The Dawn of Clean Energy and Sustainable Life in Indonesia: a Review from Startups

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Abstract. Indonesians are subliminally introduced to zero-waste and motivated to adopt net-zero practices to diminish carbon emissions. This notion is conveyed through startup apps for online transportation, facilitating increased community involvement. A tangible illustration of this can be observed when a patron makes an order (like food or beverages) through the application. The food requested via the app incurs an additional utensil fee, encouraging patrons to limit the use of disposable cutlery that contributes to waste. This study aims to uncover the extent of the contribution made by online transportation apps in preserving the environment and attaining specific objectives outlined in the sustainable development goals, particularly those on renewable and clean energy. The research drew important information and data about the keywords from related literature. The selected information was then analysed using a conceptual approach and presented descriptively. A conceptual approach is where research is conducted to observe already present information. This research demonstrates that Indonesian startups are essential in reducing extreme weather change. Therefore, if they are supported sufficiently, the excess carbon can be reduced significantly.

Keywords: sustainable development, zero waste, Indonesia, clean energy, startups.

1 Clean Energy of Indonesia

1.1 Energy and Natural Resources

Energy is a resource that can be used to carry out a variety of activity processes, including fuel, electricity, mechanical energy, and heat. Energy is always derived from an energy source, which can generate energy directly or through a conversion or transmutation. Energy sources are natural resources such as oil and gas, coal, water, geothermal, vegetation, and biomass that can be utilised directly or indirectly as energy. All living creatures have access to free and bountiful energy sources nature provides. However, humans must also manage and develop the already present energy to

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support human activities on Earth. Develop the natural energies that are already available to meet their requirements. Consequently, new and renewable energy arises as the solution to this issue. Biofuels, biomass, geothermal, wind, solar energy, ocean tides, and waves are examples of New and Renewable Energy sources.[1]

The subsequent section provides an overview of the current status of the significance of renewable energy in Indonesia. Constraintlessly and abruptly transpiring significant disasters on the earth's surface, the World Meteorological Organisation (WMO), an entity operating under the auspices of the United Nations (UN), has issued a global warning. All humanity has a responsibility in the twenty-first century to halt this devastation, according to UN Secretary-General António Guterres earlier in 2021. Already, indications of this impending catastrophe have become apparent. Extremely heavy rainfall is common for those who reside in Jakarta and this region. According to Meteorological, Climatological, and Geophysical Agency (BMKG) data, extreme rainfall occurs more frequently.[2] Formerly an occurrence that transpired in this nation every 50 years, precipitation averaging 300 millimetres per day has accelerated over the past three decades and is now nearly annual.

There is a growing prevalence of hydrometeorological catastrophes, including abrasion, winds, landslides, and tornadoes. An annual influx of cases is observed. Seasonal cyclone Seroja caused sudden flooding and landslides in East and West Nusa Tenggara in 2020 and 2021, respectively. This hydrometeorological catastrophe has resulted in significant economic losses. An approximation of 22 trillion Rupiah in losses is plausible for 2020.[3]

Jakarta's attendance at the Climate Change Summit in April 2021 can be attributed to this occurrence. Given its bountiful renewable energy potential, Indonesia, an Equatorial nation, demonstrated assurance at this conference that renewable energy will be the country's future. West Kalimantan, East Kalimantan, South Sumatra, and North Sumatra are advantageous regions; for instance, they all possess solar energy potential. Wind energy-potential regions include East Nusa Tenggara, East Java, West Java, and Central Java. Hydroelectric potential exists in Papua, Southeast Sulawesi, and South Sulawesi. Bioenergy is a viable resource in Riau.[4]

1.2 The Basic Principles of Indonesia's Sustainable Energy

The application of Renewable Energy in Indonesia must be conducted according to the Environmental Protection and Management Principles outlined in Law No. 32 of 2009 regarding Environmental Protection and Management. Such regulation has provided Environmental Protection principles: The sustainability and sustainability principles. This principle explains that everyone has obligations and responsibilities to future generations and each other within the same generation by preserving the ecosystem's carrying capacity and improving environmental quality. Improve the environment's quality. Renewable Energy exists to provide Energy that is less harmful to the environment and can be used continuously, ensuring that Renewable Energy will continue to exist in the future.

The principle of biodiversity states that the protection and management of the environment must focus on integrated efforts to preserve the environment's existence,

diversity, and sustainability. The biodiversity principle explains that environmental protection and management must focus on integrated efforts to preserve the existence, diversity, and sustainability of biological natural resources consisting of plant and animal natural resources, which, along with the surrounding non-living elements, form an ecosystem. This must also be considered in the Application of Renewable Energy, where the use of Renewable Energy is a substitute for nonrenewable energy, which can imperil and diminish biodiversity.[5]

The ecoregion principle states that environmental protection and management must consider the characteristics of natural resources, ecosystems, geographical conditions, local community culture, and indigenous knowledge. This indicates that the existence of Renewable Energy can be a measure for the government and the community to utilise all available energy. And for the community to utilise every renewable energy resource in Indonesia.[6]

The beneficial principle explains that all efforts and/or development activities should be proportional to the energy source's potential. Adapting development activities to the potential of resources and the environment to enhance community welfare and human dignity without harming the environment. Harmony between human dignity and the environment. This can highlight the presence of renewable energy, which can provide numerous excellent benefits for a flourishing and prosperous community life.

The justice principle states that the preservation and administration of the environment must be consistent with proportional justice. Cross-regionally, cross-regionally, and cross-regionally, the environment must reflect justice proportionately for every citizen. citizens, cross-regionally, cross-generationally, and cross-gender. This implies that in implementing environmental management and preservation policies, consideration must be given to sustainability and healthy regeneration for each community in the present and future. Consequently, New Renewable Energy can serve as a means of implementing the policy.

The principle of State Responsibility explains that the utilisation of Renewable Energy is a government effort to implement good environmental management and protection environment and can be implemented by:

a. the state guarantees that the utilisation of natural resources will provide the greatest benefits for the welfare and quality of life of the people, both present and future welfare and quality of life of the people, both the present generation and the future generations;
b. the state guarantees the rights of citizens to a good and healthy environment; and
c. the state prevents the utilisation of natural resources that cause pollution and/or natural resources that cause pollution and/or damage to the environment; 3) the state prevents the utilisation of natural resources that cause pollution and/or damage to the environment.[7]

Energy availability affects global geopolitics and is a major concern for industrialised, developing, and impoverished nations, geopolitical affairs. Energy issues are inextricably linked to international conflicts because they affect the viability of life and the capacity of nations to continue developing. Energy control can be a country's political

power in pursuing their respective national political objectives, and energy dependence in a country will indeed be documented as a sign of fundamental vulnerability.[8] Renewable energy is not a novel geopolitical issue in Indonesia because it has had a significant impact, particularly on energy access. Due to declining hydrocarbon production, reliance on fossil energy supplies from other nations is unavoidable, compelling Indonesia to consider fossil fuels as an alternative to fossil fuels in the future. This forces Indonesia to consider geopolitical factors before developing alternative energy sources before developing alternative energy sources in the future. Mastery of energy towards the metamorphosis of renewable energy is a crucial, essential, and formidable challenge for Indonesia. A significant challenge for Indonesia must be resolved through a robust energy transformation scheme, legal capacity, and utilising Indonesia's geopolitical position.[9] The battle to reduce carbon emissions began in early 2021 as Jejak.in, a startup that employs Artificial Intelligence and the Internet of Things to promote carbon offsets. The kind of digital startups that align and follow Jejak.in have now begun to sprout everywhere as a commitment of Indonesia to reduce carbon emissions.[10]

2 The Rise of Environment-Friendly Startups

The research on how Indonesian startups build and establish a robust system where people can participate in reducing carbon emissions is scarce. Research specifies the topics, particularly on the role of Indonesian startups fighting to reduce carbon emissions is deficient. This work is one that convinces readers that this piece of work is novel.

2.1 Digital Framework

The Sustainable Development Goals (SDGs) are a global agenda devised to address the world's environmental, social, and economic problems from 2015 to 2030. Global nations must make several endeavours, one of which is goal 7: providing clean and affordable energy. Various nations have enacted policies to significantly reduce greenhouse gas (GHG) emissions, a phenomenon known as the "energy transition." The energy transition is a long-term programme and policy focusing on increasing energy efficiency, implementing low-carbon technologies, and electrifying end-users.[11]

This era of renewable energy has begun approaching reality, particularly in meeting life's necessities. Numerous Indonesians now rely on the facilities and services provided by online motorbike transportation in their daily lives. Beginning with transportation, food ordering, product delivery, and purchasing for daily necessities. People in Indonesia rely heavily on the Grab, Gojek, and Shopee applications. To achieve pure and affordable energy, several environmental impacts must be mitigated.[12]

Grab and Gojek applications, for instance, can reduce carbon emissions in the transportation sector. Some delivery services already utilise vehicles powered by elec-

tric motors. Gojek has reportedly committed to achieving Three Zeros by 2030, including NZE or zero carbon emissions, zero waste or zero waste, and zero barriers or zero barriers.[13] Gojek is also devoted to becoming a carbon-neutral platform by 2023, intending to convert its entire fleet to electric vehicles. To reach the seventh Sustainable Development Goal (SDG) target on Energy and Affordability, Gojek aims to become a carbon-neutral platform by leveraging the most advanced science, research, and technology to develop clean energy and mobility systems. In 2021, annual carbon inventories will identify and inform the transition to renewable energy.[14]

2.2 Digital Startup Application Accelerates the Electric Powered Vehicle

Transport is the greatest final energy consumer in Indonesia.[15] In an effort to increase energy efficiency, the Indonesian government has given significant consideration to the development of battery-powered electric motor vehicles. Presidential Regulation (Perpres) Number 55 of 2019 pertaining to the Acceleration of the Battery-Based Electric Motor Vehicle Programme for Road Transportation enabled the initiative. Compared to conventional motorised vehicles, battery-powered electric motorised vehicles have several advantages, including greater energy efficiency, superior performance, greater environmental friendliness, and decreased reliance on fossil fuels.[16] The development of battery-powered electric vehicles will directly impact the transportation sector's energy composition. Increased battery-powered electric vehicles will increase electricity consumption but decrease petroleum consumption.

In terms of the environment, electric vehicles powered by batteries do not produce pollutant emissions from exhaust gases, thereby reducing environmental damage. Electric motorised vehicles can help reduce greenhouse gas (GHG) emissions that contribute to climate change if the power plant used is fueled by renewable energy sources such as hydroelectric, geothermal, solar, or wind. Due to their reliance on fossil fuels such as fuel oil and petrol, conventional modes of transportation are susceptible to price increases and disruptions in the energy supply. Battery-based electric motorised vehicles help mitigate these threats as electrical energy can be produced by power facilities using various domestic energy sources, such as: coal, natural gas and renewable energy sources. Electric vehicles (EVs) can substantially reduce emissions and improve air quality if they are widely adopted. Both in terms of fuel and hydrocarbon costs and carbon dioxide (CO2) emissions, EV conversion offers a number of benefits.[17]

2.3 Digital Startup Service Contributes to Lessen Carbon Emission

Gojek and other online services have committed to becoming carbon neutral. Gojek has measured its carbon footprint to identify the most effective and pertinent strategies for yearly direct and indirect emissions reduction. Daily activities, such as using electricity and driving, generate carbon footprints by generating greenhouse gas emissions in the form of carbon dioxide and other pollutant emissions. The carbon footprint is frequently used as a reference to quantify the amount of greenhouse gas emis-

sions produced by an activity or a production process. Climate extremes and degraded air quality are the negative effects of an excessive carbon footprint. Carbon offsets are one of the efforts to reduce these negative effects. By planting new trees, carbon footprints can be absorbed; by planting trees, we can absorb the daily carbon footprint we produce. With the technological innovation of Gojek and Jejak.in, tree-planting activities for carbon footprint absorption can be conducted efficiently, transparently, and environmentally responsible.

Customers of Gojek can contribute to this programme by reserving a GoRide or GoCar. A fixed fee per two or four-wheeled journey will be added to the total cost of the reservation. This fee will be transferred from Gojek customers to Jejak.in, which will then plant trees based on the amount collected at the end of a specified period. Jejak. Jejak's conservation partners will buy. This sowing will occur in a conservation area agreed upon by both parties. The method for calculating mangrove trees' carbon footprint and absorption relies on scientific recommendations based on regulations from the Ministry of Environment and Forestry and numerous IPCC references. The parameters used to calculate the carbon footprint include travel distance, fuel consumption, and emission factor. The conversion from carbon footprint to the value of mangrove trees and their carbon stocks is based on the findings of CIFOR and Klimangrove.[18]

If increased carbon dioxide due to human activity is not counterbalanced by increased plant growth, CO2 levels in the atmosphere will rise, and the greenhouse effect will intensify.[19] As part of the carbon cycle, carbon dioxide is reduced when plants assimilate it. In a state of equilibrium, the quantity and transfer of carbon dioxide emissions from the carbon cycle are nearly identical. Carbon dioxide absorption in plants is the capacity of a plant to absorb carbon dioxide through stomatal openings found on the surface of leaves.[20] From the innovation of tree planting activities by Gojek online services, it can be a source of renewable energy that can be developed, such as bioenergy. Biomass from plant materials can produce bioenergy. In addition to absorbing carbon dioxide, cultivated plants can provide alternative energy sources such as woodchips, wood pellets, DME, methanol, Biobutanol biodiesel, etc. The development of plant-based bioenergy aims to reduce greenhouse gas emissions and enhance environmental quality.

2.4 Online Startup Service Provides Environment-Friendly Features

Online food delivery service applications are one of the many modern luxuries available to satisfy the requirements of today's society. Using the online delivery service application can contribute to an increase in plastic waste due to the rising demand for food packaging. Large quantities of unmanaged waste will negatively affect all aspects of the lives of living creatures.[21] Garbage can negatively affect the environment by degrading aesthetics, polluting soil, water, and air, harming diverse ecosystems, etc. Debris can also cause natural calamities, specifically flooding, because garbage that enters water bodies creates a garbage buildup at the bottom of the water and raises the water's surface, making it easier to flood when it rains.[22] Plastic waste has so many adverse effects that prevention and management must be imple-

mented. Plastic waste management should not be performed carelessly, as it can also have adverse effects; rather, it should be carried out with the proper approach to reduce a variety of other negative effects. The 3Rs (reuse, reduce, and recycle), recycling plastic waste, converting plastic waste into fuel oil, conducting hydro cracking (reacting plastic with hydrogen in a closed container and by mixing catalysts at a certain temperature), conducting thermal cracking (heating plastic to a certain temperature in the absence of oxygen), and conducting catalytic cracking (heating plastic to a certain temperature in the absence of oxygen).[23] There are also numerous additional methods to manage waste safely without causing additional negative effects.

Gojek is committed to reducing, reusing, and ensuring comprehensive waste management to prevent food ordering service waste pollution. The transition assistance provides stakeholders with packaging alternatives to avoid and reduce single-use plastic consumption and pollution. By using reusable containers, plastic waste can be reduced. There are alternatives to plastic bags that are more environmentally beneficial. Joining the Steering Committee of the National Plastic Action Partnership (NPAP), a collaboration with the Global Plastic Action Partnership and the World Economic Forum, to identify solutions for an end-to-end plastic waste management system in Indonesia will help reduce single-use plastics. Raising awareness (education), facilitating access to greener plastic alternatives (facilitation), leveraging technological innovation to accelerate the transition (acceleration), and targeting the three most relevant stakeholder groups, namely driver partners, GoFood business partners, and customers, to ensure a systematic and long-term beneficial approach.

2.5 Online Service Ensures that Electric Vehicles are Well-Developed

According to Hardin Z's essay "Tragedy of the Commons", the development of motor vehicles and urbanisation in Indonesia create problems in the transportation system and impact the air as a commons.[24] Multiple interests are destroying the air as a public good. Moreover, among the various causes of air pollution, it is evident that transportation emissions account for approximately 85 per cent of air pollution. This is evident because most motor vehicles generate poor exhaust emissions due to inadequate maintenance or low-quality fuel (e.g., a high lead content).[16]

Nearly all conventional energy products and motor fuel formulations used in the transportation sector continue to be sources of air pollution. The use of petrol fuel in a combustion motor will always emit compounds such as CO (carbon monoxide), THC (total hydrocarbon), TSP (dust), NOx (oxides of nitrogen) and SOx (oxides of sulphur). Exhaust emissions consist of lead/black tin (Pb), suspended particulate matter (SPM), oxides of nitrogen (NOx), oxides of sulphur (SO2), hydrocarbons (HC), carbon monoxide (CO), and photochemical oxides (Ox) and are the result of an incomplete combustion process.[25]

Gojek aims to educate driver partners on maintaining the quality of their vehicle's exhaust emissions to satisfy the government-mandated threshold. As part of the Jakarta Langit Biru programme initiated by the DKI Jakarta Provincial Government, Gojek conducts continuous emission tests on fossil-fueled vehicles owned by driver-partners. >95% of the samples analysed for 2W and 4W vehicles used by Gojek driver

partners were compliant. One of Gojek's efforts is a concrete manifestation of efforts to realise clean energy and affordability by assuring the quality of Gojek partners' exhaust emissions.

3 Conclusion

The increasing development and the endeavour to initiate discoveries or innovations put Indonesian startups in a strategic position. Such a condition where the application calculates for the customer and lets the customer know how the application can help efficiently reduce carbon emissions is sound.

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