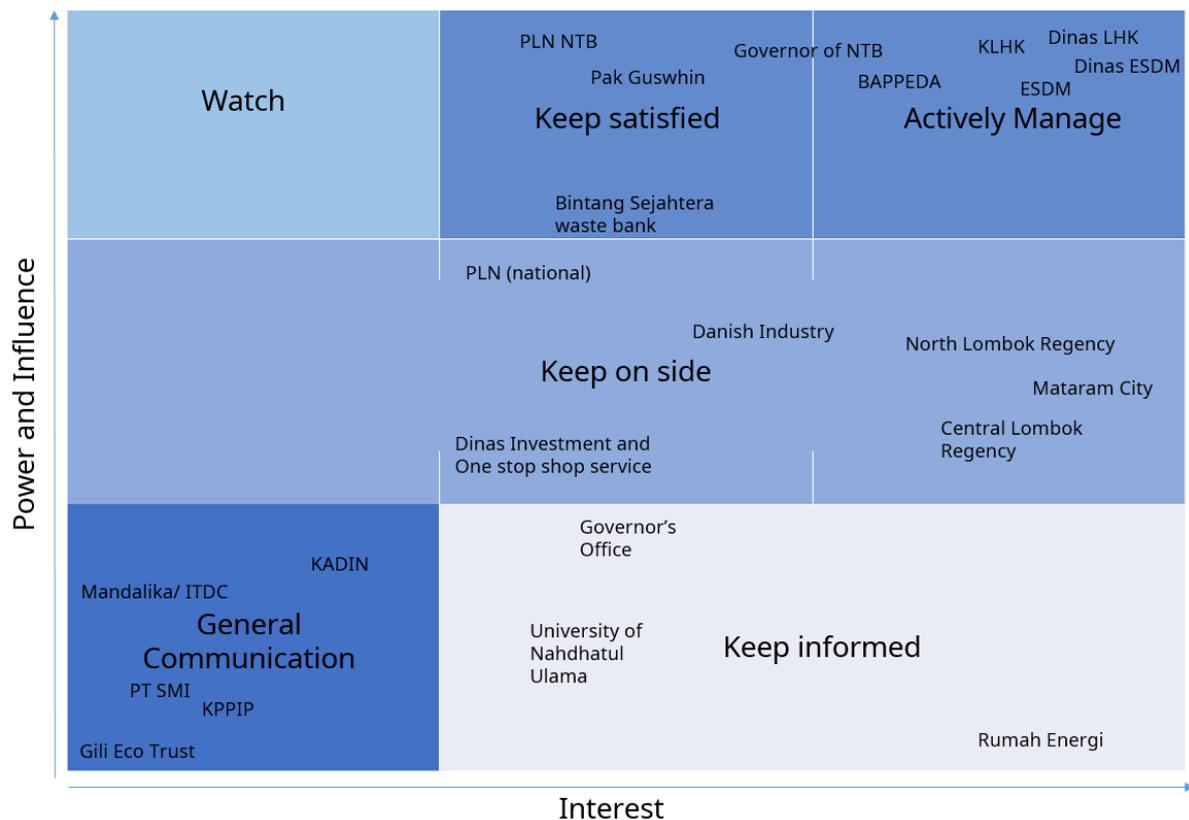
			<p>Mitigation: Involve PLN NTB in the SII and actively engage. Make sure the SII is aligned with PLN's interests and wishes. Inspire PLN NTB to work for a green transition, e.g. by introduction to SSC work tools.</p>		
<i>Mataram City</i>	Interested in a functioning waste management system.	The SII needs data from the municipalities. Though not essential for the initial phases of the SII, the municipalities are important in implementing the regulations associated with the SII further down the road.	<p>Risk: The implementation of regulations associated with the SII is not prioritized, which makes implementation a hassle. There is not allocated enough resources to implementing the regulations associated with the SII.</p> <p>Mitigation: Keep the Mataram City on side and include them in aspects of implementation. Emphasize the need for allocating economical resources to the implementation.</p>	2	3
Stakeholder	Stake in the SII	What do the SII need from them?	Risks and mitigation efforts	Power/ influence score (1-3)	Interest score (1-3)
<i>North Lombok Regency</i>	Interested in a functioning waste management system.	The SII needs data from the municipality. Though not essential for the initial phases of the SII, the municipalities are important in implementing the regulations associated with the SII further down the road.	<p>Risk: The implementation of regulations associated with new projects is not prioritized, which makes implementation a hassle.</p> <p>Mitigation: Keep the North Lombok Regency on side and include them in aspects of implementation. Emphasize the need for allocating fiscal and non-fiscal resources to the implementation.</p>	2	3
<i>Central Lombok Regency</i>	Interested in a functioning waste management system.	The SII needs data from the municipality and the Special Economic Zone in Mandalika. Though not essential for the initial phases of the SII, the municipalities are important in implementing the	<p>Risk: The implementation of regulations associated with the SII is not prioritized, which makes implementation a hassle.</p>	2	3

		regulations associated with the SII further down the road.	Emphasize the need for allocating fiscal and non-fiscal resources to the implementation of new projects Mitigation: Keep the North Lombok Regency on side and include them in aspects of implementation. Emphasize the need for allocating economical resources to the implementation.		
Stakeholder	Stake in the SII	What do the SII need from them?	Risks and mitigation efforts	Power/ influence score (1-3)	Interest score (1-3)
<i>Bintang Sejahtera Waste Bank</i>	Interested in gaining skills to upscale their waste bank	The SII needs data, information and the network of Bintang Sejahtera. Bintang Sejahtera waste bank is well run and has a huge network among important decision-makers.	Risk: There is a risk of Bintang Sejahtera Waste Bank fails in upscaling the waste bank, hence threatening the plastics and waste bank agenda on Lombok and the part of SII thereof Mitigation: Provide skills and expertise to dinas LHK in order to improve capacity and involve waste bank manager as much as we can to partly support the capacity building.	2	3
<i>Dinas Investment and One stop shop service</i>	Interested in investments in NTB.	Though not essential in the initial phases of the SII, the SII needs permits, lands and licensing for investment in projects in the province further down the line.	Risk: Risk of not getting the permits for investments and thereby losing the business opportunity for Danish companies might be a risk. Mitigation: Keeping the Dinas on our side by developing good relations and highlighting the benefits of Danish investment.	2	2
<i>Danish Industry</i>	Interested in Business opportunities for Danish companies.	Facilitation of contact to Danish companies who are interested in investing in projects in Indonesia.	Risk: Risk of Danish Industry seeing the SII as too complicated and difficult for them to involve their members, which can make it more	2	2

			difficult to involve Danish companies. Mitigation: Listen and consider potential concerns of Danish Industry and highlight the great business potentials of the SII.		
<i>Mandalika Special Economic Zone/ ITDC</i>	Has a need for waste management, waste water management and renewable energy as they want to become a centre for ecotourism	The Special Economic Zone is not directly linked to the SII as it is not regulated by the government, but can serve as business opportunities for Danish companies and as inspiration for the SII.	Risk: Very little risk for the SII Mitigation:	1	1
Stakeholder	Stake in the SII	What do the SII need from them?	Risks and mitigation efforts	Power/ influence score (1-3)	Interest score (1-3)
<i>Governor's Office NTB</i>	Interested in following the priority of the governor.	Smoothing the process and communication between different public administrations. The SII also needs information and access to the governor from the Governor's office.	Risk: If not kept on our side the SII risks lacking access to the governor and risks losing the process smoothing currently given by the Governor's office. Mitigation: Keep the aides in constant communication update during mission and from Jakarta.	1	2
<i>University of Nahdhatul Ulama</i>	Interested in furthering their competences within waste data	As dinas LHK has not assigned anyone to waste data at the LHK, waste data is conducted by the University of Nahdhatul Ulama. The SII could potentially need better waste data for supporting policy making and implementation, which would require cooperation with the University of Nahdhatul Ulama.	Risk: The data resources work in an academic sector and hence no access to influence and inspire the use of data in the agency. Mitigation: Emphasize the need for LHK to assign someone to waste data in dinas LHK for the data track to work with agency, instead.	1	2
<i>KADIN (Chamber of Commerce and Industry)</i>	Generally interested in Business opportunities	Access to commercial links in Indonesia. Ease the process of developing projects on the islands.	Risk: Make the process of developing projects more difficult. Mitigation:	1	1

			Engage in constant communication within the green sector		
PT SMI	Generally interested in Business opportunities.	Access to commercial links in Indonesia. Ease the process of developing projects on the islands.	Risk: Make the process of developing projects more difficult. Mitigation: Engage the company when the infrastructure project development commences.	1	1
KPIIP (Committe for Accelerated Priority Infrastructure Delivery)	Not interested in Lombok nor have any authority.	Information and updates on infrastructure developments. Commercial links.	Risk: Very little risk for the SII. Mitigation:	1	1
Gili Eco Trust	Has a goal of functioning waste management on Gili, but does not currently have stake in the SII.	Information on challenges with waste management in NTB. A showcase of problems and solutions.	Risk: Very little risk for the SII. Mitigation:	1	1

Stakeholders that have been deemed of less importance: PLTD Ampenan



10. Governance Structure

The SSII will be part of and aligned to the two existing SCC projects implemented by KLHK and Dinas ESDM with the assistance from DEPA and DEA, respectively, while ensuring a strong local participation in decision-making and implementation at provincial and municipal/regency levels. The SII will be governed by the two existing Steering Groups hosted by KLHK and ESDM EBTKE. The steering committees will only have advisory capacity.

It is proposed to form a new Working Group chaired and hosted by the Vice-Governor's office with members from relevant local authorities at Lombok. Close interaction and linkages between the Steering Groups and the Working Group will be ensured to support and further strengthen the vertical coordination and collaboration within integrated solid waste management and energy. The provincial level working group will be in-charged of local planning, execution and monitoring of the SII. This will ensure local ownership and management at lowest appropriate level. The working group will consist of representatives from local authorities, the Embassy and the two agencies. An important function of the working group will also be to strengthen coordination and collaboration among local energy and environment institutions and other relevant local authorities.

11. Expected project results

It is proposed that the SII will aim at the following results:

- Increased capacity of relevant staff at regional/municipal/regency level within solid waste management and renewable energy production. Specific topics within circular economy, waste management, plastic and/or data management will be considered.
- Findings from a prefeasibility study will be included in the RUED and Jakstrada. The studies will include a context and sector situation analysis and recommendations for possible specific investments in circular economy, solid waste management and RE generation. The feasibility studies will most likely focus on biomass and bioenergy production.
- Strategic recommendations and solutions provided on how to accelerate WtE and biogas at Lombok mainly driven by B2B are adopted by regional decision makers. The suggested solutions will target regional authorities at Lombok in order to enhance the enabling environment for waste and biogas at Lombok.
- Implementation of solutions suggested and recommendations bridging toward commercial stakeholders with the objective to spark commercial investments and B2B collaboration with WtE and bioenergy at Lombok.

DEA and DEPA will agree on joint annual reporting to Danish MFA.

12. Risks

The main activities of the SII will include sector dialogue, capacity building, studies and interaction with the private sector at regional and local levels. A potential key risk of the project could be lack of capacity and available staff and resources with local authorities to assess and realise WtE projects.

Some of the main risks of larger scale WtE projects might be the following:

- Lack of financial frameworks, laws and regulation in relation to WtE projects.
- Lack of local management skills and access to skilled workforce.
- Lack of policy enforcement, allowing cheaper waste disposal options to compete with WtE projects.

- Lack of enforcement of laws and regulations related to illegal dumpsites and other practices that work against options for effective waste management and sustainable WtE projects.
- Resistance to raise tipping fees and feed-in-tariffs to make WtE projects economically feasible.
- Expected revenues for power sales insufficient and uncertain.
- Lack of regional/municipal/regency capacity to assess, plan and manage contractual arrangements for WtE projects.
- Lack of local operation and maintenance capacity and skills.
- Lack of sufficient waste collection infrastructure to ensure availability of waste for energy generation.
- Social barriers and resistance in regards to WtE projects.
- Lack of public consultation to address social barriers and resistance towards infrastructure development, land acquisition and environmental impacts of WtE facilities.
- Public resistance towards waste separation at household or local level in solid waste management and WtE projects.

Contextual risks will be addressed during implementation of the initiative.

13. State the amount of funding requested from the grants programme

The budgets for energy (DEA) and environment (DEPA) are estimated to be DKK 3.5 Mio. and DKK 3.5 Mio, respectively.

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November 2019

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