Dominica Geothermal Development Company

Government of Commonwealth of Dominica

Dominica Geothermal Risk Mitigation II Project

Construction of Transmission Lines and Substations

Environmental and Social Impact Assessment –

Non-Technical Summary

Draft for Consultations

July 2023

Abbreviation

ARAP	Abbreviated Resettlement Action Plan
CIA	Central Intelligence Agency
CLO	Community Liaison Officer
CoI	Corridor of Impact
DGDC	Dominica Geothermal Development Company
DGRMP	Dominica Geothermal Risk Mitigation Project
DGRMP II	Dominica Geothermal Risk Mitigation Project II
DOMLEC	Dominica Electricity Services Ltd.
E&S	Environment and Social
EHS	Environmental, Health and Safety
ESIA	Environment and Social Impact Assessment
ESF	Environment and Social Framework
ESMP	Environment and Social Management Plan
ESS	Environment and Social Standard
FGD	Focus Group Discussion
FSI	Transmission line network from Fond Cole substation to Sugarloaf substation
GDP	Gross Domestic Product
GLI	Transmission line network from the geothermal power plant to Laudat substation
GFI	Transmission line network from the geothermal power plant to Fond Cole substation
GoCD	Government of Commonwealth of Dominica
GRM	Grievance Redress Mechanism
GTI	Transmission line network from the geothermal power plant to New Trafalgar substation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IMF	International Monetary Fund
IUCN	International Union for the Conservation of Nature (IUCN)
KBA	Key Biodiversity Area
kV	kilovolt
LMP	Labor Management Plan
MTPNP	Morne Trois Pitons National Park
NTS	Non-Technical Summary
O&M	Operation and Maintenance
OHS	Occupational Health and Safety
OHT	Overhead Transmission
PAP	Project Affected Person
PFI	Transmission line network from Padu substation to Fond Cole substation
RAP	Resettlement Action Plan
RoW	Right of Way
SEP	Stakeholder Engagement Plan
TA	Technical Assistance
TPI	Transmission line network from Trafalgar substation to Padu substation
UGC	Underground Cable
UNESCO	United Nations Educational, Scientific, and Cultural Organization
WHO	World Health Organization

1. INTRODUCTION

1.1 Overview

This Non-Technical Summary (NTS) provides an overview, in plain language, of the main findings of the Environmental and Social Impact Assessment (ESIA) prepared for the construction and operation of the Dominica Geothermal Risk Mitigation II Project (hereafter referred to as 'the Project' or 'DGRMP II'). The Project will construct and operate the first phase of transmission network development to evacuate the power to the Dominica Electricity Services Ltd. (DOMLEC) system from the ongoing construction of a 10 MW geothermal power plant. When complete, the Project will make an important contribution to the region's socio-economic development and the Commonwealth of Dominica. It will provide a stable source of electricity for the island and reduce the overall reliance on diesel generation.

It is important to note that this NTS does not intend to convey all of the information relating to the Project and its potential impacts on the physical and social environment. The text provided herein summarizes the detailed assessments discussed in the various Environmental and Social (E&S) instruments prepared for this project, such as ESIA, Stakeholder Engagement Plan (SEP), Labour Management Plan (LMP) and Resettlement Action Plan (RAP). These documents have been prepared in compliance with the World Bank Environmental and Social Framework requirements and national regulations. Draft versions of these documents are available at the office of the Dominica Geothermal Development Company Ltd (DGDC) (refer to Section 3.4) and on DGDC's website (https://www.geodominica.dm/publications222/).

1.2 What is the Project?

The proposed DGRMP II comprises two components: (1) Transmission Network Development for Integration of the Geothermal Power Plant and (2) Technical Assistance and Project Implementation Support.

Component 1 will entail the construction of new transmission lines and three substations connecting the geothermal power plant with the national electric system load centers in Fond Cole (near Roseau City in the southwest). Network expansion will take place in four segments:

(i) A 69 kilovolt (kV) transmission line of 7.5 km from the geothermal power plant to the Fond Cole substation (GFI) consists of underground and overhead installation. To reduce land acquisition and easement in the Glasgow community, a part of the GFI transmission line will be installed underground on a public road from the Fond Cole sub-station up to the Glasgow community. Thereafter, GFI will switch to an overhead installation with about 20 pole structure sites.

(ii) A 33 kV underground transmission line, totaling 10 km that connects between the geothermal power plant and New Trafalgar substation (GTI), between Trafalgar and Padu substations (TPI), and between Padu and Fond Cole substations (PFI). TPI and PFI will be placed under the major road between Trafalgar and Roseau City.

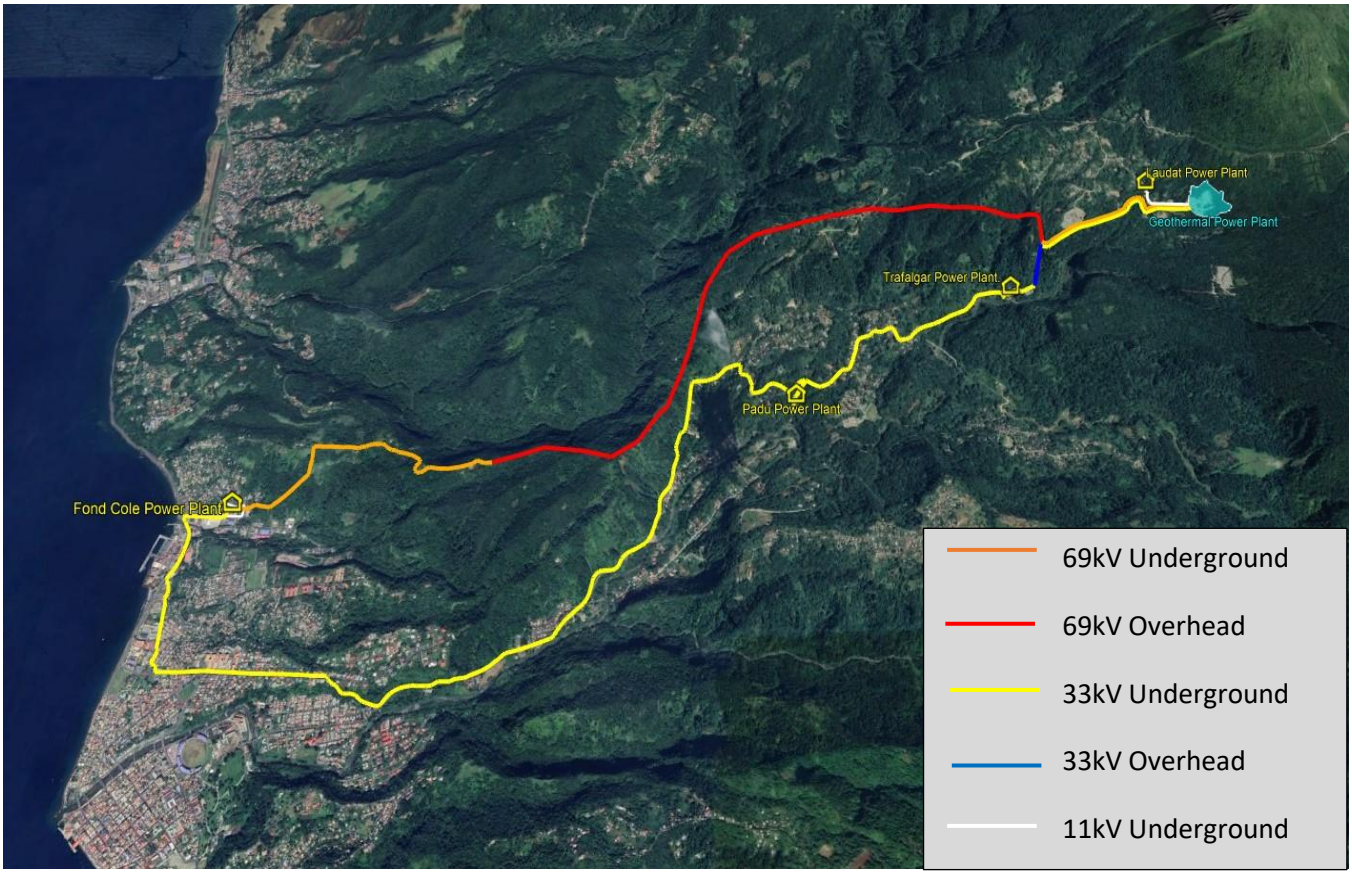
(iii) An 11 kV underground transmission line of 0.5 km connecting the geothermal power plant to the Laudat substation (GLI).

(iv) One new 69/33/11 kV substation at Fond Cole; a new 33/2.2 kV substation at New Trafalgar; and a new 33/11 kV substation at Padu.

An overview of the Project and the location of its elements is provided below in Figure 1.

Component 2 will finance project management by DGDC and capacity building of DOMLEC in operating the new 33kV and 69kV networks.

Figure 1: Project Location Map.



1.3 Why is the Project Needed?

The Project activities will complement the first of the two phases of the transmission network expansion required to support the ongoing construction activities under the DGRMP, the outcome of which is expected to be 10MW of geothermal generation capacity becoming available to the DOMLEC system. When both projects are completed, the share of renewable electricity used by the domestic power system is expected to increase significantly while the reliability of the electricity supply will be improved as the majority of the aged diesel generators (which have exceeded their unit's maximum operational hours and life expectancy) will be displaced by the new geothermal capacity.

The future and second phase would extend the 69 kV transmission line from the Fond Cole substation to the Sugar Loaf substation in the north of the island; it is expected to be financed by a follow-up investment project by the World Bank.

1.3 What are the activities to be carried out under the Project?

The Project's activities include (a) the construction of an overhead transmission line network, including the establishment of pole structures, the installation of overhead transmission lines, and the construction of access roads; (b) the excavation of trenches and the installation of underground cables along the public roads; and (c) the construction of new sub-stations and upgrading of existing substations. The overhead transmission lines will pass through mountainous terrain with lush green vegetation. The underground cable lines will pass through communities along public roads.

Pole Structures. The overhead transmission (OHT) lines will be constructed from the geothermal power plant in Laudat to Glasgow. There will be about 20 pole structure locations, adopting one of three types of steel pole structures: Type A and B, which are single-pole steel structures and Type C, a three-pole steel structure. The footprint of each type of structure is estimated to be around 160m^2, 210m^2, and 280 m^2, respectively. Type A single pole structure is straight, while Type B will be angled. The pole height for all structure types is 20m. There is a Right of Way (ROW) of 15.5m from the centerline (i.e., 31m width in total). The pole structures will be built on forest or agricultural lands. The locations of the poles are shown in Figure 2. Schematic views of single and 3 pole structures are given in Figures 3 and 4, respectively.

Figure 2. GFI Overhead Transmission Line from Geothermal to Glasgow

Figure 3. Single pole structure with stays

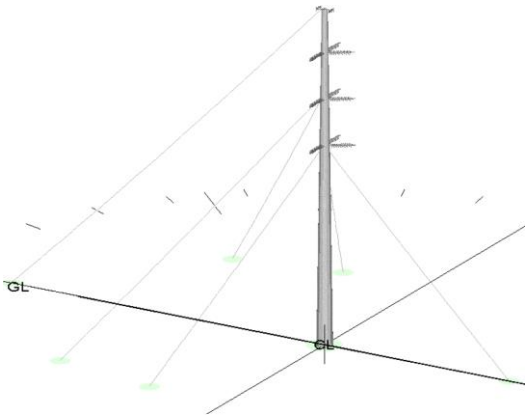
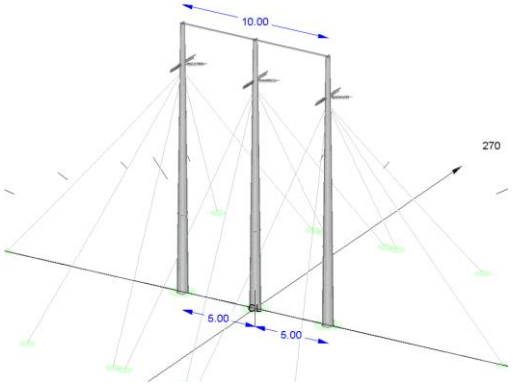


Figure 4. Three-pole structure with stays



Access roads. The majority of pole structure sites will require new access roads to construct and maintain the pole structures. The access roads will be earthen roads built with locally available *tarish material* from volcanic gravel. The approximate road width is 3 to 5m.

Underground cables. Underground cables (UGC) will be installed in the public roads between the geothermal power plant and Laudat sub-station (GLI), between the geothermal power plant to the Trafalgar sub-station (GTI), between Trafalgar and Padu substations (TPI), between Padu and Fond Cole substations (PFI), and between Glasgow and the Fond Cole substation (the tailend of GFI). The cables for GLI and the initial section of GFI and GTI lines will be installed near the existing right of way of Laudat's hydropower pipeline. The tailend section of GFI will be installed on the public road connecting the Glasgow community and Fond Cole. Cables will be laid by digging open trenches. The approximate width and depth of the trenches for 11 and 33 kV lines are 0.4 m and 0.9 m, respectively. The approximate width and depth of trenches for the 69 kV line are 0.6 m and 1.5m, respectively.

1.6 What land requirements will there be?

DGRMP II will require minor land acquisition to construct a 69kV overhead transmission line and install a 69kV underground cable. For the overhead transmission line, the land will be acquired at pole structure locations. The land acquisition will be around 160 m^2 to 280 m^2 per location, depending on the structure type. To ensure safety under the high voltage transmission line, there will be land use restrictions within the right of way (i.e., 15.5m on each side of the center line). The affected land will be under easement. As the overhead transmission line will be built in the mountainous terrain, the majority of pole structure locations will require access roads. The land required for access roads will also be under easement.

The total land requirement is about 319,868.22 sq ft (29,716.73 m^2). About 25% will be acquired for pole structure locations and trenching. The remaining 75% will be under easement, affected by midspan or access roads. It is estimated that 22 land parcels will be affected by land acquisition and/or easement. 20 land parcels are privately owned, while two parcels are owned by the Government. Government-owned land is free from squatters or encroachers. The Project will affect about 20 Project Affected Persons (PAPs.) The majority of the PAPs will be affected by both land acquisition and easement.

No land acquisition or easement is anticipated for the 33kV underground transmission line.

1.7 What will happen during the construction phase?

During the construction phase, all the proposed project activities (refer to section 1.3) will be constructed. The main civil works during construction will include:

- Construction of trenches for the underground pipelines and installation of cables
- Establishment of temporary storage facilities, security fencing, drainage controls and access controls
- Earthworks for the construction of temporary access roads
- Construction of foundations for the transmission line structures and erection of poles.
- Construction of foundations for installation of equipment in the existing substations.
- Stringing of conductors for overhead transmission lines and interconnection with the underground cables and substations

1.8 What will happen during the operation phase?

DOMLEC will operate and maintain the transmission line facilities according to its general system maintenance procedures. These procedures include periodic inspections that require access to the towers and visual checks of the line corridor. If any defects or repairs are detected, maintenance crews will be deployed to fix them.

2. DESCRIPTION OF THE ENVIRONMENT

2.1 What are the general environmental conditions at the site?

The Commonwealth of Dominica is a small island developing state in the Caribbean Sea with a population of approximately 72,000 people and a land area of approximately 750 km^2. The island is the largest and most northerly of the Windward Islands in the Lesser Antilles, lying between Guadeloupe and Martinique. An estimated 60% of the land is classified as the Morne Trois Piton National Park – a World Heritage site by UNESCO due to its rich biodiversity. The capital Roseau is located to the island's southwest and has a population of around 15,000.

The climate of Dominica is tropical all year round, with high temperatures, high humidity and heavy rainfall. The magnitude of variation in ambient temperature is low, generally ranging from 26°C during the day in January to 32°C in June.

2.2 What is the condition of the physical environment at the site?

2.2.1 Air Quality

The existing air quality in the vicinity of the Project is expected to be generally good, given the relatively low population, absence of heavy industry, and the island's relatively small size. Sources of air pollution are primarily limited to diesel-fired power generators, traffic, and solid fuel combustion for cooking. As Dominica is a volcanic island, there are natural sources of emissions, including steam, carbon dioxide, and hydrogen sulphide, via natural geothermal features such as vents and fumaroles.

2.2.2 Water

Site investigations and observations of the stream channels indicate that the tropical environment and steep gradients promote high-velocity flood events with a significant erosive force that may put infrastructure at risk during large events. Titou Gorge, the Roseau River and the Blanc River are all watercourses in Roseau Valley but are located away from the area of influence of the transmission lines.

2.2.3 Geology and Soils

Dominica is a summit of a submerged mountain chain at the eastern edge of the Caribbean Tectonic Plate and consists almost entirely of volcanic rocks. Soils are consistent with those found in wet climates and receive a large amount of rain.

2.2.4 Natural Hazards

Hurricanes

Dominica is located in the hurricane belt, and since 1979, tropical systems of note (storms and hurricanes) which have impacted Dominica include David (1979), Gert (1981), Gilbert (1988), Hugo (1989), Iris (1995), Marilyn (1995), Hortense (1996), Lenny (1999), Dean (2007), Erika (2015) and Maria (2017).

Landslides

Landslides are a potential hazard throughout Dominica, especially in the steepest rainfall areas. West and South of Morne Micotrin are within the high landslide risk, including the entire village of Laudat.

Seismicity

The proposed transmission line and power plant site are located partially within ‘moderate’ and ‘very low’ earthquake risk areas.

2.3 What is the condition of the biological environment at the Project sites?

The proposed transmission line traverses a geographical area with varied biological environments. The biological environment of the transmission line corridor includes three ecological zones. These zones are (i) secondary rainforest, (ii) transitional/semi-evergreen forest, and (iii) dry scrub woodland. The dry scrub woodland is located in the "West Coast Shrub Woodland', which is a Key Biodiversity Area (KBA) but not a protected area. The baseline studies found the presence of three endangered species, namely, the Red-necked Amazon Parrot (*Amazona arausiaca*), the Imperial Amazon Parrot (*Amazona imperialis*), and Black-capped Petrel (*Pterodroma hasistata*) in the project influence area.

2.3.1 Secondary Rain Forest

Secondary Rain Forest occurs above 275 meters (900 feet) elevation above mean sea level in areas previously occupied by mature rain forests that have experienced disturbance from timber harvesting, shifting agriculture and hurricanes. These areas receive annually 3,810-6,350 mm (150-250 inches) of rainfall. Abundant pioneer species and an assortment of regenerated rainforest species characterize the vegetation in this zone. The canopy height is approximately 24 meters. The proposed GFI pole structure locations from 17 to 30 and the 11 kV UGC line are in this zone (refer to Figure 2 for the tower locations). A typical photograph of this ecosystem is shown in Figure 5.

Figure 5: Secondary Rain Forest at Pole Structure #30

2.3.2 Transitional Forest / Semi-Evergreen Forest

Transitional Forest/Semi-Evergreen Forest is usually found at elevations between 214 -396 meters (700-1300 ft) above mean sea level, mostly on Dominica's west and north sides. Annual rainfall in this ecosystem ranges from 2,540- 3,810 mm (100-150 inches). It is found within a relatively narrow zone between the secondary rainforest and dry scrub woodland. This vegetation type is mainly semi-evergreen. Its floristic composition comprises a combination of species, including dry scrub woodland and rainforest species. Most of this ecosystem is under cultivation or previously has been cultivated at one time. This vegetation type is largely secondary woodland. The canopy height varies based on the level of disturbance, but it is usually in the range of 18-24 meters (60-80ft) high. The proposed GFI pole locations from 12 to 16 are located in this zone (refer to Figure 2). A typical photograph of this ecosystem is shown in Figure 6.

Figure 6: Secondary Transitional Forest near Pole #13

2.3.3 Dry Scrub Woodland

Dry Scrub Woodland is the main vegetation type of the seasonally dry lowland areas of Dominica's leeward or Caribbean side. It occurs along the west coast from the shoreline up to an elevation of approximately 213-244 meters (700-800 feet) above mean sea level. It is in the “Rain Shadow” of the island, and annual rainfall ranges from 1,270-2,540 mm (50-100 inches). It is dominated by deciduous trees and shrubs, most of which flower in the dry season (February to June) when they are practically leafless. The dominant trees usually reach a height of 15-18 meters. The undergrowth forms a dense thicket characterized by a diversity of smaller trees and shrubs, vines, climbers, and herbaceous plants. The tailend of the GFI near the Fond Cole and 36 KV line along the existing road mainly passes through this ecosystem. A typical photograph of this ecosystem is shown in Figure 7.

Figure 7: Degraded Dry Scrub Woodland Near Tailend of GFI

2.3.2 Mammals and Reptiles

The mammal species reported in this ecosystem are opossums (*Didelphis marsupialis)*, agoutis (Dasyprocta leporine), and bats. Opossums were recorded during the field surveys at the secondary rainforest zone.

The reptile species recorded during field surveys are the invasive Puerto Rican-Crested Anole (*Anolis cristatellus)*, the Dominica tree lizard (*Anolis oculatus*) and the Dominica ground lizard (*Pholidoscelis fuscatus*). The other reptile species known to occur in these areas but not recorded during the field surveys are tree gecko (mabouya hazyé), golden skink (*zanndoli kléwan*), skink (*Mabouya mabouya*), Lesser Antillean iguana (*Iguana delicatissima*), Dominican boa (*Tèt-chyen*), and the black-and-white checkered snake.

The "West Coast Shrub Woodland' is a KBA due to the presence of a critically endangered frog species known as mountain chicken (*Leptodactylus fallax*). The proposed transmission line doesn't cross any water courses, so this frog species is not found in the project area.

2.3.3 Birds

A total of eighteen (18) bird species were visually and aurally encountered in the project area, mainly in the secondary rainforest ecosystem. The avifauna recorded comprised only resident species. The diversity of birds included parrots, hummingbirds, euphonias, flycatchers, warblers and finches, among other avian species typically associated with secondary rainforest and agricultural cultivations.

Globally threatened species of concern within the transmission line's area of influence include the Red-necked Amazon Parrot (*Amazona arausiaca,* a vulnerable species), the Imperial Amazon Parrot (*Amazona imperialis,* an endangered species), and the Black-capped Petrel (*Diablotin Pterodroma hasitata,* an endangered species*)*. All three threatened species are listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species. During the field surveys, Red-necked Parrots were observed foraging within the area of influence (except in the dry scrub woodland). The Imperial Parrot, though not observed, is reported to utilize the forest and airspace within the region as a migration corridor between the rainforest habitat around the foothills of Morne Watt (Morne Trois Pitons National Park) and habitats in the Central and Northern Forest Reserve.

The nocturnal surveys within the zone of influence at Laudat could not verify the presence of the Black-capped Petrel. However, recent collaborative research has confirmed the presence of the Black-capped Petrel, in the airspace over Laudat, on its flyways to and from nesting grounds near the summit of Morne Micotrin and other mountain summits within the district.

2.3.4 Morne Trois Pitons National Park

The Morne Trois Pitons National Park, a UNESCO World Heritage Site, is located about 500m from the buffer zone of the geothermal power plant and about 1 km from the overhead transmission line. The Park comprises some of the best remaining examples of volcanic island ecosystems in the Caribbean. The park protects active volcanic and geothermal areas, mountains, clear streams, various forms of wild fauna (including Dominica's two Amazona parrot species), and various types of tropical forests for conservation, educational, scientific, recreational and scenic purposes.

2.4 What is the condition of the economy and communities at the site?

2.4.1 The Roseau Valley

Dominica is made up of 10 parishes. DGRMP II will be implemented in the Roseau Valley in the parish of St. George. The Roseau Valley mainly consists of secondary forests and plantations. The eastern part of the valley tends to be agricultural land. The urban areas in the Roseau Valley are particularly concentrated at the entrance to the valley and in the eastern part of the valley.

2.4.2 Population

According to the World Bank's Databank[1], the total population of Dominica was 72,737 in 2022. The male/female ratio is about 50/50. 71% of the population lives in urban areas. About 20% of the population is less than 14 years old, about 70% are between 15 and 64 years old, and about 10% are above 65 years old. The working-age population is about 28%.

[1] https://data.worldbank.org/country/dominica Accessed in July 2023

According to the Population and Housing Census of 2011, the population of St. George parish was 20,791. There were 7,377 households, and the average household size was 2.8.

2.4.3 Ethnicity

The great majority of the population is of African descent. English is the official language and is understood by everyone, but due to historical French influence, a French-based Creole language is widely spoken. The majority of Dominicans are Christian. More than 60% of them are Catholic.

The island is also the home of the Kalinago, an indigenous group with a population of 3,000. They reside in the northeast of the island, thus, will not be affected by the Project.

2.4.4 SEA/SH

According to the Bureau of Gender Affairs, Dominica had 1,035 reported cases of gender-based violence in 2015. 87% of survivors were women. [2]

2.4.5 Education

The school enrolment is high. According to the World Bank, the enrolment was 100% for boys and girls at primary and secondary schools between 2019 and 2021. While the primary completion rate was 100% for boys and girls in 2021, the lower secondary completion was 24%: 14% among boys and 35% among girls.

2.4.4 Cultural Heritage

The complex and ancient history of human occupation of the island has led to numerous influences on current and past architecture in the Roseau Valley. Dominica's rich architectural heritage includes the old market square, St. Patrick's Roman Catholic Cathedral in Roseau, traditional arts and crafts, festivals, and cultural events. The cultural heritage sites near the project sites are natural landscapes with aesthetic and tourism significance, including The Morne Trois Pitons National Park, a UNESCO World Heritage Site.

2.4.5 Economy and Tourism

According to the World Bank, Dominica's GDP growth was 5.9%, and GDP per capita was US$ 8,414.50 in 2022. Agriculture and tourism are two key sectors in Dominica. Tourism accounts for close to 25% of GDP and employment.[3] CIA estimates that in 2017, services accounted for 65.1% of GDP, agriculture for 22.3%, and industry for 12.6%.[4]

Tourism is a key sector in Dominica. The IMF indicated that tourism's direct contribution in 2019 was 12.2% of GDP. Tourism accounts for about 10.5% of total employment, mainly through hospitality sectors

[2] https://genderaffairs.gov.dm/publications/booklets/file/43-data-on-gender-based-violence
[3] https://thedocs.worldbank.org/en/doc/7276af45227db85e778cd1586c68e040-0350082021/original/mpo-dma.pdf
[4] https://www.cia.gov/the-world-factbook/countries/dominica/#economy

(e.g., hotel and restaurants)[5]. Attractions in the Roseau Valley include the Boiling Lake, Waitukubuli National Trail, Middleham Falls, Freshwater Lake and Boeri Lake, the "Dragon's Mouth" (an accessible cave with hot water) and Trafalgar Falls, Titou Gorge, and the various hot springs in Wotten Waven and Papillote, the tropical gardens in the rainforest, and outdoor adventure activities among other attractions. According to the World Bank, in 2019, approximately 322,000 international tourists visited Dominica.

2.4.6 Transportation

The area observed is characterized by a variety of terrain types ranging from flat areas to steep and mountainous areas with jutting rock formations of which the topography makes driving conditions dangerous. The Roseau Valley area is served by a dual carriageway which begins at Valley Road and provides a link for traffic between Roseau and Roseau Valley.

Cruise Ships

Cruise ships are a regular occurrence in Roseau during the cruise seasons (November to March), and occasionally, there can be as many as two or three in the port in a single day. They can range in size from a small ship with 100-200 passengers to a 'Royal' class cruise ship with over 4,000 passengers. Many cruise ships that stop for the day in the cruise terminal in Roseau allow visitors to visit the Trafalgar Falls and other tourist sites in the Roseau Valley due to the proximity to the port. The passengers from cruise ships add to the road network as they tend to travel by either buses or private taxis.

Public Transport Network

The public transport network serving Roseau is largely unstructured and demand-driven. There is a relatively high volume of buses on the network serving all communities. The buses are privately owned, and rates are fixed by the National Transport Board. Some of the buses double as taxis for tourists after receiving training and certification. While not all of these buses are likely to be public – some are most likely from the cruise ship passengers being shuttled to tourist sites. Anecdotally, the public transport services in Roseau run regularly and are popular with the locals.

The Waitukubuli National Trail

The Waitukubuli National Trail is the only large-scale marked trail in the East Caribbean and is an important attraction for Dominica's image as the 'Nature Isle'. The Waitukubuli National Trail was officially declared as an eco-tourism site on May 10, 2013, in accordance with the Commonwealth of Dominica Statutory Rules and Orders No. 7 of 2013 National Parks and Protected Areas Regulations. Many tourists visit Dominica to experience the rugged and untouched side of the Caribbean. The trail provides a relatively accessible marked route through the entire length of the island.

[5] Unlocking Tourism Potential for Sustainable and Inclusive Growth in Dominica. IMF Country Report No. 23/247. July 2023. Web: http://www.imf.org

3. CONSULTATION

3.1 What Consultation Has Occurred?

In preparation for the proposed DGRMP II, DGDC initiated FGDs with 12 local councils in Corridor of Impact (CoI) in Roseau Valley and West Coast between May and August 2022 (i.e., Colihaut, Fond Cole, Salisbury, St. Joseph, Mahaut, Roseau, Laudat, Portsmouth, Trafalgar, Canefield, Coulibistrie, and Dublanc). 69 council members (30 men and 39 women) participated in FGDs. The council members were overall supportive of the proposed transmission line network, which was understood to be a part of the ongoing geothermal development. Key questions/feedback include the safety of higher voltage overhead lines, expected economic benefits of the geothermal project, and the planned delivery date of power from the geothermal plant.

In March 2023, DGDC conducted face-to-face public consultations in six communities in CoI, i.e., Portsmouth, Mahaut, Colihaut, St. Joseph, Fond Cole, and Trafalgar. A total of 55 community members (32 men and 23 women) participated in the public consultations.

3.2 What is the Feedback from Consultations

Key questions/feedback raised include the safety of electromagnetic fields/radiation, project design, economic benefits, land acquisition/ compensation, land use restrictions, and employment opportunities. A summary of public consultations is provided in Table 1 below:

Table 1. Summary of public consultations.

Stakeholder (Group or Individual)	Dates of Consultations	Summary of Feedback	Response of Project Implementation Team	Follow-up Action(s)/Next Steps	Timetable/ Date to Complete Follow-up Action(s)
Community members in Portsmouth, Mahaut, Colihaut, St. Joseph, Fond Cole, and Trafalgar	March 2023	Concerns about electromagnetic field.	WHO has exposure limits, and the design will be within those limits. 69kV is very small and way within the limits. For the most part, lines will be away from communities.	Known hazards from electromagnetic field are accounted for in design. The project will be audited and held to WB standards.	Considered in project design
		Type of poles to be erected?	Tubular steel poles, designed for 188 km wind. They are safe at a higher	N/A	Addressed

Stakeholder (Group or Individual)	Dates of Consultations	Summary of Feedback	Response of Project Implementation Team	Follow-up Action(s)/Next Steps	Timetable/ Date to Complete Follow-up Action(s)
			voltage and resilient to Category 5 Hurricane.		
		Will my electricity bill be cheaper?	The primary purpose is to reduce dependence on diesel and stabilize and reduce the price of electricity.	The power generated by the geothermal plant will be sold to DOMLEC.	O&M phase
		Can all transmission lines go underground?	33 and 69 kV lines are to dispatch the power to Fond Cole and the north. Having underground and overhead transmissions will ensure a continued electricity supply in case of emergency.	It is costly to have all transmission lines underground.	FSI alignment to be determined (overhead or underground) in the follow-on investment.
		How deep under the river do you expect to run these lines? Any effect on the species under the river?	3-5 metres below the waterbed. We are not trenching the riverbed but drilling under the river.	ESIA to be prepared and implemented	Draft ESIA to be prepared by June 2023
		ESIA to complete before any work? Can I comment?	Your comments and questions will be used to inform the ESIA and will be included in the final design.	ESIA to be prepared and consulted	National consultation planned in July 2023
		Will there be technical people from Dominica understudying and learning so that we will have local people to maintain?	Yes. This has already started with the drilling. So, there are local engineers learning.	Addressed	DGRMP II will also engage local engineers.
		You spoke about high standards of social protection and fairness in	We monitor environmental and social safeguards internally, and	RAP will be prepared and implemented	Draft RAP prepared by July 2023

Stakeholder (Group or Individual)	Dates of Consultations	Summary of Feedback	Response of Project Implementation Team	Follow-up Action(s)/Next Steps	Timetable/ Date to Complete Follow-up Action(s)
		compensation. To what degree is this being followed?	there also is an external audit. All lands acquired are duly compensated through a Lands Department led process.		
		What happens if people are not compensated?	We do not start construction, unless the people are compensated.	RAP will be prepared and implemented	Draft RAP to be prepared by July 2023
		Given that one is permitted to be within 15m on either side – would you acquire the property there?	It will be a mix of acquisition and easement agreements. The areas with the actual structures will be acquired. Where land use is restricted, easement will be applied.	RAP will be prepared and implemented	Draft RAP to be prepared by July 2023

3.3 Is there an opportunity to comment on the Project?

Community members or interested parties can contact DGDC as follows:

Name	Allan Toussaint
Address	DGDC P.O. Box 1454, 18 Kennedy Avenue Roseau Commonwealth of Dominica
Email	allan.toussaint@geodominica.com
Telephone Number	767-448-6178/275-7392

3.4 Where the E&S Instruments will be Disclosed?

The draft Environmental and Social (E&S) Instruments of the Project, such as the Non-Technical Summary of ESIA, LMP, SEP and RAP, have been disclosed on the DGDC's website for consultation purposes. The feedback received during consultations will be incorporated into the final E&S instruments. The final

versions of these instruments, including ESIA, will be disclosed on the DGDC's and World Bank's websites in August 2023. The documents' hard copies will also be available at DGDC's office.

4. Managing Environmental and Social Impacts

4.1 How will the environment be affected during construction?

The following impacts have been identified during the construction of the transmission lines:

- The earthworks for the construction of access roads, foundations for tunnels and trenches for the underground lines require site and vegetation clearance. The stormwater discharge from the construction sites will contain sediment load due to the erosion of exposed soils. Wastewater discharges at the construction sites include bentonite-laden discharges from the directional drilling cable tunnels (for laying UGC lines) and wastewater from the construction yards and vehicle cleaning areas. The wastewater will be adequately treated through sedimentation ponds with oil-water separators before releasing it to the natural drains.
- Vegetation clearance from the transmission line towers and ROW will generate huge quantities of waste, and if they are not removed from the construction sites, they will obstruct the surface runoff and may cause soil erosion. Local communities will also be allowed to take the logs. The logs would be used for erosion construction. The other type of waste generated at the construction site includes discarded construction material and solid waste from the construction yards and camps.
- Underground cables will be mainly laid abutting the public roads or below the public roads. The construction of these lines will cause many traffic problems, especially during peak traffic hours. The construction activities will be carefully planned to minimize traffic congestion.
- There will be minor temporary impacts for local residents in relation to noise and dust during earthworks for access roads, trenches and foundations. Appropriate mitigation measures by the Construction Contractor, such as frequent water sprinkling and compliance with the noise standards, will reduce these impacts to acceptable levels. DGDC will establish a grievance mechanism.
- Construction of open trenches near the residential areas and schools poses safety risks to the community and may block access to these areas. Trenches will be protected with fences, and temporary access will be provided during the construction.
- There will be potential Occupational health and safety risks (OHS) associated with the construction of overhead transmission lines, including, among others, exposure to physical hazards from the use of heavy equipment and cranes; hot weather; working on steep slopes in mountainous terrain, trip and fall hazards; exposure to dust and noise; falling objects; exposure to hazardous materials; and exposure to electrical hazards from the use of tools and machinery. The potential OHS risks associated with the construction of underground transmission lines include working in trenches and confined spaces; risk of collapse of trenches; exposure to live traffic near the construction sites, exposure to physical hazards from the use of heavy equipment and cranes; hot weather; exposure to dust and noise; falling

objects and exposure to electrical hazards from the use of tools and machinery. The contractors will mitigate these risks by maintaining OHS standards with regard to workers' safety, health, and welfare of people at work.

4.2 How will the environment be affected during operation?

The following risks have been identified during the routine operation and maintenance stages.

- There is a potential risk of bird collision with the overhead transmission line. These risks have been minimized in the project design by adopting underground cables of 0.5 km connecting the geothermal power plant to the Laudat substation. Thus, the overhead lines will start at 1 km from the national park's buffer zone. The overhead lines will be attached with visible bird deflectors to avoid bird collision. A regular monitoring program will be in place to study the effectiveness of these measures.
- The potential OHS risks during the O&M stage include exposure to live power lines, electric and magnetic fields, and working at height.
- Transmission lines generate electrical and magnetic fields, which are considered health hazards, although not scientifically proven. The Project will comply with exposure limits for EMF fields developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) - a non-governmental organization formally recognized by WBG EHS Guidelines and WHO.

4.3 What about the potential for natural hazards?

Of particular note when considering natural hazards is the devastating effects Hurricane Maria brought to Dominica and the increased likelihood of landslides following the event. The tower structures will be designed for a wind speed of 288 km/hour to withstand Hurricane Category 5 (with wind speeds of 252 km/hour or more) based on the experience of Hurricane Maria (265 km/hour). The design of towers will also consider geotechnical requirements.

4.4 How will the people be affected?

In addition to exposure to construction-related hazards, as discussed in Section 4.1, the social impacts associated with the Project during construction are summarized below.

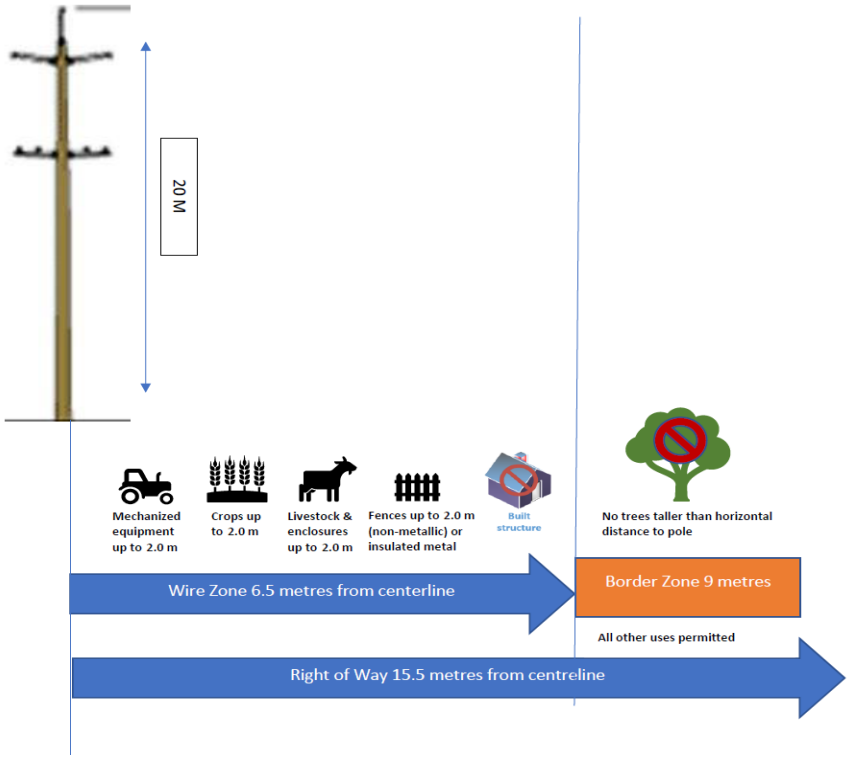
Employment

The Project would require a small labor force for civil works. For the construction of underground transmission lines, around 10-12 contracted workers would be required per 300m segment, including a few skilled workers (likely regional or international). The Contractor would work on 4-5 segments at a time. Similarly, around 10-12 workers would be anticipated per pole structure site for the overhead transmission line network construction. The Contractor for substations will also engage a small workforce of 10 to 15 people to install the equipment in the existing substations. The estimated number of contracted workers will be 100, of which 40 will be foreign and the remaining will be local. A construction camp may be established for foreign workers or accommodated in rented houses or hotels (as practiced for the well-drilling Contractor under DGRMP).

Land Acquisition

The Project will require small land acquisition and land use restriction (easement) for the construction of a 69kV transmission line network, connecting the geothermal power plant and the Fond Cole substation (GFI). For the construction of overhead transmission line, a small piece of land (between 160 m^2 and 280 m^2) will be acquired for about 20 pole structure locations. There will be land use restrictions under the overhead transmission lines and the access roads to the pole structures. Under the transmission line, no buildings are permitted within the wire zone. At the pole sites in the **wire zone**, i.e., within a radius of 6.5m around each pole, no structure (e.g., livestock enclosures, fences), mechanized equipment and trees/crops taller than 2m are permitted. At the pole sites in the **border zone**, i.e., in a radius of between 6.5m and 9m around each pole, no tree or structure taller than 6m is permitted (see Figure 8). In addition, along the right-of-way, i.e., midspan between one pole site and another, no structure or tree is allowed within 18m below the conductors. Under the overhead transmission lines, i.e., midspan between one pole structure site to another, no structure or tree/crop taller than 2m will be allowed within the wire zones. In addition, no tree/crop taller than 18m will be permitted within the right of way (detailed in Figure 8).

Figure 8. Right of Way Land Use Restriction



The 69kV underground cable will be installed mostly on the public road from the Glasgow community. However, a small diversion is required for the final cable connection to the Fond Cole substation. The land will be acquired for trenching.

It is estimated that about 319,868.22 sq ft (29,716.73 m^2) of land will be required by the Project through land acquisition or easement. About 25% of the total land requirement will be acquired for trenching and pole structure locations. The remaining 75% of the land will be under easement, affected by midspan or

access roads. More than 20 PAPs will be affected by the Project: about 17 PAPs by the construction of the overhead transmission line and 3 PAPs by the installation of the underground cable from Glasgow to the Fond Cole substation. About 16 PAPs are affected by both land acquisition and easement, while four PAPs are affected by easement only (under midspan). There will be no land acquisition required for other project components. The installation of 33kV underground cable will be on the public road, and that of 11kV will be on public land. The overhead portion of the 33kV transmission line will be constructed on public land. The four new substations will be built within the boundaries of the existing substations; thus, no land acquisition will be required. All public lands required for the project are free from encroachers and squatters.

4.4.2 Economic Displacement and Livelihood Impacts

The affected lands are agricultural lands, some with forest. The majority of affected agricultural lands are abandoned. Because of the current land use and the small land requirements, the Project does not anticipate livelihood impacts. No PAP is losing more than 10% of their affected land plots. However, two PAPs will have about 10% of their lands under easement due to the span and access road. While the impact on their livelihoods is expected to be minimal, DGDC will monitor the impact during the RAP implementation.

Vulnerable Group

There are three PAPs whose monthly income is less than minimum wage. Two of them are above 70 years old. DGDC will monitor the Project's impact on their livelihoods and provide support through existing government social programs (pension, healthcare, etc.).

4.5 What will be the key mitigation and monitoring for the project to protect the people and the environment along the Transmission Line?

The Construction Contractor and DGDC will ensure that mitigation and monitoring practices are undertaken during the construction and operation of the Project. This will help reduce any adverse impacts on the environment or the communities along the transmission lines. Various plans and procedures will be developed for mitigation and monitoring practices. These will include those related to the following topics:

- Biodiversity restoration;
- Waste management;
- Hazardous substance management;
- Soil and erosion management;
- Air quality/dust management;
- Environmental and social monitoring;
- Stakeholder engagement;
- Grievance mechanism (community and workers);
- Emergency preparedness and response;
- Recycling plan;

- Landslide stabilization risk management;
- Occupational safety and health management; and
- Traffic management.

4.6 Conclusion

This document summarizes a large amount of technical work undertaken to assess the impact of the proposed Project. The ESMP sets out mitigation and monitoring actions that address the key environmental and social impacts identified in the analysis. DGDC and its Contractors will implement the ESMP to ensure that the environmental and social impacts of the Project are acceptable and in compliance with the World Bank Environmental and Social Framework, Dominican regulations and good international industry practices.