Appendix I – Visual Impact Assessment

Expansion of 13 MW Wind Farm plus BESS, Cape Verde

Cabeolica SA

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Acronyms and Abbreviations

Acronym	Definition
ASTER	Advanced Space borne Thermal Emission and Reflection Radiometer
BESS	Battery Energy Storage System
DEM	Digital Elevation Model
DTM	Digital Terrain Model
ESIA	Environmental and Social Impact Assessment
GLVIA	Guidelines for Landscape and Visual Impact Assessment
ITP	*Indústria Transformadora de Pedras*
UK	United Kingdom
WTG	Wind Turbine Generator
ZTC	Zone of Theoretical Visibility

1 Scope of work

1.1 Project Background

Cabeolica plans to maximise the delivery of all available energy and reduce the risk of losing potential revenue. The Cabeolica Expansion Project, to be implemented at the windfarms on two of the four islands, comprises the following:

- **Component 1:** Expansion of the Cabeolica Santiago windfarm with three (3) wind turbines to contribute a total net power capacity of approximately 13.5 MW.
- **Component 2:** Installation of a Battery Energy Storage System (BESS) of approximately 6 MW/ 6 MWh storage capacity for grid stability control and short-term storage at the Cabeolica Santiago windfarm.
- **Component 3:** Installation of a BESS of approximately 6 MW/6 MWh storage capacity for grid stability control and short-term storage at the Cabeolica Sal windfarm.

BESS will be installed in compact containers that will require the occupation of a small area without height components and will not pose relevant visual impacts on landscape.

The scope of this Visual Impact Assessment is focused on the impact expected due to the installation of three (3) new wind turbine generators (WTGs) in the Santiago Windfarm (Component 1).

The coordinates and heights of the eleven (11) Vestas V52 850kW WTGs currently operating on Santiago Island (since 2012) are listed in Table *1***Error! Not a valid bookmark self-reference.**. The 3 new WTGs, Vestas V150 4.5MW, each have a hub height of 105 m.

Table 1 Wind turbines currently in use with their heights and coordinates

WTG in Use	Model	Hub Height (m)	Coordinates	
			[X]	[Y]
WTG1	Vestas V52-850kW	55	228922	1657323
WTG2	Vestas V52-850kW	55	229105	1657225
WTG3	Vestas V52-850kW	55	229266	1657095
WTG4	Vestas V52-850kW	55	229427	1656967
WTG5	Vestas V52-850kW	55	229575	1656856
WTG6	Vestas V52-850kW	55	229693	1656674
WTG7	Vestas V52-850kW	55	229833	1656563
WTG8	Vestas V52-850kW	55	230033	1656479
WTG9	Vestas V52-850kW	55	230167	1656288
WTG10	Vestas V52-850kW	55	230323	1656181
WTG11	Vestas V52-850kW	55	230574	1656161

Given that the locations of the 3 new WTGs have not been defined, two scenarios based on potential location configurations were modelled to determine the potential loss of visual amenity on sensitive receptors.

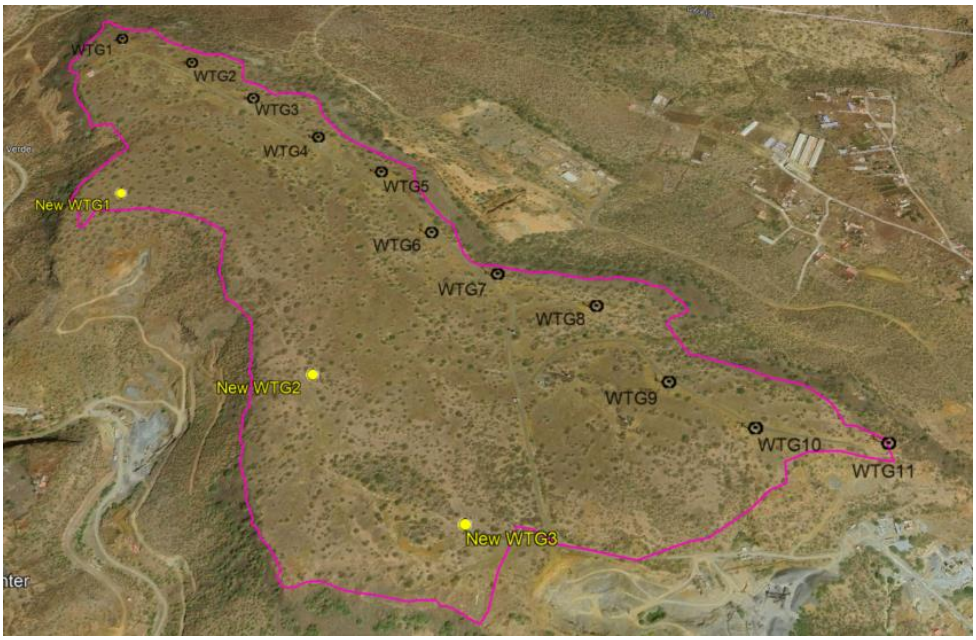
Scenario 1:

The coordinates of the 3 new WTGs under Scenario 1, listed in Table *2*, were the same as those previously used by Advisian to complete an independent energy yield study for Cabeolica, which placed the WTGs farther from the V52 turbines currently in use and closer to the edge of the site boundary to determine whether energy production could be increased. The Scenario 1 configuration, shown in Figure *1*, is considered the worst-case due to the closer proximity of the new WTGs to the receptor locations.

Table 2 Scenario1 Locations of new turbines

WTG (Scenario 1)	Model	Hub Height (m)	Coordinates [X]	[Y]
WTG12	Vestas V150 4.5MW	105	229018	1656796
WTG13	Vestas V150 4.5MW	105	229479	1656303
WTG14	Vestas V150 4.5MW	105	229782.7	1655968

Figure 1 Santiago windfarm – Scenario 1



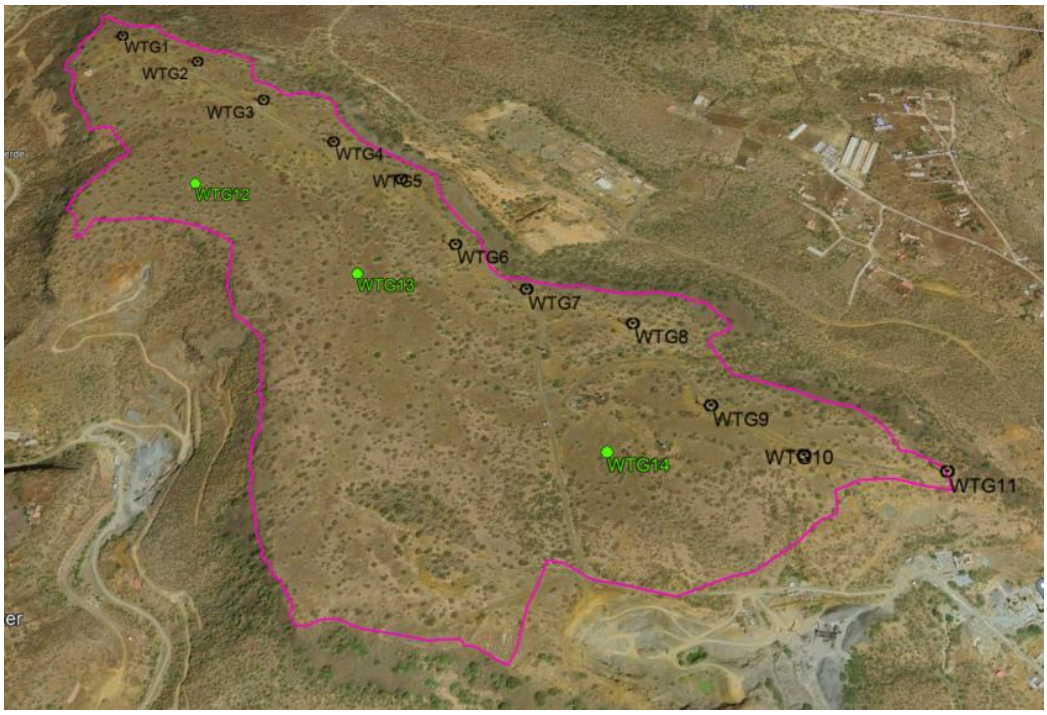
Scenario 2:

Scenario 2 was developed based on the shadow flicker study results under Scenario 1, which indicate that WTG13 and WTG14 would exceed the shadow flicker impact limits of 30 hours per year and 30 minutes per day at some receptors. Therefore, Scenario 2 is a slight modification of Scenario 1 by moving the 3 new WTGs farther from the receptor locations, while remaining within the site boundaries, as listed in Table *3* and shown in Figure *2*.

Table 3 Scenario 2 Locations of new turbines

WTG (Scenario 2)	Model	Hub Height (m)	Coordinates [X]	[Y]
WTG12	Vestas V150 4.5MW	105	229157.4	1656846.8
WTG13	Vestas V150 4.5MW	105	229505.8	1656599.1
WTG14	Vestas V150 4.5MW	105	229976.0	1656183.0

Figure 2 Santiago windfarm – Scenario 2



1.2 Objectives

The main objective of this Visual Impact Assessment is to determine the potential loss of visual amenity due to the Santiago Windfarm Expansion Project.

The potential visual impacts due to the Project were identified, characterized, and evaluated, and the extent to which the Santiago Windfarm Expansion Project will visually affect its surroundings was determined through the development of a 3D sketch of the windfarm, visibility maps and photomontages under each scenario.

Mitigation measures to reduce the impacts are proposed in the Project ESIA.

1.3 Assumptions and Limitations

This assessment was based on the following assumptions and limitations:

- The Santiago windfarm is situated in Monte São Philipe, which is a plateau with average altitudes between 170 and 300 m above sea. Adjacent areas include lower elevation terrains, making the windfarm visible from numerous locations on Santiago Island.
- This assessment was carried out according to the Guidelines for Landscape and Visual Impact Assessment developed by the Landscape Institute of the UK Institute of Environmental Management & Assessment (GLVIA), which provide best practices and high standards for the scope and contents of landscape and visual impact assessments. The Guidelines, which are recommended but not mandatory, were adapted to the specific requirements of the Project.
- Two 3D models, one for each possible scenario, were developed for this assessment as coarse 3D models that only capture the wind turbine generators as the only major structures to be assessed.
- This assessment was entirely reliant on the quantity and quality of the photographs taken during the photographic survey.
- The photomontages were created using available information on the future development, and they represent approximated future views from selected points once the Santiago Windfarm Expansion is installed.

2 Previous landscape and visual impact assessments of the Santiago windfarm

The landscape and visual impacts due to the existing windfarms were assessed previously for the 2009 ESIA[1] by analysing the characteristics and functional aspects of the dimensions of the wind turbines, the number of turbines, and the alignment, as well as the visibility of the main structures to an observer from the surrounding areas within a 20-km radius.

The 2009 assessment included two types of studies for each windfarm: a visual simulation with a photomontage, and the development of Zone of Theoretical Visibility (ZTC) maps.

Regarding the photomontage, five (5) images were created to analyse the visibility of the Santiago Windfarm and its appearance. Each image recreated the viewpoints of populated places that are strategic in terms of the visibility of the wind farm:

- Viewpoint 1: Monte das Vacas, 1.1 km north of the Santiago windfarm site and close to the quarry.
- Viewpoint 2: Achada São Felipe, 1.7 km south of the Santiago windfarm site.
- Viewpoint 3: São Francisco, 2 km east of the Santiago windfarm site and close to the road that connects Praia with São Francisco.
- Viewpoint 4: Achada Palha de Sá, 1.2 km southeast of the Santiago windfarm site.
- Viewpoint 5: Road from Praia to the Airport, 3.1 km southeast of the Santiago windfarm site.

In addition to the photomontages, three (3) ZTC maps were developed for each island based on the different potential capacity turbines, which were represented by tip heights of 70 m, 71 m, and 101 m.

Overall, the assessment of the Santiago Windfarm concluded the following:

- Certain options produced considerable visibility of the wind farm from points along the city limits of Praia and in the surrounding areas when not accounting for shielding by buildings and vegetation.
- The topography of the city allows for theoretical visibility of all turbines from most of the city, except for a few scattered areas where only 1 to 3 turbines were potentially visible.
- Other important areas from where the windfarm would be potentially visible included the Praia Airport, the Port of Praia, São Francisco, and segments of important roads (Circular da Praia and the road connecting Praia with São Francisco). It will not be possible to view the wind farm from any point beyond a radius of roughly 10 km.

[1] Gabinete de Advocacia, Consultoria e Procuradora Jurídica, Environmental Impact Assessment, Complete Report, Feb 2009.

3 Methodology

The Visual Impact Assessment methodology that was used in this study followed a staged approach:

Stage 1: Baseline conditions

The landscape baseline conditions of the Project area were defined through the following steps:

- An **initial overview** of the existing landscapes, visual amenities, and topographical features in the Project area is carried out, as described in Regional and Local Landscape Description 4.1.1 Regional and Local Landscape Description.
- For each scenario, a **3D sketch of the Project area** was developed based on a Digital Elevation Model (DEM) of the study area and documentation of Santiago Expansion Project. The 3D sketches, described in Regional and Local Landscape Description 4.1.2 Santiago Windfarm 3D Sketch, provide a modelled visualization of the present windfarm and the expected visualization due to Expansion Project under the scenarios.
- For each scenario, a **potential visibility map** was developed based on the 3D sketch to identify the zones of visual influence of the Project and the sensitive visual locations, as described in Section 4.1.3 Viewshed Map.

Stage 2: Assessment of viewpoints and photomontages

- The visibility maps developed in Stage 1 were used to identify a set of **visual receptors (viewpoints)**, described in Section 4.2.1 Identification of Visual Receptors (viewpoints). The locations were selected to account for the different receptors in the Project area to prioritize zones where the number of potential observers and the visual sensitivity will be higher.
- The visual receptors were used to define the **photographical surveys**, as described in (Section 4.2.2 Photographic Survey). During the field survey carried out in November 2023, photographs of the landscape toward the Santiago Windfarm were taken with the objective to assess the current views from the selected viewpoints prior to the construction of the Santiago Expansion Project.
- For each scenario, **Photomontages of the visual receptors** were prepared by using the photographs and the 3D sketch model developed in Stage 1, as described in Section 4.2.3 Photomontages, to provide a virtual view of the new WTGs as they will be integrated into the existing landscape and to assess the potential visual impacts of the Project on the visual receptors.

Stage 3: Assessment of visual impacts

The visual impact assessment was completed by evaluating the sensitivity of each receptor (viewpoint) and the magnitude of the visual impact under each scenario using the following criteria:

Sensitivity of visual receptors depends on:

- Location and context of the viewpoint,
- Occupational purpose (land use) of the receptor (e.g., industrial, transit, residential, recreational), and/or
- Importance of the view as determined by its popularity and number of people affected.

Based on these parameters, the visual receptor *sensitivity* can be classified as High, Medium, or Low.

Magnitude of visual impacts defined by:

- Scale of change in the view due to the Project,
- Degree of contrast or integration with the existing landscape,
- Duration of the visual impact,
- Angle of view in relation to the main activity of the visual receptor,
- Distance from the Project to the visual receptor, and
- Extent of area over which the Project would be visible.

Based on these parameters, the visual impact *magnitude* can be classified as Adverse (Major, Moderate or Slight), Neutral, or Beneficial (Major, Moderate or Slight).

Visual impact *significance* was determined using the matrix in Figure 3, which was used in previous studies for planning developments[2] and which is based on GLVIA guidelines.

[2] 21165/A5 LVA Methodology. Landscape and Visual Impact Assessment Methodology (Rev A). Dacorum Borough Council

Figure 3 Visual Impact Assessment Matrix

Assessment of significance of visual impacts **Red cells** represent significant adverse impacts **Green cells** represent significant beneficial impacts **Blue cells** represent impacts that are not significant			**Visual receptor sensitivity**		
			High	**Medium**	**Low**
			• Residential properties with views from ground and first floor windows and gardens towards the proposals. • Important public sites used by many people. • Public rights-of-way, public open spaces and other locations where the view is part of the reason for the visit	• Commercial and industrial premises. • Schools. • Playing fields. • Other areas where the view is not central to the use.	• Roads and rail with views towards the development where the viewer passes at speed and the view is not central to the use.
Magnitude of Visual Impact	**Major adverse**	Where the proposed development would cause a significant deterioration in the existing view	**High adverse significance**	High/Medium adverse significance	Medium adverse significance
	Moderate adverse	Where the proposed development would cause a noticeable deterioration in the existing view	High/Medium adverse significance	Medium adverse significance	Low adverse significance
	Slight adverse	Where the proposed development would cause a barely perceptible deterioration in the existing view	Medium adverse significance	Low adverse significance	Neutral
	Neutral	Where the proposed development would cause no discernible deterioration or improvement in the existing view	Neutral	Neutral	Neutral
	Slight benefit	Where the proposed development would cause a barely perceptible improvement in the existing view	Medium beneficial significance	Low beneficial significance	Neutral
	Moderate benefit	Where the proposed development would cause a noticeable improvement in the existing view	High/Medium beneficial significance	Medium beneficial significance	Low beneficial significance
	Major benefit	Where the proposed development would cause a significant improvement in the existing view	**High beneficial significance**	High/Medium beneficial significance	Medium beneficial significance

4 Visual Impact Assessment

4.1 Stage 1: Baseline conditions

4.1.1 Regional and Local Landscape Descriptions

The Santiago windfarm is situated in the southeast of the island in Monte São Filipe, which is a plateau with average altitudes between 170 and 300 m above sea level and a minor slope (2% and 4%) toward the SE coast of the island.

Adjacent areas include lower elevation terrains through which the main streambeds flow into the city of Praia and numerous systems with considerable altitude, such as Monte das Vacas and Monte Cristóvão.

Monte São Filipe is covered by layers of volcanic rock, e.g., basalt and basanitoids, which are exploited by a basaltic rock-oriented industrial unit, *Indústria Transformadora de Pedras* (ITP), from a quarry to obtain blocks of considerable size and aggregates for civil construction.

The total landscape is a mixture of the green tone of vegetation and the brown of uncovered soil. The waterlines are elements that greatly characterize the local landscape.

The entire area is part of a community of semiarid and sub-coastal areas, presenting some layers of shrub vegetation, as well as trees with medium density during the dry season and high density during the wet season.

4.1.2 Santiago Windfarm 3D Sketch

To visualize the future presence of the new wind turbines generators, which will be installed within the boundaries of the existing Santiago windfarm (as seen in Figure 1 (Scenario 1) and Figure 2 (Scenario 2), a 3D sketch model for each scenario was built using ArcScene based on:

1. A 30 x 30 m resolution digital terrain model (DTM) obtained from the ASTER (Advanced Space borne Thermal Emission and Reflection Radiometer) satellite[3],
2. Orthophotography of the study area, and
3. Wind turbine generators digitalized with AutoCAD and ArcMap.

An overview of the 3D sketch models under both scenarios are provided in Figure 4 and Figure 5, respectively.

[3] ASTER website available at: https://asterweb.jpl.nasa.gov/

Figure 4 Overview of Santiago windfarm – Scenario 1 (3D sketch model)

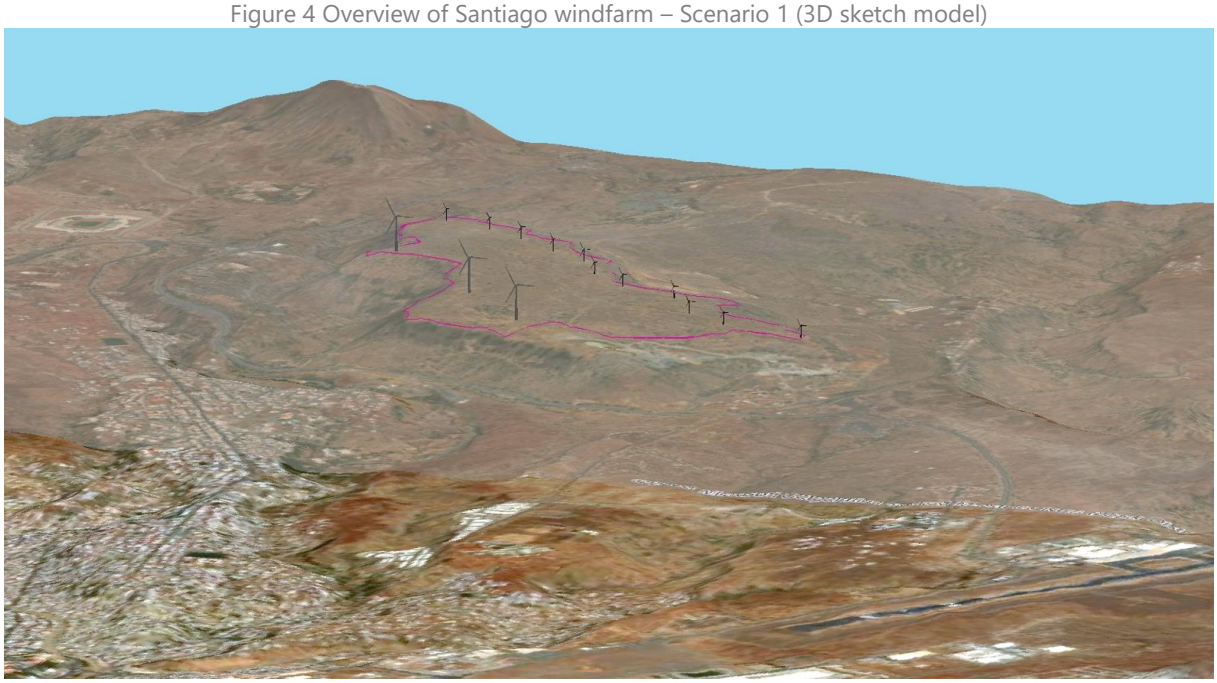
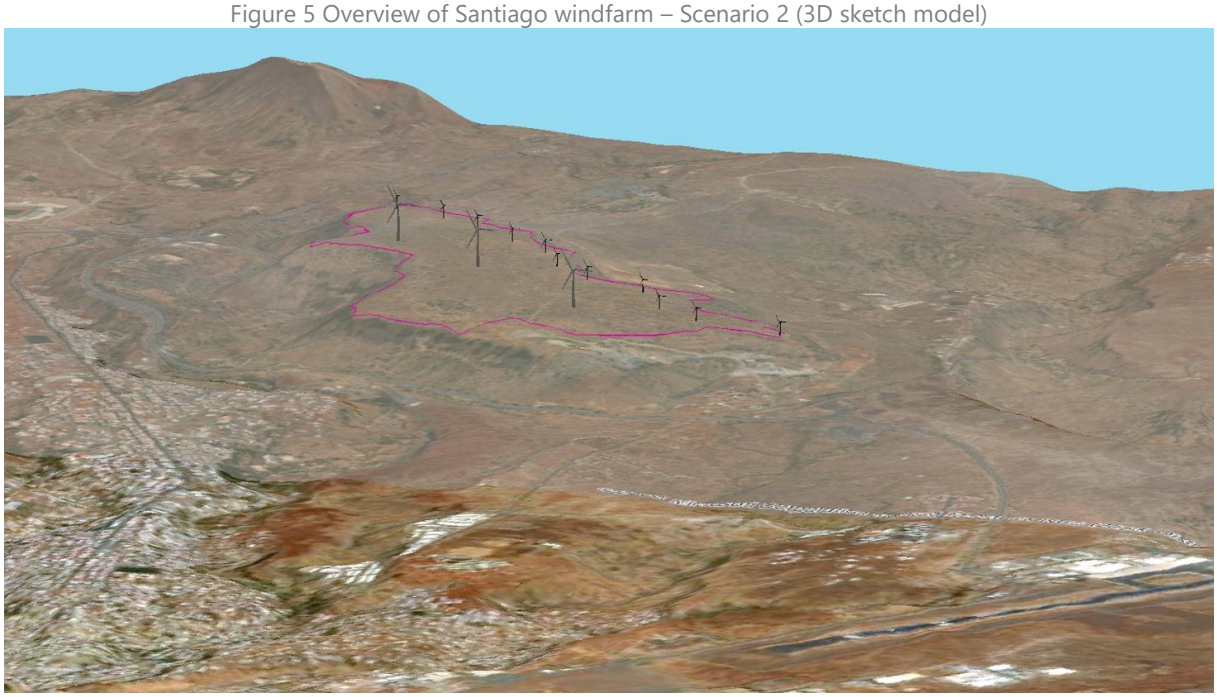


Figure 5 Overview of Santiago windfarm – Scenario 2 (3D sketch model)



4.1.3 Viewshed Map

The 3D sketch model was used to develop a visibility map (viewshed map) under each scenario to identify the areas from which the main features of the wind farm will be visible. Viewshed maps consider the elevations obtained from the Digital Elevation Model (DEM) and the heights of the structures included on the 3D model (i.e., simulated Santiago Windfarm WTGs) to calculate the potential visibility of the Santiago Expansion Project from every viewpoint within the study domain.

The viewshed maps built using the Viewshed tool in ArcMap for the Santiago Windfarm Expansion Project under Scenarios 1 and 2 are provided in Figure *6* and Figure *7*, respectively.

Figure 6 Visibility Map of Santiago windfarm with the locations of visual receptors – Scenario 1

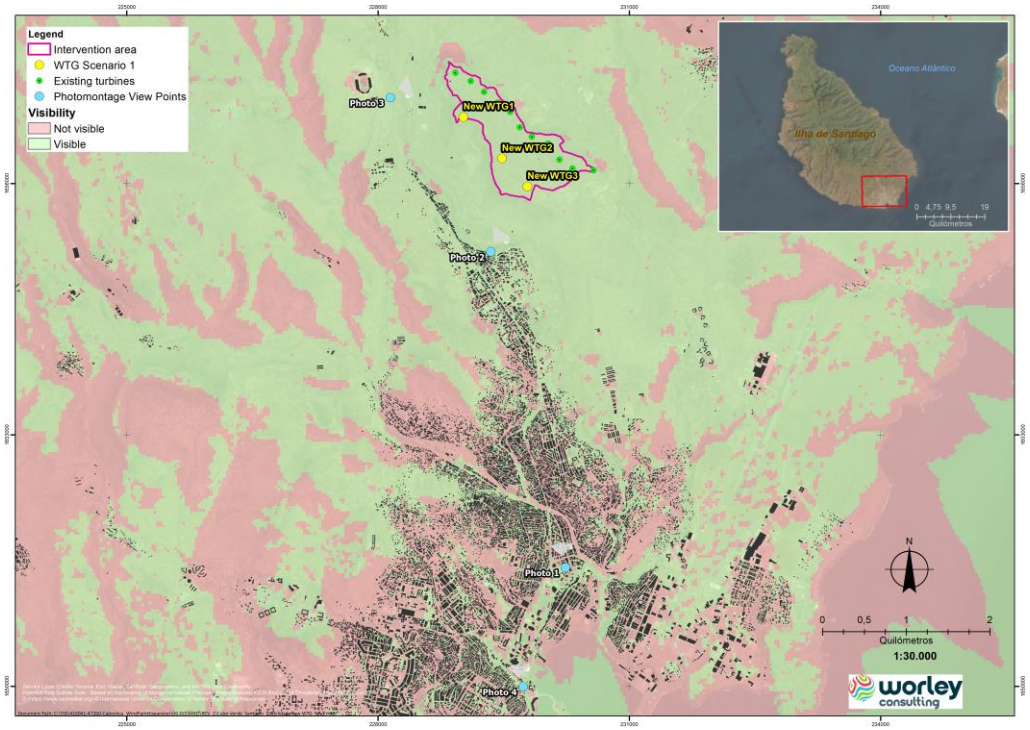
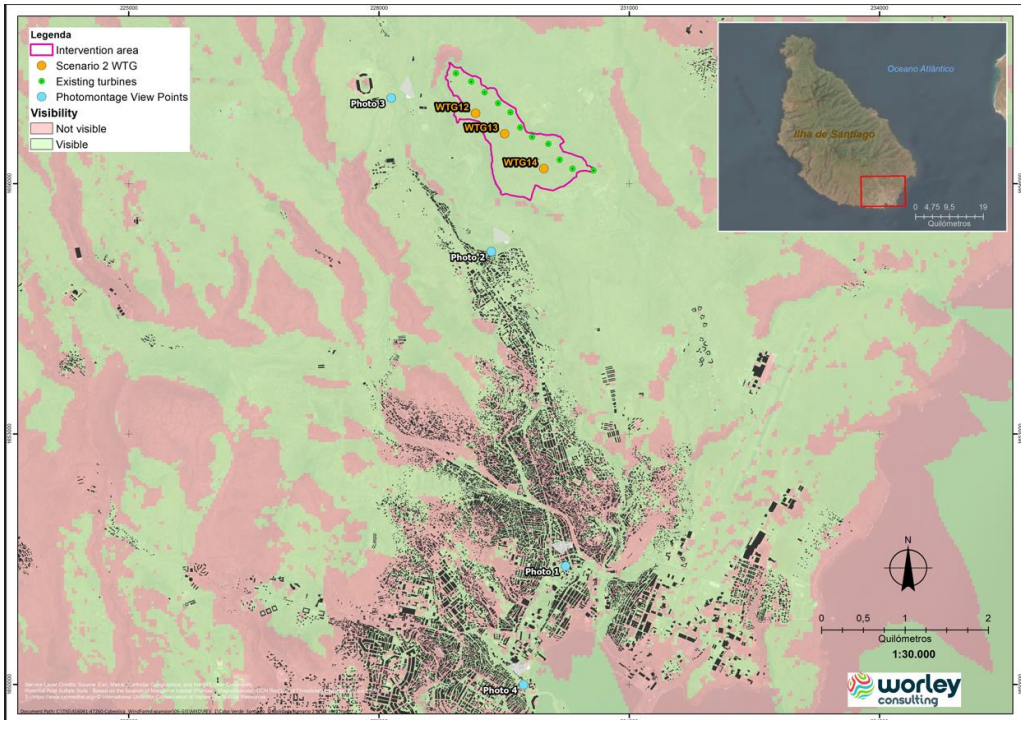


Figure 7 Visibility Map of Santiago windfarm with the location of visual receptors– Scenario 2



The viewshed analysis found minimal differences between Scenarios 1 and 2 in terms of visibility, as follow:

- The topography of the city allows for theoretical visibility of all turbines from most of Praia City except for some areas in the city center.
- Other important areas from where the wind farm would be potentially visible include the Praia Airport, the Port of Praia, São Francisco, and segments of important roads (Circular da Praia and the road connecting Praia with São Francisco).

4.2 Stage 2: Assessment of Viewpoints and Photomontages

4.2.1 Identification of Visual Receptors (viewpoints)

The visual receptors and their locations, listed in Table *4*, were selected by prioritizing zones where the potential number of observers and the visual sensitivity are higher. These receptors are at ground level except for the Hotel Perola on Gamboa Beach, receptor 4, which was assessed at an elevation of 10 meters to approximate the potential viewpoint from that location.

Table 4 Sensitive receptor locations and their coordinates

Item	Sensitive Receptor	Coordinates UTM27 WGS84	
		Easting	Northing
1	Parque de diversoes	230254.40	1651397.90
2	Residential complex – Achada Sao Filipe	229370.00	1655159.70
3	National Stadium – Circular da Praia	228165.40	1657018.60
4	Hotel Perola, Praia de Gamboa	229760.00	1649988.80

Figure 8 Locations of sensitive receptors 1-4 (yellow)

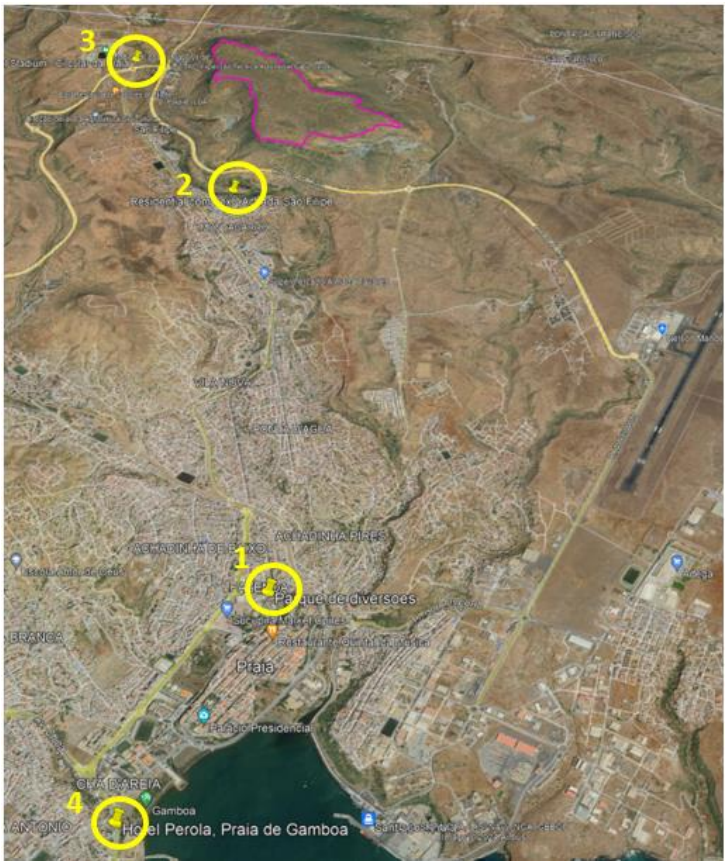
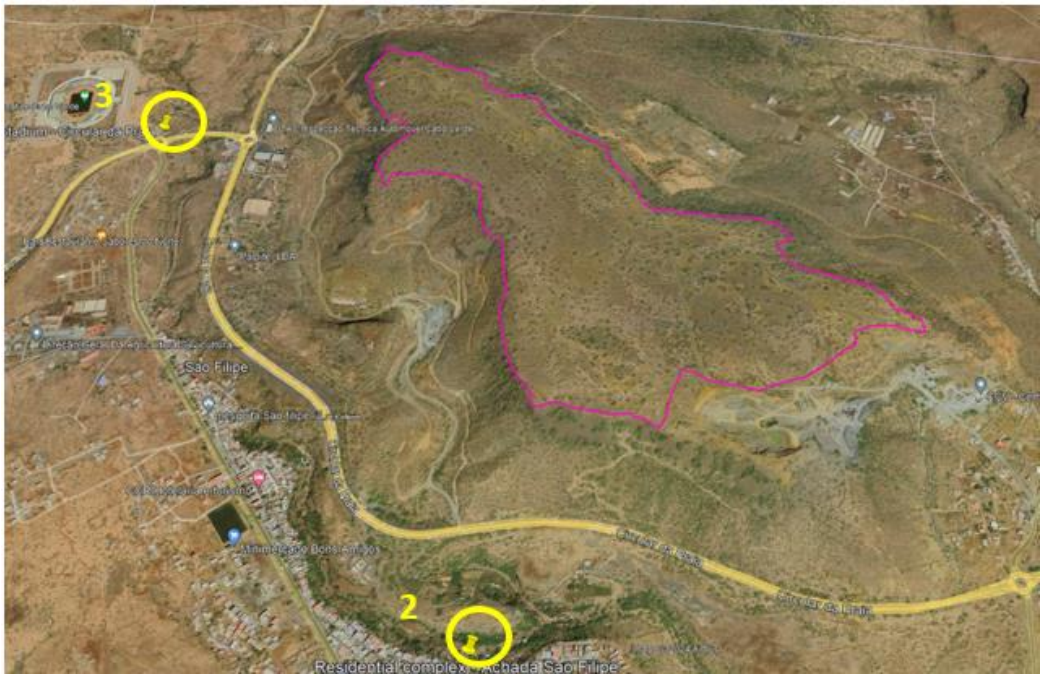


Figure 9 Detailed view of locations of sensitive receptors 2 and 3 (yellow)



4.2.2 Photographic Survey

The selected viewpoints were visually inspected through a photographic survey in November 2023, during which the locations (Table *4*) were visited and high-resolution photographs of the landscape were taken. The objective of the survey was to assess in the field the actual visibility from each selected receptor. The photographs taken at these locations are provided in Section 4.2.3.

4.2.3 Photomontages

Photomontages were prepared from selected sets of photographs taken during the survey. The objectives of the photomontages were to obtain simulated views of the future wind turbines in the Project area while considering two possible location configurations of the new WTGs. The photomontages were used to assess the potential impact on visibility due to the Expansion Project for the visual receptors (i.e., from selected viewpoints).

These photomontages were prepared using Corel Photo-Paint with the photographs and the simulated view generated from the 3D sketch model (see Section 4.1.2). The locations from where the photomontages were prepared are those of the receptors described in Section 4.2.1.

For each scenario, four photomontages were prepared, one for each visual receptor. Each photomontage provides the current and predicted views (with the Santiago Windfarm Expansion).

4.2.3.1 Photomontage 1: Parque de diversoes

Photomontage 1 provides the potential view of the Santiago windfarm expansion project from the Parque de diversoes in the Praia City center, 4km from the windfarm. This area has zero visibility of the Project, as reflected on the visibility maps under both scenarios (see Figure *6* and Figure *7*). Given that the Santiago windfarm is not visible from this area due to residential buildings throughout the Parque, the Photomontage 1 of the future view, provided in Figure *10*, is the same for both scenarios.

Figure 10 Photomontage 1: Parque de diversoes (Scenarios 1 and 2)

4.2.3.2 Photomontage 2: Achada do São Filipe

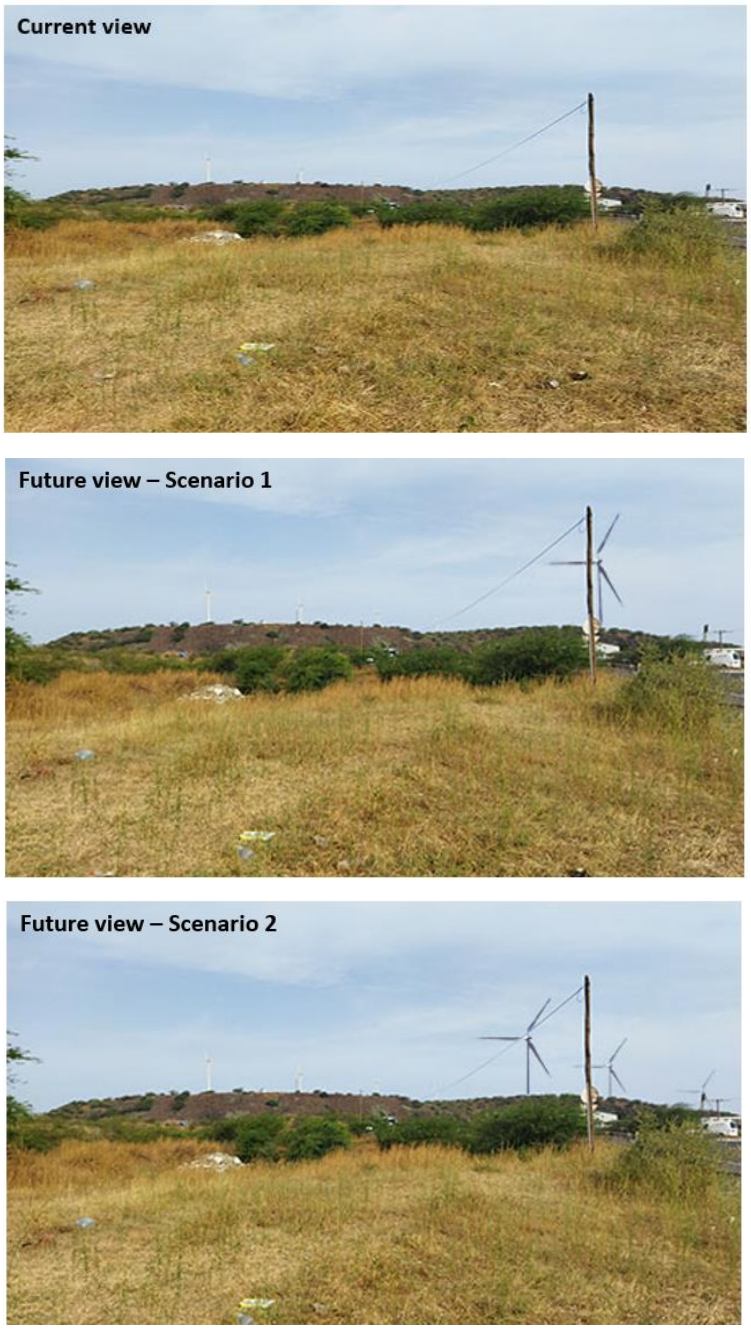
Photomontage 2 provides the predicted view of the Santiago Windfarm Expansion Project from a residential area in Achada do São Filipe, as shown in Figure *11*, which is below low hills south of the windfarm.

Figure 11 Photomontage 2: Achada do São Filipe (Scenarios 1 and 2)

4.2.3.3 Photomontage 3: National Stadium

Photomontage 3 provides predicted view of the Santiago windfarm and the new WTGs from the Circular do Praia (roundabout), as shown in Figure *12*, located close to the National Stadium. Of the four selected receptors, receptor 3 is closest southwest of the windfarm.

Figure 12 Photomontage 3: National Stadium (Scenarios 1 and 2)



4.2.3.4 Photomontage 4: Gamboa beach

Photomontage 4 provides the predicted view of the Santiago Windfarm Expansion Project from the second floor of Hotel Perola on Gamboa beach in Praia City, 7km from the windfarm.

Figure 13 Photomontage 4: Gamboa beach (Scenarios 1 and 2)

4.3 Stage 3: Assessment of visual impacts

The visual impacts on residents of the nearest populated areas, i.e., the most sensitive receptors of the study area, were assessed, and the results are presented below.

4.3.1 Area 1: Parque de diversoes (photomontage 1)

Sensitivity of visual receptors

Parque de diversoes is a central square with children's playgrounds in the center of Praia City. This square, which was under renovation during the photographic survey, is surrounded by residential buildings of three or four floors and parking areas. Based on these variables, the visual sensitivity of receptor No. 1 is classified as **Medium**.

Magnitude of the visual impact

The new WTGs inserted into the photomontages of this receptor location are not visible under either scenario due to nearby buildings that block the view of the windfarm. Thus, the visual impact due to the new WTGs is negligible in this area. The magnitude of the visual impact in Area 1 is classified as **Neutral** because the proposed development would not cause a discernible deterioration or improvement of the current view.

Assessment of visual impact

Based on this assessment of the impact sensitivity and magnitude, the visual impact of the expansion project in Area 1 is assessed as **Neutral under both scenarios**.

4.3.2 Area 2: Residential area in Achada do Sao Filipe (Photomontage 2)

Visual receptor sensitivity

Achada do Sao Filipe is a residential area southwest of the windfarm, below low hill hills, and the sensitivity of Receptor No. 2 is classified as **High**.

Magnitude of the visual impact

Two of the three new WTGs (WTG13 and WTG14, are visible from the location of this receptor due to the height of these turbines. Under Scenario 1, the WTGs are closer to the windfarm fence and WTG13 and WTG14 are more visible from this location.

The magnitude of the visual impact in Area 2 under Scenario 1 is classified as **Moderate adverse**, because the WTGs would cause a noticeable deterioration of the current view. The magnitude of the visual impact under Scenario 2 is classified as **Slight Adverse**, because the less visible WTGs would cause a slightly noticeable deterioration of the current view.

Assessment of visual impact

The visual impact of the expansion project in Area 2 is assessed as **High / Medium adverse significance under Scenario 1** and as **Medium adverse significance under Scenario 2**.

4.3.3 Area 3: Circular da Praia – National Stadium (Photomontage 3)

Visual receptor sensitivity

The Circular da Praia (roundabout) close to the National Stadium is below a hill and 750 m west of the windfarm. This unpopulated area includes the National Stadium and some businesses, such as car washing company.

The sensitivity of this visual receptor is classified as **Low**.

Magnitude of the visual impact

One WTG (WTG12) would be visible from this receptor under Scenario 1, and the three new WTGs would be visible under Scenario 2.

Under Scenario 1, the deterioration of the existing view would be barely perceptible and categorized as **Slight Adverse**. Given that the three new WTGs would be visible under Scenario 2, the proposed expansion project would cause a noticeable deterioration of the existing view. Therefore, the magnitude of the visual impact due to the new WTGs under **Scenario 2 is assessed as Moderate adverse**.

Assessment of visual impact

The visual impact of the expansion project in Area 3 **is assessed as Neutral under Scenario 1** and **Low adverse significance under Scenario 2**.

4.3.4 Area 4: Gamboa Beach (Photomontage 4)

Visual receptor sensitivity

Gamboa Beach is in Praia City (close to the business area downtown) where people fish, swim and engage in other sport. Some hotels and residential buildings are near the beach. Photographs for photomontage 4 were taken from the second floor of Hotel Perola.

The sensitivity of the visual receptor in Area 4 is categorized as **High**.

Magnitude of the visual impact

Existing WTGs are visible when looking up the hill above Praia City, and two of the WTGs will be visible under Scenario 1 and slightly more visible under Scenario 2. Consequently, a barely perceptible deterioration of the existing view would result under both scenarios. The magnitude of the visual impact due to the new WTGS in Area 4 under either scenario is categorized as **Slight adverse**.

Assessment of visual impact

The visual impact of the expansion project in Area 4 under either scenario is assessed as **Medium adverse**.

4.3.5 Significance of the visual Impacts

The significance of the visual impacts, determined by the visual receptor sensitivity and the magnitude of the visual impact on each of the four (4) areas is summarised in Table *5*.

Table 5 Visual Impact Assessment Matrix

Visual Impact Significance			Sensitivity of the Visual Receptor		
			High	**Medium**	**Low**
			Residential and recreational areas	Commercial and industrial areas. Areas where the view is not central to the use	Roads with views toward the development on which the viewer passes at speed and the view is not central to the use
Magnitude of Visual Impact	**Major Adverse**	Where the proposed development would cause a significant deterioration in the existing view			
	Moderate Adverse	Where the proposed development would cause a noticeable deterioration in the existing view	**High/Medium adverse significance** Area 2: Residential area in Achada do Sao Filipe – Scenario 1		**Low adverse significance** Area 3: Circular da Praia / National Stadium – Scenario 2
	Slight Adverse	Where the proposed development would cause a barely perceptible deterioration in the existing view	**Medium adverse significance** Area 2: Residential area in Achada do Sao Filipe – Scenario 2 Area 4: Gamboa Beach – Scenarios 1 & 2		**Neutral** Area 3: Circular da Praia / National Stadium – Scenario 1
	Neutral	Where the proposed development would cause no discernible deterioration in the existing view		**Neutral** Area 1: Parque do diversoes – Scenarios 1 & 2	

5 Conclusions

The potential visual impact due to the implementation of Santiago Windfarm Expansion Project was assessed, although the locations of the three new WTGs have not been defined. Two scenarios based on potential location configurations were modelled to determine the potential loss of visual amenity for sensitive receptors.

The visual impact assessment followed the Guidelines for Landscape and Visual Impact Assessment, developed by the Landscape Institute of the UK Institute of Environmental Management & Assessment (GLVIA). The methodology employed to assess the impact relied on the definition of the baseline landscape of the study area, the development of a 3D model to visualize the presence of the new WTGs in the Santiago windfarm, the photographic surveys conducted to assess the current views from key viewpoints, the development of photomontages for an integrated view of the current and predicted views, and the final impact assessment.

The results of this visual impact assessment indicate the following:

- The visual impact in Parque the diversoes is predicted to be **Neutral under Scenario 1 & Scenario 2**. The visibility of the Santiago windfarm (present and future) is null from this area due to the residential buildings around the square that block the view of the windfarm.
- The visual impact in the residential area in Achada do Sao Filipe, below the hill on which the windfarm is located, is predicted to be **High/Medium adverse under Scenario 1** and **Medium Adverse under Scenario 2**. Two of the three new WTGs would be more visible under Scenario 1 from this area because they would be closer.
- The visual impact in the Circular da Praia (roundabout) next to the National Stadium is predicted to be **Low Adverse under Scenario 2** and **Neutral under Scenario 1**. The new WTGs would be less visible from this location under Scenario 1.
- The visual impact in Gamboa Beach, in Praia City, is predicted to be **Medium Adverse under both scenarios**.

Visual impacts will be higher for residential areas due to the new WTGs. Furthermore, the new WTGs would be installed closer to the fence area under Scenario 1, resulting in a slightly higher visual impact except from the West-Northwest (Area 3).

To reduce these visual impacts, mitigation measures shall be considered in the Simplified Environmental and Social Impact Assessment (ESIA) of the Project.

6 References

- Guidelines for Landscape and Visual Impact Assessment (GLVIA). The Landscape Institute with the UK Institute of Environmental Management & Assessment.
- 21165/A5 LVA Methodology. Landscape and Visual Impact Assessment Methodology (Rev A). Dacorum Borough Council.

Project Documents

- Gabinete de Advocacia, Consultoria e Procuradora Jurídica, Environmental Impact Assessment, Complete Report, Feb 2009.
- Vestas, General Description 4MW Platform 4.5MW, Doc. No. 0067-7050-V05, February 2022.