

## Energy and transport profile: Romblon Island, The Philippines



This profile has been authored in October 2019 by Paul Bertheau and Tobias Rieper, RLI, in cooperation with Dean Gioutsos and Alexander Ochs, SD Strategies, as part of the APEC project “Supporting the transition to energy-efficient electric transport systems.” It presents key information and observations on the energy and transport sectors in Romblon Island as important input for a Roadmap for the Integration of Sustainable Energy and Transport (RISET). Electricity and transport services in islands are often insufficient to meet the needs of their populations. Existing systems are economically, socially, and environmentally unsustainable. Quick and bold transitions to integrated, efficient energy and transport solutions based on domestic renewable sources can make services in both sectors affordable, reliable and sustainable.

### KEY FINDINGS

#### *Current challenges:*

- Isolated island electricity system – necessary to harmonize demand and generation.
- Energy generation and transport sector depend on fossil fuel imports.
- Low GDP per capita and high poverty rate hamper societal development.

#### *Renewable potential:*

- Renewable resources are abundant and several projects on the island have begun to capitalize on this potential (3 x 300 kW wind turbines, 2 MW biomass plant (under construction)).

#### *Transport opportunities:*

- The island has decent quality of roads: a public transport system could allow for a larger share of the island’s people to commute to their potential workplaces.

#### *Opportunities for integration:*

- Electric vehicles are charged with oversupply from renewable energy generation and serve as “dump load.”

#### *Key goals for RISET:*

- Decarbonization of transport sector, tax on gasoline powered cars, subsidies for e-scooters.

## ROMBLON ISLAND, THE PHILIPPINES - IN BRIEF

### GENERAL INFORMATION

**Land area:**

83 km<sup>2</sup>.

**Population:**

38,795 (2015), avg. household size: 4.5

**Administration:**

Archipelagic Municipality with 28 barangays (districts), part of the larger Province of Romblon with 16 additional municipalities. This province is a part of region IV-B (MIMAROPA).

**Climate:** Tropical monsoon (Köppen classification: Am).

**Geographic characteristics:**

Approx. 265 km southeast of Manila. Moderately hilly (highest elevation of 450m) with significant forest cover.

**Primary economic activities:**

Marble industry, coconut farming, fishing, tourism (emerging).

**Income level:**

866 USD per capita and year (2010 estimate), 43.0% of population living below national poverty line.

### ENERGY

**Share of electricity generation capacities:**

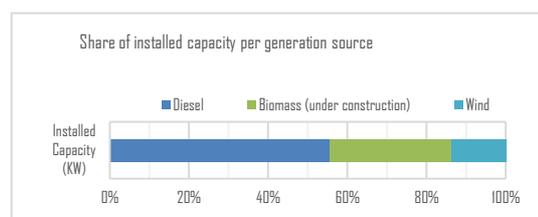
3,650 kW – Diesel Power Plant.  
900 kW – Wind Power Plant (3 x 300 kW as of January 2019).  
2,000 kW Biomass Power Plant (to be commissioned in 2020).

**Annual energy demand:**

9,983 MWh (2018).

**Demand growth rate:**

2019: 5%.  
Average annual growth rate of the last 8 years: 5.7%.



**Share of GDP spent on electricity:**

Approx. 6% (spent on variable fossil-based power generation costs, estimate based on GDP and fuel/OPEX expenditures).

**Connection to mainland elec. grid:**

None, and no current plans.

### TRANSPORT

**Access to the island:** By ferry only.

**Private vehicle fleet size:**

3.36 million private cars (2015) (data for Philippines).  
461,000 commercial vehicles (2015) (data for Philippines).

**Public vehicle fleet size:**

Public or hired vehicles only accounted for 14% (2010) (data for Philippines).

**Demand growth rate:**

6.4% growth of private cars (data for Philippines).

**Motorization rate:**

38 cars per 1000 inhabitants (data for Philippines).

**Transport modal split:**

Main transport modes are Jeepneys (buses), tricycles and motor scooters.

### EMISSIONS

**GHG of Energy generation:**

10,382 t CO<sub>2</sub> per year (calculated from energy generation from diesel power plant).

**GHG of Transport:**

34 million t CO<sub>2</sub>. per year (data for Philippines).

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## Introduction to Romblon Island

Romblon Island is the capital of Romblon province and is part of the Romblon archipelago, which is located in the MIMAROPA region. Around 40,000 people inhabit the tropical island. The production and processing of marble is the most significant economic activity in Romblon. The reserves are estimated at 150 million metric tons and are projected to last for the next three centuries. The main products produced are construction material, marble furniture and small items (gifts/souvenirs). Agriculture is the second source of income in Romblon. Coconut is the main crop produced, followed by rice and vegetables. Livestock plays a minor role and is mostly owned by small farmers. Fishing constitutes an important source of income for many remote living and poorer families. Additionally, many families fish for their own consumption. Tourism is slowly emerging, but Romblon is not yet in the spotlight of the Philippine tourism industry.

The GDP is around USD 33.6 million (2010 estimate) and the revenues amount to 1.9 million USD (2016 – 3rd Municipal income class). In contrast, 2.1 million USD was spent for necessary fuel purchases in 2018. Another 187,349 USD was spent for maintenance and spare parts of the Diesel Power Plant in the same year. A regular ferry schedule (10 hours) connects Romblon to the main port of Batangas in Southern Luzon. The closest airport is Tugdan airport, which is located on the neighboring island of Tablas and can be reached via a 3-4 hour combined boat and car trip. No formal public transportation system is in place in Romblon. Few privately operated ‘Jeepneys’ (buses) provide daily services for fixed routes. Besides that, private tricycles and motorbikes are used for commuting. Car ownership is not very common in Romblon Island, instead many families own 1 or 2 motor scooters. Public or hired vehicles only accounted for 14% in the Philippines in 2010. This value has likely increased significantly since then due to the growth of ride sharing service providers like Grab.

## Power and transport in Romblon today

### *Current configuration of energy and transport system*

#### **Electricity sector**

Until 2018 the power supply on Romblon Island almost exclusively relied on diesel generators, as is the case for the majority of islands in the Philippines that are not connected to the national transmission grid. Diesel-based power generation is very expensive and in case of the Romblon power plant, it could not provide a stable supply. In 2018, more than 2.1 million USD was spent on diesel fuel purchases and another 187,349 USD was spent for spare part and the necessary maintenances of the diesel generators. Based on these numbers, the true costs of power generation are in the range of 0.2 USD per kWh. In contrast, the annual revenues from sold electricity only account for 1.26 million USD equating to a loss of more than 1 million USD per year. This loss is compensated through the Universal Charge for Missionary Electrification (UCME) subsidy scheme, which is paid by a UCME levy that customers served by the Philippine Transmission grid pay on top of their bills. These costs will constantly rise in the coming years given the expected demand growth of 5% per year. One of the key objectives of the Government of the Philippines is to decrease the UCME requirement, which implies reducing diesel power generation. The conditions for renewable energies on Romblon are very good and this means that they can generate cheap electricity and pay off fast, if they are properly integrated into the existing energy system.

The Romblon Electric Cooperative (ROMELCO), which operates the distribution grid in Romblon and neighboring islands, is spearheading the energy transition efforts. One of its main achievements to date was the commissioning of three 300 kW wind turbines in early 2019, the implementation of a combined hydropower-battery plant on neighboring Sibuyan island in 2015 and the installation of a solar-battery-hybrid system on the neighboring island of Coadador in 2017. Currently, the planning for the construction of a two MW biomass power plant is going ahead. Thanks to the installation of the wind park on Romblon Island, the electricity outages could be reduced. Together with the future biomass power plant, the wind park will drastically



Figure 1: 300 kW Wind power plant (topgear 2019)

reduce diesel power generation and the fuel import costs. A higher RE share in the power mix is also an important step regarding climate change, which has strong impacts on the Philippine islands due to extreme weather effects and sea-level rise. Each diesel-based energy system contributes to this trend of global warming and the costs of its consequences are high. In addition, an island like Romblon, with high touristic potential should push forward a clean energy system to protect its environment from fossil fuel pollution.

### **Transport sector**

Like many small islands, Romblon faces transport challenges, such as lack of investment in public transport and basic transport infrastructure, shortage of clean vehicle technologies, and a topology which is not always suited to high density public central transport systems. Simultaneously, despite numerous awareness campaigns, road accidents and fatalities are increasing every year. The population of Romblon is concentrated around the largest urban agglomeration, Romblon town. This has resulted in the dominance of one center on the island, resulting in a skewed concentration of labor and administrative services. This primacy of capitals and centralization makes the provision of services, including public transit, to small towns more difficult. The concentration of human settlements and valuable infrastructure also occurs near the coast. Future trends move toward ever-higher number of cars owned by households, highly concentrated economic and business activity, high land price in attractive areas, wider urban sprawl, rising standard of living along with economic and population growth. In addition, climate impacts also interact with the transport system. Romblon's road system, with its 42 km-circumference ring road, is strictly bounded along the islands' shores. There are few roads in the islands' interior, especially as the island is partly covered by dense forests. Transport activities, and livelihoods in general, remain concentrated in the urban area between shores and hill ranges. Mobility transition is pushed by the high fuel prices, as it is an isolated archipelagic province leading to prices higher by an average of 0.07 USD/liter versus Metro Manila prices. The electric cooperative ROMELCO aspires to push forward the transition to electric vehicles and seeks partnerships with companies, which can provide the technical infrastructure. One successful pilot project has already started with E-scooters.

The E-scooter project (as presented in the island snapshot below) can improve the island's transport situation by offering cheap transport to its residents, which is a basic requirement for a healthy economy. This project also contributes to the transition to a cleaner transport, an important aspect since a large share of air pollution in the Philippines is caused by gasoline powered transport and affects the health of the country's citizens.

Although air pollution is worse in metropolitan areas, it also affects small island communities that have a high share of motorbikes with inefficient engines.

## Policy and investment environment

### Existing measures and targets on emissions, climate & sustainable development

The Philippine government finally ratified the Paris agreement in 2017 and committed itself to cut all GHG emissions by 70% compared to the business-as-usual (BAU) scenario. In terms of electricity access, the objective is to achieve universal access to electricity by 2022. Currently, roughly 90% of the population have access to electricity.

### Electricity sector

There are two major policies in the Philippines that aim to support renewable energies and private investments in the power sector: The Renewable Energy Act (RE Act) and the Electric Power Industry Reform Act (EPIRA). Since the state-owned energy monopolist, the National Power Corporation (NPC) was partly privatized through the EPIRA, private entities, so called New Power Producers (NPP) and Qualified Third Parties (QTP), are allowed to perform power generation and distribution services. This is also the case in off-grid areas, where usually the state-owned National Power Corporation – Small Power Utilities Group (NPC-SPUG) provides power generation and the local Electric Cooperatives (EC) organize the power distribution. The Energy Regulatory Commission (ERC) regulates the competition of the actors and the bidding processes for projects. The figure below shows the structure of the stakeholder environment of the off-grid energy system.

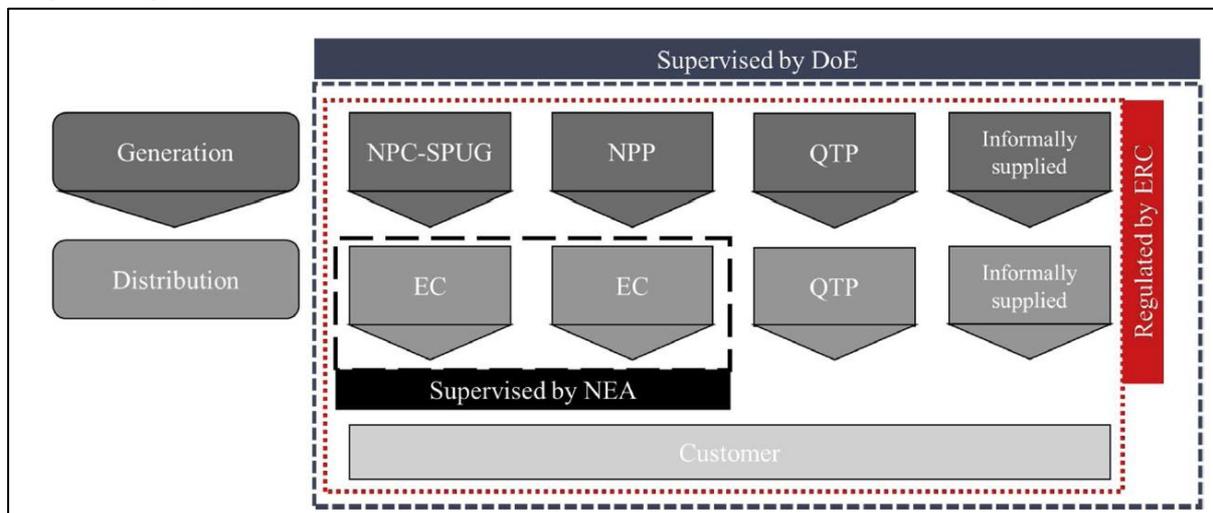


Figure 2: Organizational Scheme of the Philippine Off-Grid power sector (Bertheau et al. 2019)

In off-grid areas, such as Romblon Island, the electricity supply is mostly provided through diesel power plants and the fuel costs are high and volatile due to transport and oil price fluctuations. The electricity tariffs paid by customers do not cover generation, transmission and distribution costs and therefore the UCME subsidy scheme compensates off-grid energy producers for their economic losses. As of 2012, a new policy act encourages ECs to operate power generation facilities themselves, partly because of the limited interest of private investors in off-grid energy projects due to high risk and bureaucracy. The Romblon Electric Cooperative (ROMELCO) is a good example of an EC that is very active in deploying renewable energies and hybridizing their energy generation portfolio. ROMELCO has also set RE targets for the electricity mix and

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wants to achieve 90% of RE-generation by 2030.

### **Transport sector**

The Draft Implementing Rules and Regulations (IRR) of the National Transport Policy issued by the National Economic and Development Authority (NEDA) analyses the condition of the Philippine transport system. It indicates recurring issues such as: 1) lack of integrated and coordinated transport network; 2) overlapping and conflicting functions of transport agencies; 3) transport safety and security concerns; 4) inadequate transport facilities particularly in conflict affected and underdeveloped areas.

Member states of ASEAN (Association of Southeast Asian Nations) adopted a region-wide strategic transport plan aiming to combating the negative externalities from the burgeoning private car ownership levels: the ASEAN Strategic Transport Action Plan (ASTP). Specifically, the strategic plan aims to create safe, efficient, and environmentally friendly transport corridors. The Philippines' Department of Transport and Communications (DOTC) also aims to improve public transportation networks and promote alternative mobility options. Cleaner transport options are supported in the way of alternative fuels, electric vehicles and the recent introduction of express buses and point-to-point systems.

Following the Avoid-Shift-Improve (ASI) concept, the government is also trying to promote cycling and walking, by investing in appropriate infrastructure. Furthermore, the new House and Senate bills include an excise duty exemption and value added tax (VAT) exemption for raw materials, parts, and capital equipment used for the manufacture of EVs. Buyers of hybrid and electric vehicles will be given priority in registration and licensing of the vehicles. Furthermore, hybrid vehicles and EVs could be exempted from the Unified Vehicular Volume Reduction Program (driving restrictions for certain car types during traffic peak time hours) and be allotted free parking spaces. On Romblon Island, ROMELCO seeks to increase the share of sustainable transport to 10% until 2025 and to 50% until 2040.

## *Main stakeholders/actors*

### **Electricity sector**

The main actors in this sector on Romblon Island are the NPC-SPUG (National Power Corporation – Small Power Utilities Group) and ROMELCO. The NPC-SPUG is part of the National Power Corporation, a state-owned power company that operates power plants in off-grid areas including the 3,650 kW diesel power plant on Romblon Island. ROMELCO is in charge of the power distribution on Romblon Island and operates the 900 kW wind park, consisting of three wind turbines. The wind park is owned by a private subsidiary of ROMELCO. ROMELCO will also operate the biomass power plant that is currently under construction. The main electricity consumer of the island is the residential sector (59%) followed by the commercial (15%) and Industrial sector (4%). Other unspecified consumers use the remaining 22% of the electricity.

### **Transport sector**

There is no public transport, thus vehicles are acquired privately and are licensed through the local government. ROMELCO has one of the few car fleets on the island and disclosed the vehicles types and numbers of the fleet: 8 cars, 19 motorbikes/scooters, 9 tricycles, 10 electric vehicles.

## Island snapshot: Electric scooters pilot

On Romblon Island, the local electricity cooperation ROMELCO has joined forces with two Japanese companies, Honda and Komaihaltec, and elevated the local off-grid energy system to a whole new level. By supplying electric scooters (E-scooters), and powering them with renewable electricity, the transport and electricity sectors have been coupled. Three new wind turbines (900 kW), provided by Komaihaltec, feed



Figure 3: E-scooter battery exchange station (Topgear 2019)

electricity into the existing grid and also supply the charging stations for the E-scooters. The 17 charging stations, called “exchangers”, are spread across the island’s road network. Honda provides the exchangers and E-scooters, which are leased to the local population for USD 38 per month over a 4-year period. Uptake of the scooters has been very successful with many locals utilizing the modern and comfortable scooters for their daily mobility needs.

In doing so, the users are reducing local particulate matter and their personal GHG emissions relative to combustion engine

vehicles and scooters. The average range of the electric scooter with a fully charged battery is 42 km and recharging of the battery takes about 4 hours. If customers do not want to wait the entire charging time, they can swap their batteries for fully charged ones at the exchangers for a fee of USD 0.7. In comparison, one tank of gasoline, takes you approximately the same distance but costs 1.1 USD.

The new system addresses several of the common problems island energy systems and offers numerous advantages for all stakeholders: Blackouts and capacity shortages are mitigated by the newly installed RE capacities, which have been common occurrences for the people of Romblon and the electricity grid, which was predominantly dependent on a diesel power plant. System efficiency is maximized, as the excess electricity generation from times of surplus renewable production can be used to charge the E-scooters. Residents also benefit from the availability and flexibility of the cost-effective transport mode. The economic performance of the entire energy system and its stakeholders is boosted, as less fuel and gasoline have to be imported and this results in cost and emission reductions. The project is currently in a 4-year pilot phase, due to end in 2023, but has already received much positive feedback from the locals. Due to the wide range of benefits generated and the positive reception so far, it seems likely that the project will be continued. To build upon the successes of this pilot, greater numbers of electric cars and public transport could be supported, which would be helpful to avoid an increase in private gasoline-fueled cars and to continue to reduce emissions and improve the local environment, making the island more attractive for tourists.



Figure 4: General Manager of ROMELCO Rene Fajilagutan changes E-scooter battery (Topgear 2019)

## The way forward...

### *Opportunities to advance the energy and transport systems*

The meteorological conditions on Romblon are favorable for renewable energies: the map below shows that the average solar irradiation lies at almost 2000 kWh/m<sup>2</sup> and that is for example almost twice as high as the solar irradiation in Germany. Regarding wind energy, the conditions are decent as average wind speeds are above 8 m/s in certain areas (see map below). This means wind turbines can achieve high annual energy yields. The wind turbines on Romblon Island were built in these suitable regions.

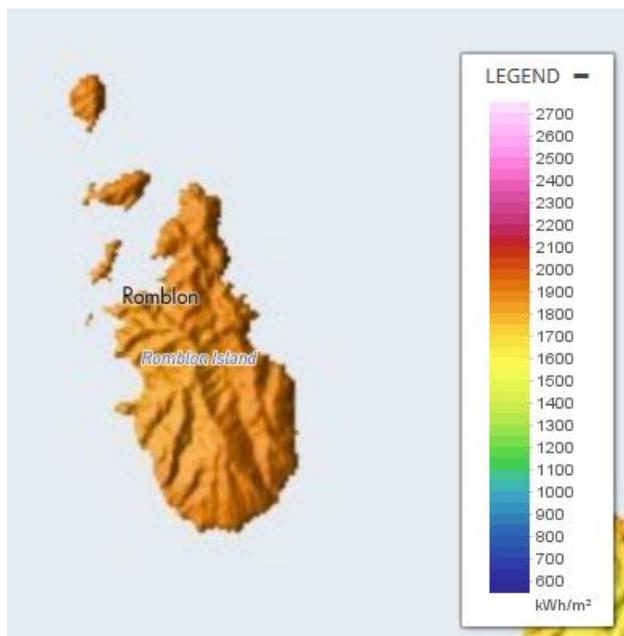


Figure 5: Global horizontal irradiation on Romblon Island in kWh/m<sup>2</sup> (Globalsolaratlas 2019)

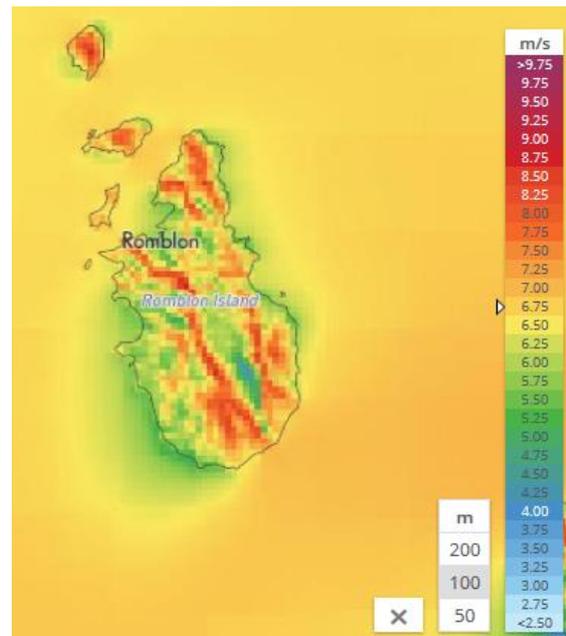


Figure 6: Average wind speeds on Romblon Island in m/s (Globalwindatlas 2019)

Although Romblon is covered by tropical forests and many areas are not easy to access, a circumferential paved road connects parts of the coast and parts of the inner island and is suited for motorized vehicles. The yellow line on the map in Figure 7 reflects the road.

### *Integration roadmap for electric public transport*

The E-scooter and wind park project on Romblon represents a successful example of sector coupling for an island energy system. As a next step, a concept of electric public transport should be elaborated to further improve the transport system. The current transport system on land mainly consists of scooters and tricycles. The use of conventional tricycles causes a significant amount of emissions and air pollution to the Philippines and they depend on expensive fossil fuels. In 2014, the Department of Energy (DOE) together with the Asian Development Bank (ADB) launched the “electric tricycle program”, that aims to distribute 100,000 E-tricycles (so called E-trikes) across the country and to replace conventional inefficient tricycles. Already 10 million USD has been invested in the manufacturing and the distribution of the E-trikes. In addition, the government and the DOE address the financial and regulative obstacles for e-mobility by introducing new laws and action plans, that reduce taxes on EVs, facilitate the licensing process and the access to loans.

Therefore, a public transport project on Romblon using E-tricycles would align with the nationwide strategy of spreading this vehicle type that is cleaner and resilient to rising oil prices. Results of pilot tests also showed that the e-trikes are advantageous for the owners because they are able to carry more passengers and the vehicle is more secure and comfortable. The performance of E-trikes regarding costs and emissions was assessed in a study of the Clean Air Asia Initiative in 2011 and it found that the annual savings on costs and emissions were substantial but the high investment costs for E-trikes was still preventing fast amortization. With falling costs of lithium-ion (Li-Ion) batteries, the main cost driver of EVs, the economic performance of E-trikes will most likely be more competitive now and should be further investigated. A potential project on Romblon could benefit from the experiences made on islands communities where the DOE/ADB project already deployed E-trikes, for example in the tourist hotspot Boracay and in San Vicente on Palawan. Romblon has the great advantage of an existing battery charging infrastructure from the e-scooter project and it would be a great opportunity to combine the two projects in order to share the infrastructure and its costs. The benefit of combining e-mobility and renewable energies was already highlighted with the E-scooter/wind park project and would be extended, if also the e-trikes would be powered by the renewable excess energy. This way, Romblon could become a testbed for a sustainable energy and transport systems on islands, where sector coupling can

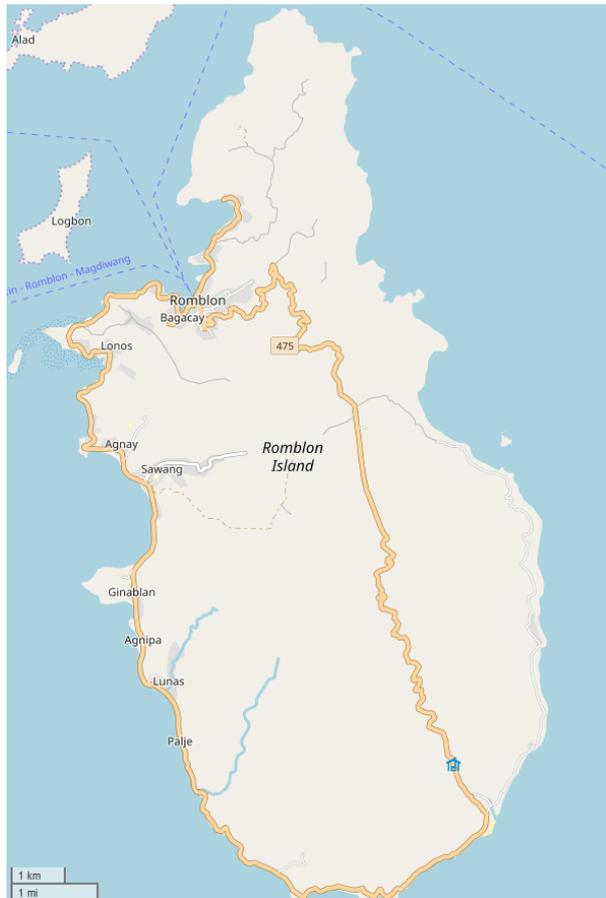


Figure 7: Circumferential road on Romblon Island (OpenStreetMap, 2019)



Figure 8: E-trike in San Vicente, Palawan (Palawan-News 2018)

maximize the benefits of both systems. A clean energy and public transport system could not only serve the local population but would also promote Romblon as a touristic destination with a modern sustainable infrastructure. These arguments show the potential of further e-mobility projects on Romblon. The DOE and ADB could be addressed to receive support for the procurement and financing of the e-trikes. Additionally, the Electric Vehicle Association of the Philippine (EVAP) could be included for information and education campaigns as it is experienced in this field and could help to raise the awareness on Romblon's integrated sustainable energy and transport project.

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